

Program Title: Statewide Emerging Technologies

1. Projected Program Budget	\$	11,200,409
2. Projected Program Impacts		
MWh		n/a
MW (Summer Peak)		n/a
3. Program Cost Effectiveness		
TRC		n/a
PAC		n/a

4. Program Descriptors

Market Sector: Crosscutting
Program Classification: Statewide
Program Status: Existing

5. Program Statement

The Statewide Emerging Technologies (ET) program is an information-only program that seeks to accelerate the introduction of innovative energy efficient technologies, applications and analytical tools that are not widely adopted in California. Emerging technologies may include hardware, software, design tools, strategies and services. There are a daunting amount of market barriers which must be overcome for a new energy efficient product to gain acceptance. As the typical product life cycle in Figure 1 illustrates, during initial marketing efforts, products accepted by “innovators” may fail to gain wider acceptance with more risk-adverse customers, and the product’s adoption may fall off into “the chasm.” The ET program intends to help accelerate a product’s market acceptance through a variety of approaches, but mainly by reducing the performance uncertainties associated with new products and applications. The program targets all market segments.

What’s New for 2006-08?

- Increase in funding levels
- Increase focus on emerging technologies for longer term

rate

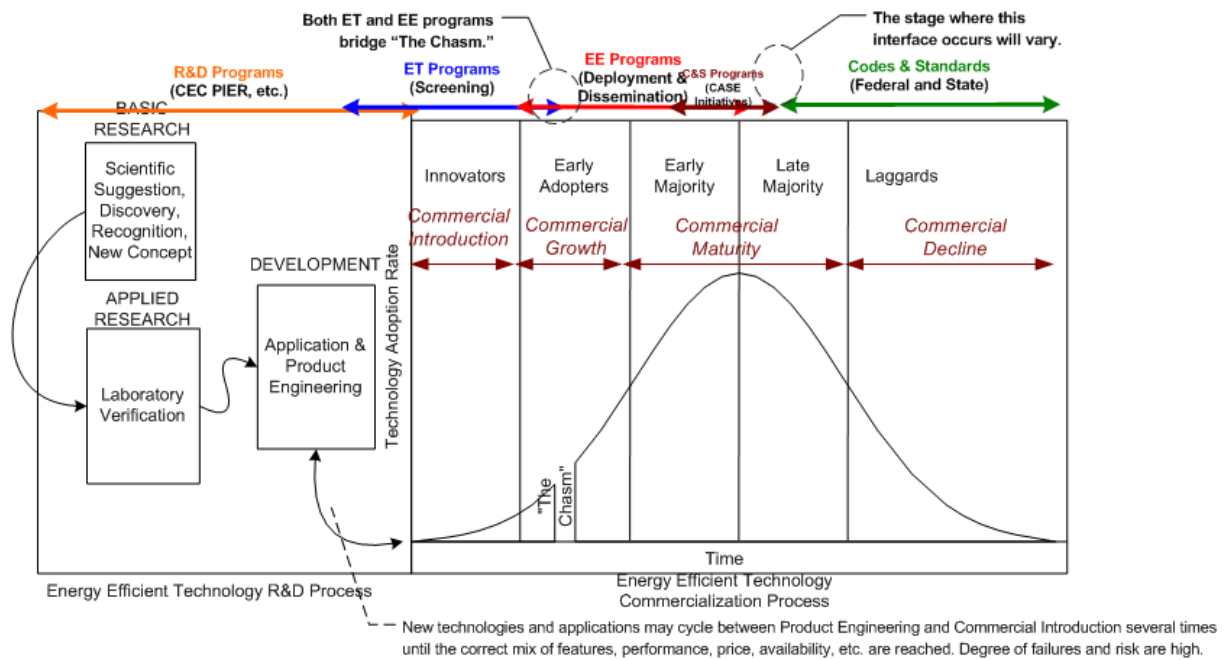


Figure 1. Energy Efficient Technology Commercialization Process

The ET program will consider technologies that are available for short-term and long-term deployment. The deployment of new and improved energy efficiency products and applications can help sustain or increase current savings. The ET program serves to make a new generation of cost-effective energy efficiency technologies available. In order to provide a continuous stream of new technologies to the energy efficiency programs, an increase of annual funding for the ET program has been requested.

6. Program Rationale

The ET program is an information program. Energy efficiency cannot remain static in the face of ever tightening energy markets and regulations. As the next generation of energy efficient technologies and applications emerge, they face market hurdles that may either delay their introduction or consign them to failure. The ET program is a statewide program that seeks to overcome many of those barriers, and to gain acceptance of innovative energy efficiency options that are not widely adopted in California. As shown in Figure 1, the program forms an important link between new energy efficient technologies and applications emerging from the Research & Development (R&D) cycle and their introduction into the marketplace. It also shows the relationship of the Emerging Technology Program, the Energy Efficiency Programs, and the Codes and Standards Program over the product life of the technology.

The proposed 2006-2008 statewide ET program will be slightly different from the 2004 and 2005 program. In 2004 and 2005, utilities and the California Energy Commission's (CEC) Public Interest Energy Research (PIER) staff met to discuss and coordinate statewide activities through the Emerging Technologies Coordinating Council (ETCC). Through PIER, the CEC helps to develop, test and demonstrate products up to the end of the R&D cycle. During the 2004-05 meetings, the PIER program managers and

contractors reviewed with the utilities those projects and technologies that have advanced enough to warrant utility ET program consideration. At SCE, work is progressing on several ET assessment projects based on PIER technologies that are in their final development stages. In addition, program staff may investigate opportunities with manufacturers, CEC PIER, and others to develop new, innovative and cost-effective energy efficient technology enhancements to existing products. ET program staff briefed energy efficiency program planners and prepared materials regarding emerging technology applications that may be considered ready for the 2006 - 2008 energy efficiency programs. The synergy between R&D programs, like PIER, and the utilities' ET programs is working well and should continue. However, the overall objective for the ET Program is to verify the performance of new innovations for the integrated portfolio supporting resource acquisition. The success of the Energy Efficiency Program will depend on the types of technologies that can achieve the greatest demand reduction and energy savings. New selection criteria were developed to meet Energy Efficiency Program objectives. It is also important that a balance of new innovations for various market segments, including residential, commercial, industrial and agricultural, be achieved.

7. Program Outcomes

The aim of the ET program is to develop all the necessary information required for the Energy Efficiency Program to employ the technology to achieve their energy savings goal. That information includes verified energy savings and demand reductions, market potential and market barriers, incremental cost, and the technology's life expectancy.

The outcome of each individual energy technology is very difficult to predict especially for high-risk projects. It is expected that a few projects may not turn out to be successful. Even unsuccessful assessments may provide insight so that improvement can be made in the future.

8. Program Strategy

The utilities will deliver the program through custom demonstration projects, often working with targeted "innovators" and coordinated efforts such as the ETCC ET database. Information transfer efforts disseminate project results through many different outlets, including the Energy Centers, utility personnel and community organizations. These information transfer activities leverage the utilities' overall energy efficiency communication efforts to disseminate information resources such as reports, fact sheets, design methods and tools developed through the demonstration projects.

9. Program Objectives

The ET program will initiate several new Emerging Technology Application Assessments during 2006 - 2008. New technologies will be developed depending upon the market potential of the innovation, market barriers, incremental cost, life expectancy of the technology, the cost of the assessment, and the time required for the assessment. Since the Energy Efficiency Program managers are the recipients of those technologies, they will be involved in the selection process. In order to guarantee a truly integrated

portfolio, it is necessary to provide technologies for all market segments although some of them may not offer great savings.

Assessments initiated in prior program years will continue until completion. Project results and information will be made available to targeted markets and the utilities' energy efficiency program planners will be briefed on emerging technology applications that may be considered ready for future efficiency program efforts. Once an assessment project concludes and the results are understood, many of the demonstrated applications become part of the portfolios of mainstream energy efficiency programs, form the basis of future energy-related codes and standards, or are adopted as standard design practice in the marketplace.

10. Program Implementation

The Emerging Technologies program consists of two parts: Assessment and Information Transfer, and the ETCC. Assessment and Information Transfer focuses on analysis of promising, early prototypes or commercially available technologies which have not yet obtained adequate penetration or acceptance in the marketplace. Emerging Technologies may include hardware, software, design tools, strategies and services. Part of the assessment may include field demonstrations, conducted at either customer sites or in controlled environments, which provide design and performance information, and verify novel energy efficient systems. Verification helps to reduce market barriers inhibiting wider acceptance of a technology. Demonstration projects help to measure, verify, analyze, and quantify the potential demand and energy savings, and document customer acceptance of specific applications in different market segments. Information transfer disseminates the results of emerging technology application assessment projects in a way which is customized to reach the most appropriate target markets.

The ETCC is a statewide information exchange and coordination effort between Southern California Edison (SCE), Pacific Gas & Electric (PG&E), Southern California Gas (SoCalGas), and San Diego Gas & Electric (SDG&E), and the CEC PIER programs. The PIER programs, like other public and private R&D efforts, develop, test, and demonstrate prototype products. The utilities' ET efforts form an important link in the commercialization of emerging energy efficient natural gas and electric technologies and their applications. Program efforts to select technology applications for assessment projects include working with the CEC PIER program, members of the research and design communities, manufacturers, energy efficiency advocates, and public entities such as Electric Power Research Institute (EPRI), Gas Technology Institute (GTI), universities, E-Source, California Institute for Energy Efficiency (CIEE), The Air-Conditioning and Refrigeration Institute (ARI), American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), Illuminating Engineering Society (IES), Institute of Electrical and Electronics Engineers (IEEE), national laboratories, Department of Energy (DOE), Environmental Protection Agency (EPA), NASA, engineering firms, industry and trade groups and customers. Contacts with these groups through both the individual utilities and the CEC PIER program constitute a large part of the public input the ETCC receives concerning energy efficient emerging technologies.

The ETCC will hold quarterly meetings to coordinate project activities, exchange information about specific customer projects and technologies, and discuss ways to enhance the utilities' Statewide ET Program efforts and collaboration with the CEC PIER, the ETCC website and the ET database. During ETCC business meetings, discussions concerning ongoing and/or proposed projects at times involve privileged customer information, business strategic and operational details, or privileged manufacturer product details that are too sensitive to discuss in an open forum. These exchanges are necessary to ensure truly effective coordination and collaboration efforts between the utilities and the CEC PIER. For this reason, ETCC business meetings will not be open to the general public. At times, the ETCC may invite speakers to a portion of a work meeting to present advances in energy efficient emerging technologies that fit within the context and interests of the existing Statewide Emerging Technology program.

Each utility's program consists of activities that may be coordinated with other utilities' approved emerging technology programs and the CEC, and activities that are unique to each utility service territory and customer base. The efforts that each utility undertakes, as part of the statewide ET program, will be guided and prioritized based on the following criteria: customer needs, coordinated ETCC activities, technology readiness, potential energy and demand savings, approved program funding levels, and other relevant objectives.

In order to meet the immediate savings goal and sustain or increase the savings; it is necessary to apply matured technologies to the new applications as well as technologies under development. The program will focus on new, energy-efficient emerging technology assessment projects in 2006 through 2008. ET Program efforts form an important link between ongoing R&D efforts on energy-efficient technology applications and their commercialization. Applications mature out of the R&D cycle at different times and are not always available for consideration during initial program planning efforts. Thus, program staffs work to remain informed on a broad range of emerging technology applications from many information sources, and any of the technologies may prove to be a viable project candidate. However, SCE will concentrate in three major areas: lighting, refrigeration and air conditioning, and industrial processes.

Lighting

Lighting consumes approximately 30% of the energy usage in commercial buildings. Energy efficient lamps, ballasts, controls, and system designs will be investigated and assessed for reducing the energy usage in lighting in buildings and special applications.

The greatest potential in lighting technology is the light-emitting diode (LED). LEDs available in the market at this time are more efficient than incandescent lights but less efficient than fluorescent lamps. LED lights, however, have many potential applications, since they have a much longer useful life than both their incandescent and fluorescent predecessors. Blue LED lights, for example, may replace incandescent taxiway lights, which would offer a 90% energy savings. Linear LEDs may also replace neon tubing in business marquee signage. On April 11, 2005, scientists at the Lighting Research Center

at Rensselaer Polytechnic Institute have developed a new process to capture the backscattered photon and significantly increase the light output without requiring more energy. It is expected that a new generation of high efficiency LEDs will come into the marketplace. The new LEDs may generate over 80 lumens per watt compared to today's compact fluorescent lamps at 60 lm/watt and traditional incandescent lamps at 14 lm/watt. Assessment programs will incorporate new LED lighting as soon as product prototypes are developed and available.

Using the appropriate lighting controls to turn off lights when they are not necessary also promises to save considerable amounts of energy. For example, parking lot lights and pathway lights are typically turned on from dusk to dawn. Most parking lots are relatively empty after midnight. By applying bi-level switching to parking lot and pathway lights with occupancy sensors which turn half of the lights off when no one is around, a 40% energy savings is estimated.

Combining different technologies may achieve even higher energy savings. Employing skylights for daylighting and advanced light fixtures with daylighting controls for electric lighting are two solutions which can be applied to classrooms. This technology combination promises to save approximately 60% of the lighting energy used in school classrooms.

HVAC & Refrigeration

As indicated earlier in this Program Implementation Plan, a balanced portfolio is important. Residential air-conditioning units are quite different from commercial units. Using evaporative processes to reject heat in cooling systems is very efficient especially in hot and dry climates. Evaporative condensers may improve the overall efficiency of air-conditioning units by about 30%. However, they are seldom used in small residential applications. This is mainly due to maintenance issues. The mineral content in Southern California's water is very high and causes corrosion in the evaporative condenser. Water treatment is essential and requires study.

Refrigeration is the major energy user in supermarkets. New technologies may improve refrigeration equipment efficiency. For example, heat flux demand defrost employs sensors in conjunction with a controller to recognize the optimum times to initiate and terminate a defrost cycle. Heat flux demand defrost is comprised of two main components, one for detecting frost or initiating defrost and the other for terminating defrost. The heat flux sensor is located in front of the heat exchanger fin and measures the heat transfer from the heat exchanger fin as a function of frost/ice formation. The temperature termination sensor, on the other hand, is located in an area of the heat exchanger where the ice melts off last during a defrost cycle. It is estimated the heat flux defrost system may save 7.6 kWh/yr/linear foot of low-temperature display case.

Industrial Processes

Many proven technologies have not been applied to manufacturing processes. If an application proves successful, it can be introduced into the market in a very short time with minimum risk. For example, variable frequency control has been used for variable

air volume systems in building HVAC systems for a long time. However, it is seldom used in industrial duct collection systems. Such an application may reduce energy usage by 50%.

Computer chip manufacturing, biotech and pharmaceutical industries are high-energy users. CEC has funded several PIER projects to improve the energy efficiency in those industries. These include LBL fume hoods, clean room microenvironments, and fan filter units. SCE will assess those technologies as soon as they are available in the market.

Most manufacturers use compressed air systems. Variable speed control of compressors, air drying systems, and piping designs promise to improve overall system performance. By taking a systems approach to the design of compressed air systems, overall system performance can be optimized while saving energy.

Water treatment and wastewater treatment are also high-energy users. Several technologies may not only save energy but also reduce water consumption in the process. Since most of the water used in Southern California comes from the Colorado River, saving water also saves pumping energy.

At the end of each calendar year, the IOUs will provide a brief report on the ETCC website which provides a list of projects selected that year, the potential energy and/or demand savings projected, and the estimated time it will take the technologies included in the assessment to reach the market. The report will discuss the progress from the previous year's assessments and identify which assessments will be continued into the following year. .

It is important to note that the less mature a technology is, the higher the risk that the technology may fail in an application. The identified risks are among the many factors that the utilities use to select technology applications for demonstration projects and to establish project contingency requirements. Starting in 2006, SCE may direct some resources toward market research to achieve a better initial understanding of a technology's market potential in order to improve the overall selection process. The significant increase in budget requested for program years 2006 through 2008 will be used to improve the ETCC website and ET database, increase assessment goals and information transfer activities, comply with added program tracking requirements and increased risks due to working with less mature products emerging from research. In past program years, the estimated specific costs of projects undertaken are reported in quarterly workbooks once the projects are committed. These costs will continue to be reported as required in the reporting workbooks. Likewise, narratives discussing initiated assessment projects and their progress are provided in past quarterly narrative reports. As requested, these narratives will be expanded to include projects initiated in previous program years. As assessment projects are concluded, their results will be summarized in the annual report narratives including which associated products have since been incorporated into the utilities' energy efficiency program efforts.

11. Customer Description

Customers from all markets segments are eligible to host emerging technology application demonstration projects. In general, the information the program generates through its demonstration activities benefits all customers. One of the goals of an ET program is to explore how far an application of a new technology can be extended into various market segments in order to characterize the widest possible deployment. Thus, the utilities seek opportunities to host appropriate demonstration projects at hard-to-reach customer sites.

The program does not use a mass marketing approach to finding interested customers willing to participate in an emerging technology application demonstration and does not enroll customers. The utilities may implement the program through custom demonstration projects. For projects that require a customer demonstration site, the program works with customers that are willing to accept the potential risks and expenses associated with relatively new energy efficient technology applications. Residential and non-residential customers from all market segments are potential participants. Figure 2 illustrates the general project and customer selection process. Customer site demonstration projects may come about in one of two ways:

- *Customer “Pull.”* A utility account representative may approach the program staff on behalf of a customer interested in pursuing energy efficiency. The ET program staff will help the account representative address the customer’s needs, and at the same time, consider a range of potential energy efficient emerging technology applications.

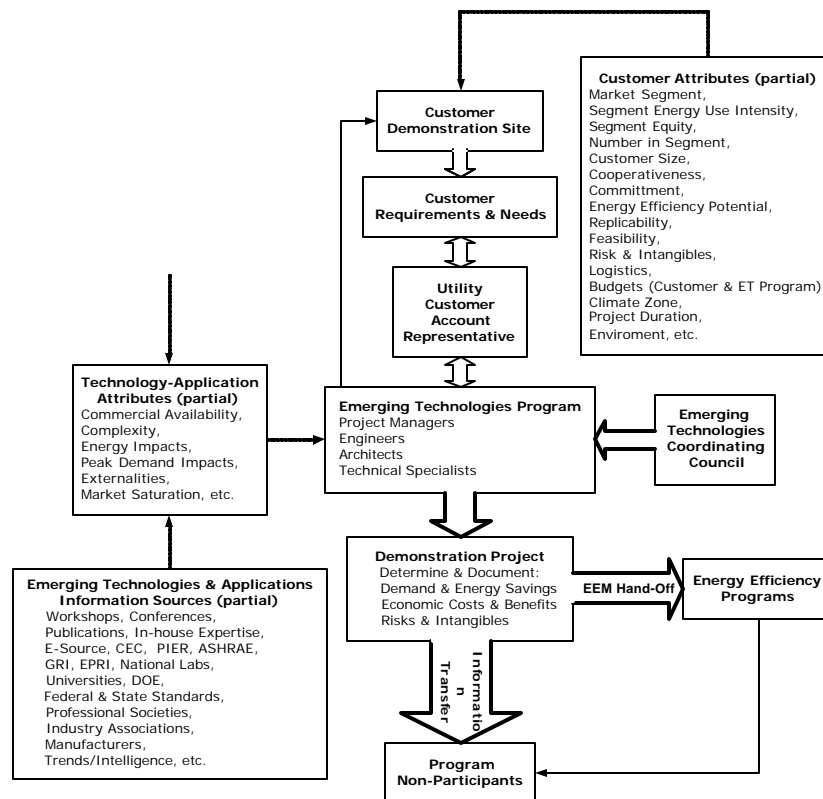


Figure 2. General Emerging Technologies Program Process

- *Technology “Push.”* The second manner in which a project may come about is due to the emergence of a significant new technology application. ET program staff then approach the utility account representatives for a particular market segment, inform them about the new technology application, and ask them to help identify a potential demonstration site from among their customers. The program follows a targeted marketing approach to work with “innovators.” These “innovators” may further influence other customers. Note that the utility’s customer account representative plays an important role in the overall process. For those projects that do not require a field demonstration at a customer site, the program staff seeks to frame the project targeting the customer’s needs and requirements. This helps ensure that project objectives are aligned with customer needs and expectations.

Before a customer site demonstration project can take place, a legal agreement acceptable to both the customer and the utility is developed, negotiated, and executed. These agreements specify the terms of the projects, maximum duration, dispute resolution methods, termination provisions, general liability, etc. It is important to note that some demonstration projects may require up to four years to complete, commencing on the date an agreement is signed with a customer. The time required to complete a project will vary due to how complex a new technology application is, construction schedules, building and process commissioning, logistics, etc.

12. Customer Interface

The Emerging Technology Program is different from other EE programs. If the technology assessment requires field verification, a test site requirement will be developed by project management and forwarded to account managers. Account managers will search for customers who fit the specification. Once customer sites are located, the project manager meets with those customers to review the project objective and responsibilities of all parties. A draft agreement is then developed by the project manager and reviewed by SCE's Law Department. The draft agreement is forwarded to the customer for their approval. If the language is not accepted, recommended changes may be provided by the customer. The changes will be reviewed by SCE's Law Department. The agreement will not be signed until the final language is accepted by both parties.

Once the agreement is fully executed by both parties, the project will begin. The project manager will be responsible for the implementation and all operational aspects of the project. All customer questions and complaints are directed to the project manager. If a dispute arises, the project manager will resolve it based on the terms of the negotiated agreement with the customer. In case the project manager cannot resolve a dispute, the issue is brought to senior management for resolution. If the unit manager cannot resolve the matter with the customer, the case is turned over to SCE's Law Department for resolution.

13. Energy Measures and Program Activities

13.1. Measures Information

Based upon the California Public Utilities Commission's (CPUC) approved Energy Efficiency Policy Manual, an information-only program is not reasonably expected to provide an estimate of energy savings. The lack of energy savings, capacity savings, therm savings, resource benefits, or a TRC ratio for any particular program, i.e., information programs, should not imply that a measure or program does not promote energy efficiency. Neither should it imply that there is no impact to the customer's use of electricity or natural gas, nor a corresponding impact to the electricity or natural gas system. Although this program does not create immediate short-term energy savings, it provides a clear, logical, and verifiable link between program activities and eventual energy savings.

The ET program performs assessments of emerging technologies. The number of emerging technology assessments initiated each year will be reported to the CPUC and can be verified. Some of those assessments may include performance of field demonstrations at customer sites. These field demonstrations may take as long as four years to complete, especially at new customer sites. The progress of the project will be reported throughout the funding cycle.

The Statewide Emerging Technologies Program progress will be measured through the following three annual metrics:

- **SCE will perform a total of 45 Emerging Technology Application Assessments over the three year period (2006 through 2008).** The technology application assessments may consist of diverse project types including: feasibility studies, simulation analyses, field demonstrations, controlled environment tests, commercial product development, design methodologies and tool development. Some assessments may take up to four years to complete.
- **Annual Update to the Emerging Technology Database.** ETCC will retain an outside contractor for this task. The list of emerging technology applications on the Emerging Technology Coordinating Council website (www.ca-etcc.com) will be updated during the program year. Each IOU as well as the CEC will be responsible for providing the project information to the contractor who will incorporate them into the ETCC website.
- **The Emerging Technologies Coordinating Council will meet at least four times during each year.** At the start of program year (PY) 2006, the ETCC will meet to coordinate and plan joint efforts, and initiate updates to the Emerging Technologies Database available on the ETCC web site (<http://www.ca-etcc.com/>). The ETCC will continue to meet throughout the program years at least once per quarter. The ETCC will assess whether energy efficient emerging technology applications have reached a sufficient stage of maturity for the utilities to consider them in the statewide program efforts. In addition, to better monitor PIER progress, utility program staff members will attend PIER project meetings as often as possible. This will allow the utilities to remain current of PIER project changes and developments. Demonstration projects will be initiated throughout the program year to assess energy efficient emerging technology applications.

13.2. Energy Savings and Demand Reduction Level Data

Section 13.2 is not applicable.

13.3. Non-energy Activities

After the emerging technologies are assessed, it is important to have the information transferred to the energy efficiency program managers as well as the customers. Information transfer efforts disseminate project results through many different outlets, including the Energy Centers, utility personnel, community organizations and other entities. These information transfer activities leverage the utilities' overall energy efficiency communication efforts to disseminate information resources such as reports, fact sheets, design methods and tools developed through the demonstration projects.

13.4. Subcontractor Activities

The ET program staff are responsible for all aspects of the program. Subcontractors may be used to perform the actual construction and installation of the equipment and hardware at customers' sites. All subcontractor activities will be reported in the monthly workbook.

13.5. Quality Assurance and Evaluation Activities

This statewide evaluation plan was developed in accordance with EM&V requirements as specified in the current Energy Efficiency Policy Manual. The manual does not require the evaluation plan for this information-only program to have a measurement and verification component. Pursuant with CPUC instructions, this plan should not be regarded as final. A final, more complete plan will be specified in accordance with the forthcoming new California Evaluation Framework at a later date.

The success of the program will be measured by the achievement of the above goals. In addition, a process evaluation of the program and an update of the market assessment will also be conducted. The proposed evaluation plan contains two primary objectives:

- To evaluate program success by measuring indicators of program effectiveness and test the assumptions underlying the program theory, and
- To provide ongoing feedback and corrective guidance regarding program design and implementation.

Program data on the number of sponsored technology assessments, field demonstrations, published articles, workshops, professional forums conducted and other information dissemination opportunities will be collected and reviewed to verify and document 2006-2008 program accomplishments. Information obtained from interviews with program staff and available data on the number of workshop and forum attendees will provide supplemental information on program activities and accomplishments. In the past evaluation report, a recommendation was made to improve the design of the ETP tracking database. Future program evaluations will monitor the program's progress in accomplishing this goal.

13.5.1. Expected Number/Percent of Inspections

The ET program is an information program which does not require inspections. The performance of the program will be evaluated by the M&V program.

13.6. Marketing Activities

The ET program is an information program. The only marketing is for information dissemination. Most of the seminars are presented at the SCE Customer Technology Application Center (CTAC) and Agricultural Technology Center (AgTAC). Seminars are promoted through e-mail, web site access, newspaper and trade association advertisements, posted seminar schedules and flyers mailings to targeted audiences.

14. Program Changes

The program implementation plan was revised to reflect the reporting procedure on the technologies that have been completed at the end of the program year and new technologies that will be investigate in the following year.