

PROPOSAL FOR ENHANCED AUTOMATION INITIATIVE FOR THE PG&E SERVICE AREA

Prepared for

**California Public Utilities Commission
San Francisco, California**

Confirmation Number:

KEMA-XENERGY PROPOSALS SUBMITTED

Program Name	Utility Area(s)
Comprehensive Compressed Air Program	PG&E, SCE, SDG&E
EEGOV B.E.S.T. Program	PG&E, SCE
Enhanced Automation Initiative	PG&E, SCE
Green Building Education and Technical Assistance Program	PG&E
Positive Energy Loan Program	PG&E
Wastewater Treatment Improvement Program	PG&E, SCE

Contact Person

Julia Larkin, KEMA-XENERGY
492 Ninth Street, Suite 220, Oakland CA 94607
510-891-0446
jlarkin@kema-xenergy.com

Prepared by

**KEMA-XENERGY Inc.
492 Ninth Street, Suite 220
Oakland, California 94607
510.891.0446**

September 23, 2003

SECTION 1	PROGRAM OVERVIEW.....	1-1
1.1	Program Concept	1-1
1.2	Program Rationale	1-2
1.2.1	Cost effectiveness	1-2
1.2.2	Long-term annual energy savings	1-2
1.2.3	Electric peak demand savings	1-2
1.2.4	Ability to overcome market barriers	1-3
1.2.5	Innovation	1-4
1.2.6	Coordination with programs run by other entities	1-5
1.3	Program Objectives.....	1-5
1.4	Market Segments	1-5
SECTION 2	PROGRAM PROCESS	2-1
2.1	Program Implementation	2-1
2.1.1	Marketing, Education and Training	2-1
2.1.2	On-site Facility EMS Assessments	2-1
2.1.3	Vendor Proposal Review	2-1
2.1.4	Financial Incentives	2-2
2.2	Marketing Plan.....	2-2
2.3	Customer Enrollment	2-3
2.4	Materials	2-3
2.5	Payment of Incentives.....	2-4
2.6	Staff and Subcontractor Responsibilities	2-5
2.7	Work Plan and Timeline for Program Implementation	2-5
2.7.1	Proposed Milestones	2-6
SECTION 3	CUSTOMER DESCRIPTION.....	3-1
3.1	Customer Description	3-1
3.2	Customer Eligibility.....	3-1
3.3	Customer Complaint Resolution.....	3-1
3.4	Geographic Area	3-2
SECTION 4	MEASURE AND ACTIVITY DESCRIPTIONS.....	4-1
4.1	Energy Savings Assumptions	4-1
4.2	Deviations in Standard Cost-Effectiveness Values.....	4-4
4.2.1	Net-to-Gross Ratio	4-5
4.2.2	Estimated Useful Life	4-5
4.2.3	Incremental Measure Cost	4-5

4.3	Rebate Amounts.....	4-5
4.4	Activities Descriptions.....	4-6
4.4.1	Unit-Based Implementation Activities with Measurable Energy Savings.....	4-6
4.4.2	Unit-Based Implementation Activities without Measurable Energy Savings	4-7
4.4.3	Task-Based Implementation Activities.....	4-8
4.4.4	Task-Based Marketing Activities	4-8
4.4.5	Evaluation, Measurement, and Verification Activities.....	4-9
SECTION 5	GOALS.....	5-1
5.1	Energy and Peak Demand Savings Targets	5-1
5.2	Other Proposed Benchmarks for Earning Performance Payments	5-1
5.3	Cost-Effectiveness Calculations	5-1
SECTION 6	PROGRAM EVALUATION, MEASUREMENT AND VERIFICATION (EM&V).....	6-1
6.1	EM&V.....	6-1
6.1.1	Description of general approach to evaluating program success.....	6-1
6.1.2	Description of approach to measuring and verifying energy and peak demand savings (applicable to all programs except information-only).....	6-2
6.1.3	Process Evaluation and Customer/Contractor Satisfaction.....	6-3
6.1.4	Suggested EM&V Contractors	6-5
SECTION 7	QUALIFICATIONS	7-1
7.1	KEMA XENERGY.....	7-1
7.2	Subcontractors.....	7-1
7.3	Resumes or Description of Experience.....	7-1
7.3.1	Corporate Qualifications.....	7-1
7.3.2	Staff Experience.....	7-12
SECTION 8	BUDGET	8-1
8.1	Budget Summary	8-1

1.1 PROGRAM CONCEPT

The goal of the Enhanced Automation (EA) Initiative is to promote investments in enhanced automation and control technologies. The EA Initiative seeks to capitalize on the synergies between energy savings and long-term peak demand reduction available through more sophisticated use of energy management systems (EMSs). These improvements often result in additional demand response capability as well. Most businesses and facilities in the State are ignoring the substantial electric and gas energy and peak demand potential available. EMS enhancements of this type usually fall through the cracks of other energy-efficiency programs.

Building automation technologies have made substantial progress in the past few years, yet most EMS systems are still not fully utilized. Our research in California shows that significant energy, demand, and temporary load reduction opportunities remain untapped.¹

There is increasing momentum to develop programs to effectively address EMS enhancements in the post-energy-crisis era. For example, the California Public Utilities Commission has developed a Critical Peak Pricing Tariff. We will also leverage the momentum created by the California Energy Commission's existing Enhanced Automation Program.² The Energy Commission's campaign has been well received, but is only an education campaign. This EA Initiative is needed to help customers take the next step—implementation of EMS system enhancements.

Essentially, the EA Initiative will obtain electric and gas energy and demand savings through cash incentives for EMS enhancements. The Initiative will facilitate demand response capabilities as an added advantage. Components of the program include:

- Marketing, education and training
- Free EMS assessments for customers
- Vendor proposal review and stipend
- Incentives for EMS reprogramming and/or hardware improvements.

¹ See, for example: (a) KEMA-XENERGY. 2003. Forecasting Energy Efficiency & Demand Response Potential. Prepared for Southern California Edison.(b) XENERGY, Inc. 2002. California Commercial Sector Energy-Efficiency Potential Study, prepared for Pacific Gas and Electric Company. (c) XENERGY, Inc. 2001. 2000/2001 Nonresidential Large SPC Evaluation Study, prepared for Southern California Edison.

² KEMA-XENERGY Inc., 2002, "Enhanced Automation Technical Options Guidebook", prepared for The California Energy Commission. This guidebook is part of a suite of materials that also include six case studies, a Business Case Guidebook, and a software tool to assist customers considering EA enhancements. All of these materials are available for free download at www.ConsumerEnergyCenter.org/enhancedautomation.

1.2 PROGRAM RATIONALE

All too often, existing EMSs have more energy management features than are being utilized. Frequently, only small amounts of additional programming or a software patch can activate these features. In other cases, the software features are there, but a few key pieces of hardware (points) are missing or not functioning. Optimizing the programming of the existing EMS and, in some cases, installing hardware enhancements have a wide variety of energy and non-energy-related benefits.

In terms of energy savings, a relatively simple reprogramming effort can reduce long-term electricity, peak demand, and gas use. Non-energy-related benefits include reduced maintenance costs, increased controls flexibility, and improved occupant comfort. In addition, these enhancements can increase demand response potential to allow businesses to more effectively respond to price signals or emergency calls for reduction.

The following subsections discuss the benefits of the EA Initiative in terms of the California Public Utility Commission's program selection criteria.

1.2.1 *Cost effectiveness*

This program specifically targets existing EMSs, which can be upgraded to increase efficiency at modest costs with new programming and/or limited hardware investments. Upgrades will provide a 2-year payback for the average targeted customer with EA Initiative incentives. The overall TRC Ratio is 1.9 with the total net benefits of \$1.1 Million.

1.2.2 *Long-term annual energy savings*

Most commercial and institutional customers are not aware that fairly simple upgrades would result in substantial long-term electricity and gas savings. We estimate a measure life of 15 years for the hardware improvements and 7 years for re-programming. However, we believe that there is an even longer lasting effect by helping the customer to learn more about how to optimize their EMS.

1.2.3 *Electric peak demand savings*

There will be direct long-term demand savings as a result of the targeted improvements. In addition to long-term demand savings, we also expect to increase the demand response capability of the participants. In order to encourage customers to temporarily reduce demand during times of shortage and high energy costs, it takes the right combination of "capability" and "motivation". Demand response programs such as critical peak pricing or demand response incentives provide the motivation. Capability involves a combination of technology that allows customers to reduce their level of energy service easily and knowledge on the best ways to respond. The technologies promoted in this program will make it easier for the customer to reduce demand thus requiring less motivation to get the customer to respond. As part of this initiative, customers will learn to manipulate their EMS more effectively at times of critical

regional peak demands or pricing signals. One of the major benefits of this Initiative is the ability to capitalize on the synergies between energy, peak demand, and demand-response potential through relatively straightforward upgrades.

1.2.4 Ability to overcome market barriers

This program will overcome the major financial and educational barriers for this target market.

Most facility managers do not even realize that an opportunity exists. And those that do know do not have the resources to accomplish it without help. Specific barriers that will be addressed include:

1. Information and/or search costs
2. Hassle and/or transaction costs
3. Performance uncertainty
4. Lack of access to capital/first cost.

Addressing Information Costs

In addition to significant untapped potential, our research has shown that there are high barriers to gaining reliable information on enhanced automation and control measures that are cost-effective for a particular customer or facility. The EA Initiative will provide customers with specific information relevant to their facility. Individualized technical assistance will take customers from the information gathering stage toward implementation.

Addressing Transaction Costs

Building operators often see dealing with the EMS as a hassle. The systems are complex and often require specialized training or the vendor to make adjustments. Yet, few have been fully trained, and most do not have time to learn about it on the job. There is a tendency, if they think the EMS is causing a problem, to just bypass it instead of programming it correctly. Since they do not typically see the energy bills or have submetering, they rarely recognize the negative effects of bypassing the programming.

Operators rarely seek to find ways to improve the functioning of the existing system, much less research opportunities to enhance its capabilities. Vendors are often not inclined to pursue recommendations of this type without direct interest from the customer, due to the level of investigation required to develop a project proposal. Yet, customers rarely ask for this type of proposal. The EA Initiative will bridge this gap through customer on-site assessments, vendor outreach, and proposal review. In addition, our engineers will be available throughout the project to provide assistance, as needed.

Addressing Performance Uncertainty

Since many operators are not thoroughly familiar with their EMS, they are reluctant to attempt improvements to programming since they are uncertain just how the system will perform. They need some outside expertise to guide them. Another reason customers do not pursue these types of EMS upgrades is that it is often difficult to predict savings. When faced with other options, such as lighting retrofits with more easily recognized savings these projects get de-prioritized.

The EA initiative will educate customers and vendors on the savings opportunities available. In addition, the incentives will provide additional reassurance to customers that these enhancements are worthwhile. When presented with reliable information on potential savings and reduced energy costs, building operators will be much more likely to follow through.

Addressing Lack of Funding

There is rarely money in a customer's annual O&M budget to make changes to EMS programming or for operator training. In addition, most control and automation technologies are outside the scope of the existing statewide programs. This leaves customers who have identified automation investment opportunities with nowhere to turn for financial incentives to reduce project payback periods enough to meet their criteria.

The EA Initiative will provide modest incentives for energy savings as a result of EMS enhancements. This will provide an important boost to customers considering these projects.

1.2.5 Innovation

There is a growing recognition that most EMS systems are not optimized for energy efficiency. In fact, a recent panel discussion at the September 18, 2003 Portland, Oregon conference of the Association of Energy Management Professionals concluded that over 50 percent of the EMS systems in place are not properly programmed. Yet, there are few other programs in the country targeted to identify underutilized systems and upgrade them. California currently has no programs targeted for EMS upgrades.

To investigate this issue, Puget Sound Energy sponsored two pilot projects in 2002. The first, conducted by Honeywell Building Control Systems, targeted customers that had one EMS that controlled a number of buildings, such as schools. The second pilot was conducted by the Northwest Energy Efficiency Council and Portland Energy Conservation Inc., and was nicknamed "Commissioning-Lite." This program recruited local contractors, who in turn recruited customers to participate in the pilot.

In both of these pilots, the key to identifying and implementing energy saving measures was to assess the programming of the EMS and its readouts and physically inspect the condition of key actuators and sensors, such as those for economizers. The findings from these pilots showed that there are many errors in EMS programming. In addition, some systems were consuming excess energy because they were in need of minor repairs. In other cases, a few additional points were

needed to operate a particular component of the EMS effectively. The pilots found that the “biggest bang for the buck” was in the programming improvements.

The EA Initiative seeks to fill an important gap in existing energy-efficiency programs. Our on-site assessments, vendor proposal review, and incentives will promote EMS enhancements in a way previously unseen in the State.

1.2.6 Coordination with programs run by other entities

This program can fill an important niche as well as provide synergies with other statewide programs, such as the existing educational, auditing, and retrofit programs. This program also will leverage the momentum built by the EA Program and will also identify opportunities for the customer to go to their regular utility for incentives on measures not covered in this program. In addition, the new Critical Peak Pricing and Hourly Pricing Option tariffs that have just been approved will call attention to this important issue and provide additional motivation. We will coordinate as needed with programs offering synergies with the EA Initiative to provide our customers with the comprehensive information on programs and resources available.

1.3 PROGRAM OBJECTIVES

The projected accomplishments of the program for the 2-year period are shown in Table 1-1. These impacts will result in significant cost savings for customers due to lower electric and gas energy use, and reduced peak demand.

**Table 1-1
PG&E Projected EA Initiative Accomplishments in 2004-2005**

EA Initiative Program Projected Accomplishments	
Net Coincident Peak Demand Savings	1,220
Net Annual kWh Savings	3,600,000
Net Lifecycle kWh	42,000,000
Net Annual Therms	88,000
Net Lifecycle Therms	1,000,000
TRC Ratio	1.90
PT Ratio	5.73

1.4 MARKET SEGMENTS

The EA Initiative targets commercial and institutional customers whose buildings have a summer peak demand of 1 MW or more in the Pacific Gas and Electric Company service area. Generally, these buildings have more than 150,000 square feet of floor space. We will target large facilities with existing EMSs, such as office buildings and campuses, public institutions, and schools.

2.1 PROGRAM IMPLEMENTATION

The major program activities the 2004-2005 Enhanced Automation (EA) Initiative will provide are:

- Marketing, education and training
- Free EMS assessments for customers
- Vendor proposal review and stipend
- Incentives for EMS reprogramming and/or hardware improvements.

2.1.1 Marketing, Education and Training

We will target the marketing to organizations most likely to benefit from our services, which are large commercial and institutional facilities with 1 MW or more of demand at a single location. In addition, we will contact system controls vendors active in the territory to inform them of the opportunities for their customers provided through the EA Initiative. We will build upon the existing Enhanced Automation (EA) materials provided by the California Energy Commission to offer concrete examples and success stories for the targeted customers. In addition, as part of our on-site assessment, discussed below, we will provide education for customers, introducing them to the EA technologies and resources available.

2.1.2 On-site Facility EMS Assessments

We will conduct a brief phone screening to ensure the customer meets the minimum eligibility criteria and interest level. We will then schedule an assessment. Our free on-site assessments will provide customers with an evaluation of the flexibility of their current energy management and controls systems to reduce energy costs, while maintaining occupant comfort and productivity. We will determine whether there are likely to be cost-effective technological investments to their energy management and information systems that will provide energy and demand savings. We will also assess opportunities to optimize their energy control strategies to respond to peak demand alerts, pricing signals or high peak demand charges, which will provide additional temporary demand savings.

2.1.3 Vendor Proposal Review

If the on-site assessment has determined that there is sufficient potential for cost-effective savings through EMS enhancements, the customer will be invited to proceed to the next stage. The most appropriate vendor, as determined by the brand of the existing system, will be solicited to submit a detailed proposal for EMS enhancements appropriate for that customer's system.

Vendors will be instructed to only provide proposals that meet EAI savings and payback requirements. The focus will be on reprogramming and small hardware enhancements that improve the functioning of the existing EMS. We do not plan to fund major hardware upgrades.

Vendors will receive a small stipend to serve as partial reimbursement for their efforts on the detailed proposal. The \$500 stipend will only cover a small portion of the vendor time to create a proposal of the detail necessary for the Program. The stipend is an important component of this program because vendors are often reluctant to invest the amount of time necessary to develop detailed proposals on EMS improvements without strong customer interest in advance. However, we believe this stipend, in addition to the customer's stated interest in proceeding with the Program, will provide sufficient incentive for most vendors to participate.

KEMA-XENERGY will evaluate all vendor proposals submitted and provide the customer with recommendations on whether they should proceed with installation. The Program will address two types of measures:

- EMS programming enhancements
- EMS hardware enhancements (additional points).

2.1.4 Financial Incentives

This Program will provide financial incentives for installation of recommended measures with verified savings. This is an important factor in moving customers from casual interest to actual implementation of measures to reduce energy usage and increase control over their facilities. While we expect electric and gas energy savings and peak demand savings, the incentives will be structured to provide:

- 7 cents/kWh for long-term energy savings through programming enhancements
- 9 cents/kWh for long-term energy savings through hardware enhancements.

Incentives will be capped to cover no more than 50 percent of actual installation costs. Our program administration would also include on-site verification of installation and implementation of measures before payment of incentives.

2.2 MARKETING PLAN

KEMA-XENERGY will initiate customer contacts through a direct mail campaign to targeted customers. The direct mailing will be to finance and facility managers of targeted commercial and institutional segments and will include a program flyer with an introductory letter outlining the program requirements and benefits of participation. We will follow up on the mailing with a telemarketing campaign to further educate customers and generate interest in participation.

A cornerstone of our marketing approach will be to also contact system controls vendors about the Program. Our past experience has shown that vendors are very interested in promoting EMS improvements but often lack information on energy savings available or sufficient customer

interest in pursuing improvements. In addition, it is difficult to obtain any incentives from other programs to help finance these types of projects.

Our main focus in the marketing campaign will be to promote our free EMS assessments and, secondarily, to educate customers on the benefits of enhanced automation. This assessment will provide the customer with an overview of the status of their current EMS and whether cost-effective improvements are likely to be available. We expect that the assessments at over three-quarters of the facilities will show there is significant potential. If there is potential and the customer is interested, we will then solicit the most appropriate system controls vendor to solicit a detailed proposal for enhancements.

The EA Initiative will also leverage the EA educational materials provided by the California Energy Commission as part of our marketing activities. These materials include sample case studies from six different building types and guidebooks outlining the business case for EA and the technical options available.

2.3 CUSTOMER ENROLLMENT

Before conducting a free onsite assessment, customers will be asked to fill out a short application that provides necessary information to determine eligibility. Once a business has signed a Participation Agreement and the business has been determined to be eligible for the Program, an onsite assessment will be conducted. As mentioned above, the on-site assessment will assess the status of the EMS at the facility and include a review of any recently completed energy assessment reports and a walkthrough tour of the building to get a quick feel for potential energy savings opportunities available from EMS enhancements.

Customers that meet program eligibility requirements, have sufficient energy improvement opportunities, and who, in the judgment of the program administrator, demonstrate a credible desire to follow through with recommended improvements will then move to the next stage. The program administrator will contact the most appropriate system controls vendor, as determined by the type of controls system already installed.

A customer can apply for incentive funds for those projects listed in the vendor's proposal that, in the judgment of the program administrator, meet the program criteria and that can be installed within the program time frame.

2.4 MATERIALS

In cases where sufficient potential is found for enhancements through reprogramming the EMS and/or additional equipment, the most appropriate vendor will be solicited to submit a detailed proposal for enhancements. The vendor will be educated about the program and solicited to submit a detailed proposal for improvements, that includes estimates of program incentives to reduce paybacks to within customer acceptance ranges. The vendor will also be required to submit proposals that meet the EA Initiative's minimum savings and payback requirements to minimize any free ridership issues and any excessively large hardware improvements.

If the vendor proposal is approved, the vendor will then provide the equipment and schedule the installation and/or reprogramming with the business. When the installation is completed, the customer will send in a project completion form signed by the business and vendor to KEMAXENERGY noting any differences in measure quantity from the original proposal. Program staff will post-inspect all projects and thoroughly track accomplishments prior to payment of the incentive.

2.5 PAYMENT OF INCENTIVES

The intent of providing our own incentives is three-fold. First, this is to avoid double-counting any savings claimed by other programs such as the IOU-sponsored Standard Performance Contract (SPC) program, or any non-utility-sponsored incentive programs. Second, it is to capture synergy with the niche technical services we are offering. Lastly, it is very difficult to obtain incentives from other programs for these types of projects due to the difficulty calculating estimated savings.

All commercial or institutional sites with 1 MW or more in demand in the PG&E service territory that meets the eligibility requirements of the program and who agree to participate in the program would also be eligible for incentives for EMS improvement projects. However, in agreeing to accept the incentive, the facility also agrees that it will accept no incentives from other state or utility programs for the completion of that work except those offered by the EA Initiative. This is necessary to prevent double counting of claimed savings by other programs such as the IOU-sponsored SPC program or any non-utility-sponsored incentive programs.

There will be two approaches to payment of incentives:

A. Energy savings (kWh) incentives will be paid directly to the customer. All projects will be post-inspected before payment is made. Customers will be paid an incentive not to exceed 50% of the cost of the design, equipment and installation costs of measures included in the project.

With program implementer review of the detailed vendor proposal, facility staff can be confident that the proposed measures have been sufficiently thought through and that the proposed changes will not negatively affect the building processes or occupant comfort. This will allow the facility to more confidently approach decision makers for the funds necessary for installation. The incentive will be offered for payment following the installation of the measure. Since the incentives will be paid directly to the facility, the facility will be at risk for the incentives if the installation is not completed on time.

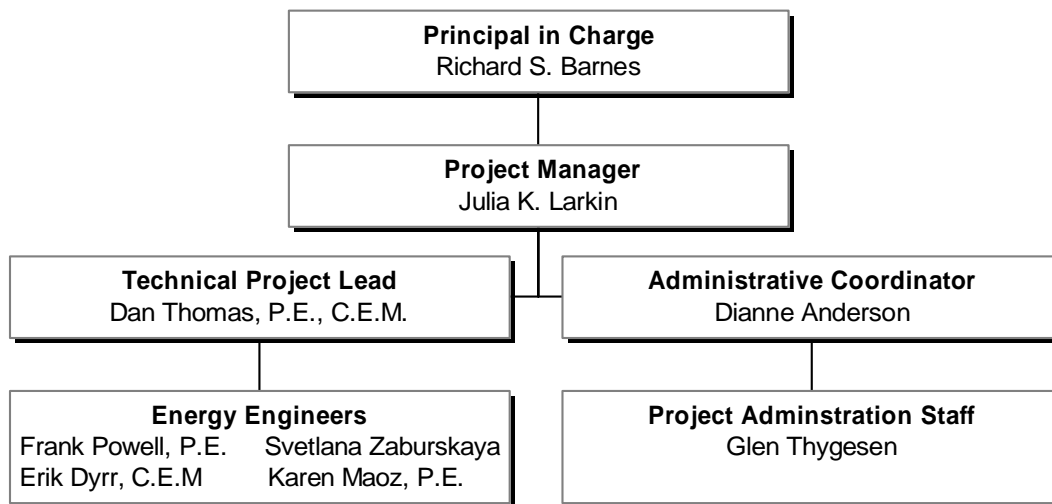
B. A \$500 vendor stipend will be paid directly to the vendor/contractor selected to submit a project proposal to serve as partial reimbursement for their services. The program administrator will determine the most appropriate vendor the type of existing

controls system installed. Other vendors may choose to submit proposals, but will not be eligible for any reimbursement for submitting a proposal.

2.6 STAFF AND SUBCONTRACTOR RESPONSIBILITIES

The project staffing structure for the EA Initiative is show in Figure 2-1. Brief biographies of key management personnel are also included in Section 7.

**Figure 2-1
Enhanced Automation Initiative Staffing Plan**



The principal in charge will have overall responsibility for managing the entire contract to ensure technical excellence and overall client satisfaction. The project manager will have the day-to-day responsibility for taking the big picture view of all tasks, and ensuring client satisfaction.

The administrative coordinator, who will handle the database administration and supervise the project administration staff, will assist the project manager in management activities. The operations will be centralized in the KEMA-XENERGY Oakland office and will utilize our existing field offices throughout the state, such as Anaheim and Glendale if needed.

The technical project lead will provide high-level technical support and serve as field supervisor for the energy engineers. The technical project lead will also have a key role in coordinating with the various vendors/contractors. Energy engineers will conduct on-site surveys, proposal review, inspections, and other technical activities.

2.7 WORK PLAN AND TIMELINE FOR PROGRAM IMPLEMENTATION

The performance targets and milestones are presented in Table 2-1. As displayed, we anticipate launching the program soon after signing a contract in January. While there are many program activity tasks, we have only assigned milestones to the tasks that have distinct end products or

quantifiable targets. Progress on program milestones will be reported in the monthly, quarterly, and final reports. A section containing our proposed program milestones follows.

**Table 2-1
Project Timeline with Major Milestones**

Category	Activity	Start Date	Completion Date	Deliverable to CPUC
Planning	Program kick-off	1/1/2004	1/31/2004	-
Planning	Implementation Plan	1/1/2004	1/31/2004	Implementation Plan
Marketing	Develop Program Flyer	2/1/2004	2/15/2004	Program Flyer
Planning	Policies and Procedures Manual	2/1/2004	2/28/2004	P & P Manual
Planning	Tracking Database	2/1/2004	3/15/2004	-
EM&V	Select EM&V Contractor	2/1/2004	4/1/2004	Name of EM&V Contractor
Marketing	Marketing and Outreach	2/15/2004	7/15/2004	-
Implementation	On-site Assessments	3/1/2004	3/1/2005	-
EM&V	Final EM&V Plan	4/1/2004	6/1/2004	EM&V Plan
Implementation	Vendor Proposal Review	4/1/2004	5/1/2005	-
Implementation	Installations	8/1/2004	9/30/2005	-
Implementation	Inspection Visits	9/1/2005	10/31/2005	-
EM&V	Final EM&V Report	10/1/2005	3/31/2006	EM&V Report
Reporting	Develop Final Report	11/1/2005	12/31/2005	Final Report

2.7.1 Proposed Milestones

Program Planning

The first major planning milestones are to develop an Implementation Plan and a Policies and Procedures Manual for the EA Initiative. Depending upon the timing of the contract signing, these tasks could be started and completed in the month of January. However, delays in approval of the program or protracted contract negotiations could cause these steps to be delayed. These are extremely important steps in implementing a successful program. The Implementation Plan lays out the program elements and establishes timelines and responsibilities.

The Policy and Procedures Manual facilitates internal and external consistency in customer service, efficiency of program delivery, and a clear understanding of goals and objectives of the

program. To demonstrate completion of this task, the Policies and Procedures Manual will be provided in hard copy and electronically with the quarterly report.

Additional program planning activities that will take place in the first quarter of 2004 include the development of a tracking database and customer and vendor contract forms. These items will also be submitted with the quarterly report. We will also develop a tracking database for the program.

Marketing

Marketing milestones include the development and approval of a program flyer for the EA Initiative. This flyer will provide a brief summary of the program benefits, rules, customer eligibility requirements and contact information. This will be used in face-to-face meetings with customers to present the benefits and requirements of the program. We will capitalize on lessons learned through our administration of the California Energy Commission's Enhanced Automation Education Campaign to develop targeted marketing materials to effectively address customer needs.

KEMA-XENERGY will also develop a program prospect list for marketing the program to customers and enhanced automation vendors in the State. The customer list will target facility managers and energy engineers in eligible facilities. The vendor list will target system controls vendors in the State. We will use this list to conduct a mail and telemarketing campaign with customers and vendors, which will be completed by July 15, 2004. In addition, a response hotline with a toll-free number will also be established at the Oakland office to respond to inquiries from interested customers.

Implementation

The monthly and quarterly reports will summarize the following to support progress on the key implementation activities including:

- Number of facilities contacted
- Number of facilities not interested
- Number of vendors contacted
- Number of onsite assessments conducted
- Number of vendor proposals reviewed
- Number of proposal agreements signed/projects generated
- Potential kWh savings as identified in the proposals
- Number of installations completed
- Number of post-installation site inspections
- Number of incentives paid

- Total kWh savings of installed measures
- Total kW savings of installed measures
- Total therm savings of installed measures
- Total kW of demand response potential of installed measures.

Evaluation, Measurement, and Verification (EM&V)

There are three major milestones associated with the EM&V task. The first milestone is to select an EM&V contractor in the first few months of 2004. Additionally, we will approve the M&V plan and get final approval the Commission on this plan by the end of the second quarter 2004. Submittal of the final EM&V report is due by March 31, 2006, representing a milestone in the first quarter of 2006.

Monthly, Quarterly, and Final Reports

The monthly, quarterly, and final reports are not listed as specific milestones. However, these reports will serve to document progress on the milestones discussed above and displayed in Table 2-1.

3.1 CUSTOMER DESCRIPTION

Based on our experience implementing the California Energy Commission's Enhanced Automation Program, supported, for example, by findings in the California Statewide Energy Efficiency Potential Study, it is clear that the average commercial customer with an existing energy management system (EMS) is not using it to its optimum capability. For the Enhanced Automation (EA) Initiative, we will target commercial and institutional customers whose buildings have a summer peak demand of 1 MW or more. Generally, these buildings have more than 150,000 square feet of floor space. There are approximately 14,000 office, retail and institutional customers with peak demands of over 500 kW statewide. It has been estimated that approximately 5,000 of these have peak demands of over 1,000 kW.

Typically, these customers have an existing relationship with the vendor of the proprietary EMS that they have installed. We plan to capitalize on and build upon that relationship by working with both the customer and their vendor through the EA Initiative.

3.2 CUSTOMER ELIGIBILITY

Nonresidential customers with a facility with an existing EMS system that have summer peak demands of 1,000 kW (1 MW) or more will be eligible to participate in the program. Customer sites with multiple buildings will be accepted if they are at a single contiguous location.

Actual program enrollment will be based on the opportunity for cost-effective savings determined during the on-site assessment. Because the intent of the program is to provide cost-effective annual and peak demand savings through optimizing the existing EMS and the implementation of capital improvement measures that enhance the operation of that EMS, some customers may not be accepted for enrollment that are just interested in a free energy audit.

To avoid double-dipping, customers will be screened carefully and will be required to sign an affidavit declaring that they will receive no funds for the same activity or measure from another program or source.

3.3 CUSTOMER COMPLAINT RESOLUTION

KEMA-XENERGY's approach to dispute resolution and consumer protection is outlined in this section. There are several methods through which disputes between program staff and end-user customers will be resolved. First, when problems arise, it is the job of the KEMA-XENERGY program manager to use all means at his or her disposal to resolve the issues at hand. If these are not successful, the issue is brought to the attention of the principal in charge for his input and

problem resolution skills. If we still have not been successful, if necessary and as a last resort, KEMA-XENERGY contracts specialists will be enlisted depending on the nature of the problem.

It should be pointed out that never in KEMA-XENERGY's long history of delivering programs and implementing consulting engagements has there been a customer complaint that was not successfully resolved. In fact, KEMA-XENERGY has rarely had to go beyond the program manager and principal in charge to resolve conflicts. KEMA-XENERGY values its long-standing working relationship with various players in the industry and looks forward to continued mutual success on future projects. Integrity remains one of the cornerstones of the work done, and it is a key value that is brought to any situation in which problems arise.

In addition, KEMA-XENERGY will inform customers of the Commission's informal and formal complaint processes, which are available through the Consumer Services Division, as another channel through which customers may file complaints.

3.4 GEOGRAPHIC AREA

This program will be available to commercial and institutional facilities with over 1 MW demand, and/or 150,000 square feet in the Pacific Gas and Electric service territory.

4

MEASURE AND ACTIVITY DESCRIPTIONS

The target market for this program is commercial and institutional buildings with summer peak demands of over 1 MW that have existing computerized Energy Management Systems (EMS). There are two measures proposed for this program:

1. Reprogramming of the EMS to optimize its capability (EMS software enhancements)
2. Adding a small number of key hardware components, or “points” (EMS hardware enhancements).

For each customer building the combination of sensors, control actuators and programming is unique. Here are examples of EMS features that will be assessed through this program:

- Updated time schedules
- Optimum restart
- Demand (CO₂) control ventilation
- Occupancy control of lighting and HVAC
- Ambient control of lighting (daylight harvesting)
- Sweep control of lighting
- Chilled-water temperature setpoint and temperature reset
- Hot water temperature setpoint and temperature reset
- Supply air temperature and pressure setpoint and setpoint reset
- Air distribution pressure and volume control
- Peak period energy and demand reduction options.

For example, chilled-water reset temperature capabilities are often not effectively utilized. It is a common EMS feature but it often requires a few more temperature sensors than were originally installed to operate effectively. Another example is economizer control. It has huge energy saving potential, but if a key temperature sensor or actuator is missing or broken, it will not work. Similarly, sweep control of lighting might not be used because override buttons are missing from a few key areas.

4.1 ENERGY SAVINGS ASSUMPTIONS

Since each project will be unique, it is difficult to determine accurate savings estimates that will apply across all participating sites. Therefore, we profiled different project types to develop average costs and savings estimates for the Enhanced Automation (EA) Initiative. In addition we reviewed information provided in reliable resources, such as the California Energy Commission’s DEER Study of measure costs and the Enhanced Automation Technical Options

Guidebook.¹ We generally relied on the lower-end values of ranges to develop conservative estimates for this program.

Our research shows that the average rate of EMS programming is approximately five zones per hour. This assumes that there is one zone for every 400 square feet of gross floor space. With contractor travel time, setup, overhead, profit etc., we estimate that the software enhancement project will cost an estimated \$15,000 for a typical 200,000 square foot (sf) building. Since ideal conditions will not exist for every job, we conservatively estimate savings of 75,000-kWh/yr for each software enhancement project. The EA Initiative will develop program criteria with the intent to average 5 kWh savings per dollar spent on reprogramming. However, since each project will be different, there will likely be a wide range of savings to cost ratios.

As stated above, we profiled different project types such as demand control ventilation and sweep lighting controls. It is assumed that a typical hardware enhancement project will cost \$50,000 in a 200,000 square foot building. Our project goals for hardware is to have on average 3.5 kWh saved per dollar spent.

Table 4-1 provides estimated costs for enhancing an existing EMS. Table 4-2 presents information on the benefits of HVAC controls measures. Table 4-3 outlines cost and savings estimates for several examples of lighting controls measures. Table 4-4 summarizes program savings.

Table 4-1
Costs for Adding HVAC Measures to an Existing EMS

Measure	Costs	Notes
HVAC Shut-off with a High Limit	Programming time	Savings range from 20% to 40%
Night Ventilation	Programming time	Activate HVAC fans in economizer mode
Optimal Start	\$100-\$1100 per zone	If additional hardware (e.g., temperature points) is needed, cost will be on the high end of the range – otherwise only programming time
Variable Capacity Control	\$300-\$500 per horsepower plus programming time	Adding a VSD can change the design of the HVAC system
Demand-Responsive Ventilation	\$1000-\$4000 per system, CO ₂ or CO sensor costs \$100-\$300 each	Several additional sensor points, wiring, and programming
Thermal Storage	\$200-\$400 per ton-hour or \$500-\$800 per ton-hour if new chiller is need	Costs are for storage tanks, pumps, heat exchangers, and piping – new chiller might be required for efficient operation at low temperatures*

For a new building, costs versus a non-storage system may be up to 20%-30% more.

From "Enhanced Automation Technical Options Guidebook", prepared for The California Energy Commission by Xenergy Inc. in 2002

¹ XENERGY Inc., 2002, "Enhanced Automation Technical Options Guidebook", prepared for The California Energy Commission and XENERGY Inc., 2001, "2001 DEER Update Study," prepared for the California Energy Commission.

**Table 4-2
Benefits for HVAC EMS Measures**

Measure	Energy Savings	Notes
Shut-off with a High Limit	20%-40%	Compared to full time operation at occupied temperature setpoints and for typical 9-to-5 building
Night Ventilation	0.1%-2% of cooling energy use	May reduce morning demand on the HVAC system
Optimal Start	5%-10% of fan and heating/cooling costs	Saves hundreds of hours of fan and cooling system operation compared to fixed start-time strategy
Variable Capacity Control	10%-30% of fan or pump energy use (might translate to 5%-15% of total building energy use)	Benefits are highly site and application specific; peak demand savings tend to be lower because variable-capacity systems have more impact on efficiency during part-load operation
Demand-Responsive Ventilation	20%-70% of ventilation use, 2%-7% of total building energy use	Compared to outside air flow rates in normal operation
Thermal Storage	10%-50% of cooling use, 2%-10% of total building energy use	Compared to conventional, non-storage operation

From "Enhanced Automation Technical Options Guidebook", prepared for The California Energy Commission by Xenergy Inc. in 2002

Table 4-3
Costs and Savings on Example Lighting Retrofits

If your current system is	And you upgrade to	Costs of enhancements	kWh savings*	Peak kW savings*
Manual On/Off whole circuits	Bi-level lighting, sweeping of one or two lamps of a fixture or checkerboard fixtures	\$1,000 per circuit	5%-15%	5%-15%
Manual On/Off (shut off by staff in evening)	Sweep Control via EMS (lights are "swept" off periodically unless local override is requested)	\$500 to \$1,000 per switch	5%-10%	0%-5%
No light level control (fluorescent)	Dimming controls via EMS	\$50 to \$100 per ballast plus \$500 to \$1,100 per lighting circuit for EMS dimming control	2%-10%	5% - 20%
No light level control (fluorescent)	Dimming controls via light level sensors	\$50 to \$100 per ballast plus sensor	2%-10%	5% - 20%
No light level control (HID fixtures)	Multi-level on/off control (multi-level ballast)	\$250-\$750 per fixture plus \$500 to \$1,100 per fixture control via EMS	2%-10%	5% - 20%
Constant, variable or multiple light level control (via EMS)	Demand or price-responsive control (via EIS)	\$1,100 per lighting control point	2%-10%	2%-10%

*Savings on the total building energy/demand usage during peak period.

From "Enhanced Automation Technical Options Guidebook", prepared for The California Energy Commission by Xenergy Inc. in 2002

Table 4-4
Savings per Unit

Measure Name	Unit Definition	Gross Coincident Peak Demand Reduction (kW)	Gross Annual Energy Savings (kWh)	Gross Annual Gas Savings (therms)
EMS Software Enhancement	Building	25.0	75,000	2,000
EMS Hardware Enhancement	Building	60.0	175,000	4,000

4.2

DEVIATIONS IN STANDARD COST-EFFECTIVENESS VALUES

For consistency, KEMA-XENERGY used the cost-effectiveness variables from the Energy Efficiency Policy Manual and the Energy Commission's 2001 DEER Study to the extent possible for the:

- Net-to-gross ratios
- Estimated useful life (EUL)
- Incremental measure costs.

4.2.1 Net-to-Gross Ratio

The net-to-gross ratio used was 0.8 from the manual for “All other nonresidential programs,” Table 4.2 on page 19 of the Energy Efficiency Policy Manual.

4.2.2 Estimated Useful Life

For EUL, we used 7 years for programming and 15 years for system controls for the hardware measures. The 15-year life is from the Energy Efficiency Policy Manual for System Controls. There is no specific measure life in the Energy Efficiency Policy Manual for EMS programming. There is a 15-year life listed for Energy Management System, which is combination of the hardware, programming, and sensors. A purely behavior item such as Audits is listed for 3 years. We feel that 7 years is a reasonable life to use for this measure since it is being done in conjunction with a review of the function of key hardware components.

4.2.3 Incremental Measure Cost

Rather than list every possible permutation of EMS enhancements, we have developed two measures for this program: (1) reprogramming of the existing EMS, and (2) adding a small number of key hardware components to improve the functioning of the existing EMS. Our project tracking database will track actual measures installed and the associated cost and savings estimates.

Since each project will be unique in terms of building size and project scope, it is difficult to determine accurate project cost estimates that will apply across all sites. Therefore, we profiled different project types to develop average costs for the EA Initiative. Typical cost for each measure is based on data from the EA Technical Options Guidebook and DEER study. Data is shown in tables 4-1 through 4-3.

Based on the estimates provided in section 4.1, we are anticipating projects will have an average cost of \$0.20 per kWh saved for programming (software) enhancements. On average for a 200,000 sf building we estimate an average project cost of \$15,000.

Estimates for the Incremental Measure Costs for hardware measures have been taken from the Enhanced Automation Technical Options Guidebook. Overall, we are anticipating projects will have an average cost \$0.30 per first year annual kWh saved for hardware enhancements, for an average an average project cost of \$50,000 per building.

4.3 REBATE AMOUNTS

Even though we expect that projects will achieve electric and gas energy savings and peak demand savings, the EA Initiative incentives will be paid based on kWh savings only. Measures implemented as a result of the EMS assessment for each customer will be rebated at the rate of \$0.07/kWh for programming or \$0.09/kWh for hardware based on predicted first-year savings up to 50 percent of total design and installation costs.

For example, a measure with expected first year savings of 75,000 kWh costing \$15,000 to make the programming changes, will be rebated at the rate of \$0.07/kWh. This would result in an incentive of \$5,000, which is about one-third of the cost of the project. The net cost to the customer for this project would then be \$10,000. If their average electricity cost is \$0.08/kWh because much of the savings is off-peak, their annual payback for this measure becomes:

$$\begin{aligned}\text{Annual payback} &= \text{Net Cost} / \text{Annual Savings} \\ &= \$10,000 / (75,000 \text{ kWh} \times \$0.08/\text{kWh}) \\ &= 1.7 \text{ years}\end{aligned}$$

As is discussed in more detail below, vendors who submit proposals will be required to meet program criteria and scope requirements to avoid paying EAI incentives for substantial hardware upgrades, which are beyond the scope of this initiative. As part of these criteria, incentives will not be paid on projects that exceed a total cost threshold, which will be specified in the Policy and Procedures Manual. This will help to ensure that project proposals are for incremental enhancements to the existing EMS rather than full-scale upgrades or replacements that are more appropriately covered in other programs. However, customers may choose to move forward with additional components outside the scope, but will not be eligible for EA Initiative incentives on those measures.

4.4 ACTIVITIES DESCRIPTIONS

Specific program activities comprising implementation, marketing, and evaluation, measurement and verification are discussed in this section. Implementation activities are described as either being unit-based or task-based. Unit-based implementation activities are presented as those with and without measurable energy savings. Both classes of activities are described next.

4.4.1 Unit-Based Implementation Activities with Measurable Energy Savings

Measurable savings implementation activities are categorized into two measures. Associated with each measure category are estimates of demand reduction, hours of usage, and annual savings per unit. Additionally, net-to-gross inputs and net-to-gross ratios are provided, as well as total program goals per measure category. KEMA-XENERGY will recommend to the program participants all measures that pass the TRC test.

The numbers and the measures that are provided in the proposal are for planning purposes only. Actual program installations may involve more measures at fewer buildings or fewer measures at more buildings.

Energy Efficiency—Conservation Measures. As discussed above, measures implemented as a result of the EMS assessment for each customer will be rebated at the rate of \$0.07/kWh for programming or \$0.09/kWh for hardware based on predicted first-year savings up to 50 percent of total design and installation costs. Total program savings projections were based on an average participant with 1.6 MW peak demand, 200,000 square feet of area, and what we feel is

the mix of measures most likely to be identified and implemented. However, since no two buildings are identical and each building's equipment and operation are different, the costs incurred, rebates paid, and savings achieved for each measure cannot be known at this time. Other measures that do not meet program criteria identified in vendor proposals could be implemented as part of the project, but will not receive incentives as part of the EA Initiative.

There may be measures that go beyond the scope of this program but are included in other rebate programs offered by the customer's utility. There may also be measures unrelated to energy savings that the customer might want to implement at the same time. For example, these could include measures to improve comfort or reliability of the HVAC systems.

If the customer wishes to bundle EAI measures with other measures into a single contract with the vendor, the cost for measures eligible for incentives must be called out separately in the quotation.

4.4.2 Unit-Based Implementation Activities without Measurable Energy Savings

Implementation activities without measurable energy savings are discussed below.

Free On-site Facility EMS Assessments. EMS Facility assessments will be conducted for each building to identify opportunities for energy-efficiency improvements. These kinds of audits actually result in savings. Often in the course of reviewing the EMS program, sensor operation and actuator operation, easily corrected errors are found. Small programming changes made on the spot or reconnecting of leads or linkages then result in savings.

Vendor Proposal Development. If the on-site assessment has determined that there is sufficient potential for cost-effective savings through EMS enhancements, a detailed vendor proposal will be solicited. A detailed proposal targeted to the customer's facility allow the customer to more confidently approach its management for the funds necessary for installation.

The customer may select the particular vendor who provides the quote and installs the equipment. The vendor stipend will only be paid to one vendor. If the customer wishes to have multiple vendors, they must choose which one, if any, gets the vendor incentive. It is not the intention of this program to interfere with an existing vendor relationship. However, if the customer does not have a preference, the program implementer will select the most appropriate vendor, as determined by the brand of the existing EMS system at the site.

The amount of the vendor stipend is not intended to cover the entire cost of preparing a quotation. The amount is intended to pay a part of the cost for a vendor who is already familiar with the customer's equipment. The targeted vendor will be the one that already has a familiarity with the customer's equipment and ideally has a working relationship with the customer. An incentive for the vendor is necessary because this kind of work tends to be low cost and low margin.

As stated in the marketing plan, we will contact the leading controls contractors in the service area and ask them to review their customer base for opportunities for this program. If a referred customer appears to be a good fit for the program, we will perform initial facility assessment of their control system. The contractor may be involved in this initial facility assessment, at the discretion of the customer.

The vendor proposal may include adding sensors, actuators or new programming. These services may also require operator training. We will review this proposal for overall cost effectiveness as well as the minimum savings and payback criteria required by the EA Initiative. If it is cost effective, we will propose an incentive to the customer to proceed with the work.

Post-Inspection Visit. Following completion of an installation, the program will conduct an inspection for compliance with the proposal. These inspections will ensure that program funds are spent on only those measures that are necessary for the achievement of the energy conservation measures.

Incentive Application Processing and Tracking. Incentive application processing and progress tracking activities will be necessary for all implementation projects. These activities will be necessary to ensure compliance with program eligibility rules and to keep the program managers apprised on progress toward completion. This process will also provide information required for reporting of monthly and quarterly progress to the Commission.

4.4.3 Task-Based Implementation Activities

Two implementation activities are classified as task-based, and are detailed below.

Develop Policies and Procedures Manual. The Policy and Procedures Manual will define the eligibility requirements for customers and measures, the rebate levels, and customer reporting requirements. This manual will facilitate consistency in customer service, efficiency of program delivery, and a clear understanding of goals and objectives of the program. To demonstrate completion of this task, the Policies and Procedures Manual will be provided in hard copy and electronically with the quarterly report.

Develop Tracking Database. The use of project tracking systems is a fundamental element of KEMA-XENERGY's programmatic philosophy. The tracking system to be used will allow program staff to efficiently track projects through the system, as well as to track other customer-related activities, such as phone calls to the hotline. As with the policies and procedures, the tracking system can evolve as necessary.

4.4.4 Task-Based Marketing Activities

This subsection outlines the task based marketing activities that will be conducted as a part of the EA Initiative.

Develop a Program Flyer. A flyer will be developed that briefly describes the attributes and benefits of the program suitable for mailing and faxing to prospects in the service territory. It will include information on eligibility rules, program deadlines, and other program requirements. This flyer will be the precursor to the telemarketing campaign. To demonstrate completion of this task, the flyer will be provided in hard copy and electronically with the quarterly report.

Develop Prospect list. KEMA-XENERGY will create a prospect list of targeted customers and targeted vendors. Customer contacts will include finance officers and facility managers. Vendor contacts will include contractors that specialize in the installation and maintenance of comprehensive building control systems in the service territory.

Direct Mail Campaign. A direct mail campaign to all the customers and vendors identified on the prospect list will include the program flyer and an introductory letter.

Telemarketing. We will follow the direct mailing with telephone calls soliciting interest in the Program. We expect vendors will be very interested in the program and will only require one follow up call. However, we plan to conduct up to three follow-up calls with the target customers, depending on customer interest and response levels.

4.4.5 Evaluation, Measurement, and Verification Activities

This subsection describes the activities comprising the evaluation, measurement, and verification (EM&V) efforts associated with the Program.

Selection of EM&V Contractor. The program administrator will select an EM&V contractor from the list of approved evaluators provided by the commission. This evaluator will be selected early in the project so that he can track progress and be aware of what is accomplished.

Develop EM&V Plan. The EM&V contractor selected will draft a detailed EM&V plan. This plan will provide additional detail and refinements to the EM&V approach outlined in Section 6.

Sample Selection. Once all of the sites have been recruited and preliminary savings have been determined, a sample can be selected that will be representative of the entire population. This sample will form the basis of the measurement and verification plan, the data collection plan, and the data analysis.

Conduct Market Assessments and or Baseline Analysis. While a comprehensive baseline market assessment is beyond the scope of the proposed evaluation, research will be conducted to provide estimates of the target market population and status of EMS programming.

Develop Survey Instruments. Short surveys focusing on program process issues will be developed for the participating customers and vendors. The customer surveys will be designed to be either administered as part of the on-site EM&V inspection or by telephone, if necessary, to reach the most appropriate customer representative.

For each sample site, an on-site evaluation plan will be written that establishes data collection needs and methodologies and examines the ex ante savings claim. The plan will indicate the

particular equipment items to be monitored and the methodology for calculating the baseline and post-case energy use profiles.

Conduct Phone/Mail/E-mail Surveys. Phone surveys will be conducted with a sample of participating vendors. In addition, telephone surveys will be conducted with any customers who did not have the process survey completed during the on-site visit.

Conduct On-site Surveys/Site Inspections. Once the site evaluation plans have been completed, the on-site inspections will be conducted. The evaluation contractor will make a post-retrofit site verification visit to verify the installation of the measures and review the data collection activities. During this visit, he will observe the operation of the equipment, examine customer operating and accounting data, and interview facility staff to determine the mode of operation and control of the equipment and to establish any seasonality of energy use. Post-retrofit monitoring will be performed at the selected sample sites. The customer's meters and EMS will be used to trend data where possible. Where customer meters or trend logs are not available, portable metering equipment will be installed.

Analyze Survey Data. The data collected from the surveys with participating vendors and customers will be analyzed. The analysis will focus on customer satisfaction and program process issues.

Perform/Review Engineering Analysis. Data obtained from the post-retrofit monitoring and the site visit will be analyzed to determine the baseline and the post-case energy usage and demand profiles. These profiles will then be used to determine ex post savings.

Provide Feedback to Implementer. The EM&V contractor will provide feedback as needed to the implementer on issues relating to program effectiveness and customer satisfaction. This will create an opportunity for the implementer to improve program delivery as soon as possible.

Provide Interim EM&V Reports and Memorandums. Throughout the EM&V process, the EM&V contractor will provide updates on the evaluation progress. These memorandums will also include any interim feedback on process issues. As mentioned above, this will provide a mechanism for the implementer to receive feedback and recommendations on improving program delivery.

Draft EM&V Report. The EM&V contractor will prepare a draft EM&V report from the data collected and analyzed. This report will provide results from the process and impact evaluation. It will include estimates of energy and demand savings and program cost effectiveness.

Final EM&V Report. The EM&V contractor will incorporate comments from KEMA-XENERGY on the draft EM&V report and any other edits needed and submit a final EM&V report.

5.1 ENERGY AND PEAK DEMAND SAVINGS TARGETS

Our gross annual energy savings goals are 3.6 million kWh and 88,000 therms. Our detailed energy, kW, and therm targets are shown in the Table 5-1.

**Table 5-1
Energy, kW and Therm Savings Goals**

Measure Description	No. of Units (Buildings)	Annual kWh Savings per Unit	Total Annual kWh Gross Savings	Total Annual Gross kW Savings	Annual Therm Savings per Unit	Total Annual Gross Therm Savings
EMS Software Enhancement	25	75,000	1,875,000	625	2,000	50,000
EMS Hardware Enhancement	15	175,000	2,625,000	875	4,000	60,000
Total			4,500,000	1,500		110,000

The basis for these savings estimates are based on typical expectations found in other similar programs, applied to the population of the target territory. Section 4 provides more detail.

The EA Initiative will also target demand-reduction measures. However, predicting the results of those is less certain. We will rely on very conservative estimates of savings for the demand-reduction measures implemented. Both permanent demand reductions and temporary measures that can be implemented as part of a demand-reduction strategy will be identified.

5.2 OTHER PROPOSED BENCHMARKS FOR EARNING PERFORMANCE PAYMENTS

Other proposed benchmarks for are for planning activities, and are detailed in Section 2:

- Submit final implementation plan
- Develop policy and procedures manual
- Develop tracking database.

5.3 COST-EFFECTIVENESS CALCULATIONS

The cost-effectiveness calculations are based on results from the spreadsheet provided by the Public Utilities Commission for use in proposing 2004/2005 non-utility programs. The Total Resource Cost (TRC) and Participant Test ratios for the EA Initiative are 1.90 (TRC) and 5.73 (Participant Test) in the PG&E area. The gross annual energy, demand, and therm savings attributed to this program are 4.5 million kWh, 1,500 kW and 110,000 therms, respectively.

6

PROGRAM EVALUATION, MEASUREMENT AND VERIFICATION (EM&V)

6.1 EM&V

6.1.1 Description of general approach to evaluating program success

Evaluation of programs is critical to ensuring accomplishments and improving programs over time. KEMA-XENERGY has been a leader in energy program evaluation for over two decades. Accordingly, we are well equipped to design and implement a program evaluation that will provide reliable conclusions as to the success of the program.

Table 6-1 outlines how our EM&V approach will address the CPUC objectives.

**Table 6-1
CPUC Objectives and the EA Initiative Evaluation**

Objectives	EAI Evaluation Approach	Evaluation Component
Measuring level of energy and peak demand savings achieved (except information-only)	We will use the IPMVP Option B to measure the energy and peak demand savings achieved for a specified sample of sites.	Impact
Measuring cost-effectiveness (except information-only)	We will re-calculate the Program cost effectiveness using actual program expenditures and the ex-post energy savings verified through the evaluation.	Impact, Process
Providing up-front market assessments and baseline analysis, especially for new programs	A comprehensive baseline market assessment is beyond the scope of this evaluation. However, an analysis of the population of eligible large customers will be conducted	Impact
Providing ongoing feedback, and corrective and constructive guidance regarding the implementation of programs	The evaluation team will be in close contact with KEMA-XENERGY and will provide ongoing feedback and recommendations as necessary through the evaluation.	Process
Measuring indicators of the effectiveness of specific programs, including testing of the assumptions that underlie the program theory and approach	The process evaluation explicitly develops effectiveness indicators as the primary way to assess program efficiency.	Process
Assessing the overall levels of performance and success of programs	Utilizing the impact and process evaluations together, we will assess and comment on the overall level of performance and success of the program.	Impact, Process
Informing decisions regarding compensation and final payments (except information-only)	The effectiveness indicators developed will allow the CPUC to assess the achievement of the program and therefore make an informed decision regarding compensation and final payments.	Impact, Process
Helping to assess whether there is a continuing need for the program.	The impact and process evaluations will assess program performance and the continuing need for the program.	Impact, Process

Our extensive experience evaluating programs has taught us that evaluation must also be well tailored to the specific characteristics of programs. For example, evaluating a training or market transformation-oriented program would typically produce a very different set of evaluation activities than an impact evaluation of say an industrial measure for which there was no prior research and, hence, no basis for deemed savings.

The primary goal of this program is to achieve a high penetration of optimized EMS programming and related hardware installations and to maximize the amount of cost-effective energy savings achieved for each participant. As a result, the key measures of our success are the number of installations achieved and the energy savings associated with those installations. Thus, the evaluation activities are focused on these two issues. In addition, we propose to conduct a process evaluation that will include measurement of customer satisfaction. A mid-program process evaluation is included in this proposal to assist in fine-tuning the program processes while in the field, allowing for the improvement of program implementation for Year 2.

6.1.2 Description of approach to measuring and verifying energy and peak demand savings (applicable to all programs except information-only)

Our evaluation approach for this program will be focused on verifying installation of the measures for which incentives are provided, estimating hours of operation for lighting measures, and measuring participant satisfaction with the program experience.

On-site Visits. We recognize that it is possible that measures may be removed in a small percentage of cases because of participant dissatisfaction with their performance, early failure, or other reasons. As a result, we will conduct a verification survey on a random sample of participants near the end of the program period. The verification survey will consist of an on-site audit in which installation of specific measures in specific locations is verified.¹ If there are cases in which measures are no longer installed, reasons for the equipment removal will be documented. The results of the verification survey will be used to estimate the proportion of measures in the tracking system that remained installed after the departure of the installation team.

On-site visits with participants will also include an assessment of any monitoring data collected and ascertain how the monitoring data were collected with respect to the EMS.

Conduct Building Simulation. Since energy and demand savings are difficult to calculate for EMS improvements with only the use of monitoring data, we will conduct building simulations using DOE-2 modeling. The inputs will be informed by the data collected during the on-site verification visit. Energy savings cannot be measured directly due to the interactive effects of weather and building occupancy on energy use. For example, a building could lose a major

¹ Our tracking system will contain information on the EMS reprogramming made and location-specific data on the installation of each measure in the program.

tenant from the time of implemented measures to the time of the EM&V work. If that happens, the bills will certainly go down, but it is not readily apparent how much was due to the conservation measures. Similarly, a tenant might add a server farm with necessary dedicated air conditioning equipment to one suite. This could appear to cancel out the savings from the energy-saving measures. A computerized building simulation can separate out the effects of the weather and tenant changes from the conservation measures.

Estimate Site-Specific Energy Savings. For each sample site, the monitored data will be analyzed to estimate the annual electricity energy and demand savings of the effected systems. If more than one ECM affects a system, it will not be possible to directly measure the savings on an ECM-specific level, so the total savings will be determined.

Estimate Site-Specific Demand Savings. Demand impacts will be evaluated for the specific site based on the energy savings in the peak period divided by the hours in the peak period. As mentioned above, energy savings will be determined from DOE-2 modeling simulation informed by the data collected during the on-site verification visit.

Determine Realization Rates. For each site, separate realization rates will be determined for demand (kW) and energy (kWh). Specifically, we will determine the ratio of the demand and energy savings presented in the original vendor proposal to the ex-post savings estimates.

Estimate Program Energy and Demand Savings. The savings predicted in the rebate applications will be adjusted based on the estimates of actual performance as indicated in the tracking database. The average realization rate for the sample sites will be used as the realization rate for the Program. The realization rate will be applied to the ex ante savings estimates in the tracking database for all sites to determine the ex post program impact.

6.1.3 Process Evaluation and Customer/Contractor Satisfaction.

A two-phase process evaluation will be performed on the EA Initiative. It will address a range of issues, including:

- Customer and vendor/contractor satisfaction levels
- Effectiveness of program marketing
 - Targeting strategy
 - Marketing materials
 - On-site assessments
- Effectiveness of program delivery
 - On-site assessments
 - Vendor proposal review
 - Post-installation inspections
- Effectiveness of program management
 - Customer tracking
 - Contractor management.

SECTION 6 PROGRAM EVALUATION, MEASUREMENT AND VERIFICATION (EM&V)

The process evaluation will be conducted in two phases: (1) toward the end of Year 1 mid-way through the program, and (2) at the end of the program. The mid-program evaluation will examine how the program is operating and assess whether adjustments need to be made to enhance performance and service to customers and program-approved contractors. In addition to a standard customer and contractor satisfaction survey that is described later in this subsection, the process evaluators will review the program operations from both the perspective of the customer, contractor, and the program team. Obstacles to the success of the program will be identified and remedies proposed to address them. The feedback provided by the process evaluation will be incorporated where feasible and every effort will be made to refine the program based on the information gathered.

Additionally, the process evaluation will measure key indicators of program success:

- Number of facilities contacted
- Number of facilities not interested
- Number of vendors contacted
- Number of on-site assessments conducted
- Number of vendor proposals reviewed
- Number of proposal agreements signed/projects generated
- Potential kWh savings as identified in the proposals
- Number of installations completed
- Number of post-installation site inspections
- Number of incentives paid
- Total kWh of installed measures
- Total kW of installed measures
- Total kW of demand-response potential of installed measures.

The end of program process evaluation will provide a retrospective picture of the success of the program process and will assess customer satisfaction.

Customer feedback will be obtained primarily through a telephone customer satisfaction survey that will focus on general customer satisfaction with the program process and the measures installed.

Vendor and contractor feedback will be obtained primarily through an e-mailed survey that will focus on ease of use and EA Initiative team responsiveness and timeliness of program processing. KEMA-XENERGY expects to have a high rate of return from participating program contractors.

6.1.4 Suggested EM&V Contractors

KEMA-XENERGY recommends two potential EM&V contractors for consideration to provide evaluation services for the Enhanced Automation Initiative: Nexant and Quantum. Both firms were on the list of approved EM&V contractors for the 2002-2003 CPUC Programs. Both have substantial experience with the evaluations and services targeting large commercial and institutional customers.

1. Nexant

Daniel C. Engel - Principal, EDM
Nexant, Inc.
101 Second Street, 11th Floor
San Francisco, CA 94105
Phone: 415.369.1033
Fax: 415.369.0894
dcengel@nexant.com

2. Quantum Consulting

John Cavalli, President
Quantum Consulting
2030 Addison Street
Berkeley, CA 94704
Phone: 510. 540.7200
Fax: 510-540-7268
jcavalli@qcworld.com

7.1 KEMA XENERGY

Since 1975, XENERGY, now KEMA-XENERGY, has been a recognized leader in providing industrial, commercial, and institutional facilities with a complete and integrated set of energy services designed to improve energy efficiency and reduce energy costs. KEMA-XENERGY's staff is highly experienced at implementing public benefit energy-efficiency and conservation programs. KEMA-XENERGY has conducted numerous energy studies of commercial and industrial facilities.

KEMA-XENERGY is uniquely positioned to implement a cost-effective enhanced automation project. Our objective is to build on the existing momentum created by our administration of the Enhanced Automation Campaign sponsored by the California Energy Commission. This comprehensive educational campaign included market research and focus groups, developing educational materials and case studies, and providing technical assistance to promote demand reduction through energy management system enhancements.

KEMA-XENERGY also has substantial experience administering financial incentives. For example, we are administering the B.E.S.T. program in the 2002-03 program year for the California Public Utilities Commission in all three major IOU service territories. We also administer the Innovative Peak Load Reduction Program sponsored by the California Energy Commission and the Nevada Power/Sierra Pacific Sure Bet Program.

Our administrative and technical staffs are experienced in dealing with exactly this type of program. In addition, we have a call center, a check processing center, and a database design team in place to support program implementation.

7.2 SUBCONTRACTORS

None selected.

7.3 RESUMES OR DESCRIPTION OF EXPERIENCE

7.3.1 *Corporate Qualifications*

KEMA-XENERGY is a national leader in the planning, marketing, and evaluation of load management programs. KEMA-XENERGY combines knowledge of the technologies for load management, real-time communication, and power generation, as well as an understanding of the markets and regulatory policies that drive the application of these technologies. Table 7-1 lists representative projects that are directly related to the proposed program.

**Table 7-1
Relevant KEMA-XENERGY Projects**

Project Name	Client	Sector	Description
Program Implementation			
• Enhanced Automation	CEC	Commercial Industrial	Case study development, market research (focus groups & telephone interviews) marketing materials design & development, materials distribution
• Innovative Peak Load Reduction Program	Calif. Energy Commission (CEC)	Nonresidential	Program Administration of \$14 million statewide small nonresidential grant program
• EEGOV B.E.S.T Program	CPUC	Small Commercial	Turnkey marketing, energy education, site-specific energy analysis, financial incentives, equipment procurement, and installation program
• Comprehensive Compressed Air	CPUC	Industrial	3 MW of turnkey assessment and implementation in SCE & SDG&E service areas.
• Sure Bet	Nevada Power/ Sierra Power	Commercial	Turnkey commercial/industrial EE program
Tech Services/Auditing			
• Technical Services Contract	PG&E	Nonresidential	Audits, feasibility studies, wastewater treatment benchmarking
• Technical Assistance Contract	Roseville Electric	Nonresidential	Audits of large nonresidential customers and technical assistance w. Peak Load Program
• Partners in Energy Program	SMUD	Small Commercial	Small Commercial direct install program delivered to over 740 project sites
• Wastewater Treatment Plant Improvement Program	CPUC	Nonresidential	Audits, feasibility studies, wastewater treatment benchmarking, efficiency training, incentives for local government facilities
• Peak Reduction Assistance (subcontractor)	Grueneich Resource Advocates	Large Commercial	Assisted with developing strategies for demand-reduction bidding programs
• HVAC PACT	PG&E, NYSERDA	Small Commercial	HVAC Contractor training program
• Technical Consulting	Owens-Brockway	Nonresidential	Identified energy-related cost-saving opportunities & advised on utility-related issues
Design & Planning			
• California Commercial EE Potential Study	PG&E, SCE, SDG&E	Commercial	Identified nonresidential electric savings potential
• Forecasting EE & Demand Response Potential	SCE & SDG&E	Commercial/Industrial	Analysis of EE & demand response investment potential
• Energy Information Management Pilot Assistance	Baltimore Gas & Electric	All	Price-responsive load technology consultation
• Load Response Program Design Assistance	ISO-NE	All	Consultation regarding load response program design & integration with SMD
• TOU Consumption Estimation	New England Electric System	Commercial	Evaluation of impact of commercial TOU rates
• Distributed Power and Load management MarketPlanner Database	Multiple clients	Nonresidential	Research on business and regulatory strategies for small on-site generation & price-responsive load management
Research & Evaluation			
• Evaluation of Hawaiian DSM Programs	HECO	All	Comprehensive evaluation of HECO's suite of DSM Programs
• Development of Uniform Protocol for DR Program Baseline Calculation	CEC	Nonresidential	Review of existing methods in use & development of recommendations based on multiple parameters
• Smart Thermostat Program Evaluation	SDG&E	Residential	Process & impact evaluations of SDG&E's pilot program for web-based air conditioning load control
• Load Management Evaluation	Northern States Power	Nonresidential	Impact evaluation of controllable rates program

Our recent assignments have placed us at the forefront in the current generation of load management and energy-efficiency initiatives, developing projects and programs that take full advantage of today's information technology and retail market opportunities. This leadership is based on our comprehensive knowledge of retail energy markets and our unique combination of experience with power markets, technologies, regulations, and programs as shown by the following:

- **Practical application of technologies for energy efficiency, load management, distributed generation, and renewable energy.** Over the past 25 years, KEMA-XENERGY's engineering and project management staff have identified, analyzed, designed, and implemented projects in thousands of U.S. facilities.
- **Understanding of customer response to energy efficiency, load management opportunities, and power products.** KEMA-XENERGY staff have designed and operated utility-sponsored demand-side programs. We have also conducted market studies and evaluations of such programs.
- **Practical experience with the information technology and management infrastructure of DSM programs.**

KEMA-XENERGY's services in the area of energy-efficiency and load management programs include program design, program implementation, pricing and cost analysis, market analysis, technology assessment, and regulatory analysis. KEMA-XENERGY has provided advice and consulting assistance to private energy companies, investor-owned utilities, and public agencies that are leading the development of distributed and renewable energy strategies in the regulated and competitive arenas.

We have compiled a large repository of information on price-responsive load-reduction programs and have worked with several ISO's, regional transmission organizations (RTOs), a large number of utilities, load aggregators, and energy services companies to help them design, deliver, and evaluate DSM programs. Our recent technology assessment studies have also provided our team with a strong working knowledge of enhanced automation technologies and communication platforms at the system, enterprise, and market levels. Through feasibility studies, we have also helped many large end-use customers to define strategies and assess the operational and economic implications of load management and efficiency.

Below, we have included project descriptions of a sample of the most relevant work that demonstrates KEMA-XENERGY's experience and capabilities administering turnkey programs. We have also included a sample of qualifications on other experience areas, such as technical services and auditing, planning, market research and program evaluation. References and additional qualifications in all of these areas are available upon request.

Program Implementation

This subsection includes a sample of relevant work we provide in the area of program implementation for energy-efficiency and peak load reduction programs.

Enhanced Automation Campaign, California Energy Commission

The California Energy Commission (CEC) has contracted with KEMA-XENERGY, Inc. to develop case studies of successful enhanced automation installations and perform various other marketing, technical assistance and research activities. The purpose of this contract is to increase customer awareness, installation, and use of enhanced automation in targeted market segments by learning from the lessons of the first round of AB970 demand-responsive (DR) activities sponsored by the CEC. Enhanced automation refers to strategies to increase the capability of existing energy or building management systems to control current and plan for future building energy costs while maintaining the comfort and productivity of all building occupants. The primary products for this project are a collection of marketing materials, including a brochure, several four-page, glossy, case study write-ups and two guidebooks that assist customers with the enhanced automation decision-making process.

Specifically, KEMA-XENERGY (1) developed case studies of successful enhanced automation installations; (2) conducted market research including focus groups and telephone interviews with DR pilot program participants and nonparticipants to assess interest, barriers, and opportunities for increased penetration of enhanced automation; (3) developed marketing materials such as brochures and guidebooks; and (4) are distributing marketing materials through various channels. Under this contract, KEMA-XENERGY also provides technical assistance to customers requesting additional help in implementing enhanced automation and assist in the implementation of building automation systems that demonstrate the full range of benefits that can be achieved through enhanced automation.

Innovative Peak Load Reduction Small Grants Program, California Energy Commission

KEMA-XENERGY is currently the program administrator for small grants under the California Energy Commission's Innovative Peak Load Reduction Program. With a \$14 million budget, this statewide program offers small grants for projects that reduce peak electric demand. The program was launched on a fast track in response to the California energy crisis. Within a 1-month period, KEMA-XENERGY was able to launch a mass marketing outreach campaign to solicit applications, create, and staff a call center for application support via web and telephone hotline, develop a tracking database to share with the CEC, and create a policies and procedures manual to guide program implementation. Lighting retrofits, HVAC and process improvements, peak load shifting, distributed generation utilizing waste-heat recovery and many other measures are eligible to receive grant funding. The project scope includes marketing, application processing, technical analysis, program tracking, site verifications, and grant payment processing.

EEGOV-Wastewater Treatment Plant Program, California Public Utilities Commission

The California Public Utilities Commission awarded a contract to KEMA-XENERGY to conduct the Wastewater Treatment Plant Improvement Program in the service territories of Pacific Gas and Electric Company and Southern California Edison. The program is a

comprehensive approach to reducing energy use in wastewater treatment plants. The program provides energy-use benchmarking analysis of plant processes and equipment, trains operators in a continuous improvement process focused on improving plant energy efficiency, identifies cost-effective process control improvements and equipment upgrades, offers incentives for preliminary measure design development, and offers incentives for installation of energy-efficient equipment upgrades in wastewater treatment plants operated by local government agencies. The overall goal of the program is to generate savings of 4.7 GWh per year and demand reductions of 610 kW at a total cost of \$0.965 million.

EEGOV-B.E.S.T. Program, California Public Utilities Commission

The California Public Utilities Commission awarded KEMA-XENERGY a contract to manage a direct installation program for the hard-to-reach, small commercial market in economically depressed areas. Targeted measures include indoor and outdoor lighting and HVAC. The program is a turkey approach, offering marketing, energy education, site-specific energy analysis, financial incentives, equipment procurement, and installation, an approach tailored to this market segment. Door-to-door marketing is key to the program's success because these customers generally do not respond to mail or telephone solicitations. The program leverages local government participants and community-based organizations for outreach activities. Relatively high cash incentives deliver high participation levels and low per-unit marketing costs. The program's gross annual energy, demand, and therm savings goals are 5.4 million kWh, 1,117 kW, and 20,800 therms, respectively. The B.E.S.T. Program along with the WWTP program described above were components of a suite of programs that KEMA-XENERGY submitted to the CPUC under the acronym EEGOV.

Comprehensive Compressed Air Program, California Public Utilities Commission

In June of 2002, the California Public Utilities Commission awarded KEMA-XENERGY a contract to conduct the Comprehensive Compressed Air (CCA) Program. The CCA combines the information value of an audit program with the implementation focus of a standard performance contract effort, to form a single, integrated program. This approach simplifies participation for smaller companies and eliminates double counting. The CCA program offers incentives of \$40 per MWh saved to a maximum of 50 industrial sites in the Southern California Edison and San Diego Gas and Electric service areas. The CCA program leverages trade allies, such as compressed air service vendors and industry trade groups, to identify qualified customers. The overall goal of the program is to generate savings of 20,000 MWh and 3.0 MW at a cost of \$1.6 million.

Nevada Sure Bet Program, Nevada Power and Sierra Pacific

KEMA-XENERGY developed the Nevada Sure Bet incentive program to help customers facilitate the implementation of cost-effective energy-efficiency improvements. The Nevada Power and Sierra Pacific Power companies are offering this program to their small- and medium-sized commercial customers; KEMA-XENERGY acts as the program administrator. The Sure Bet program offers prescriptive incentives on a per-unit basis for common high-efficiency lighting, cooling, and motor technologies, while a custom incentive option allows for flexibility

in choosing energy-saving measures. KEMA-XENERGY trained contractors in Nevada on the program policies and procedures and continues to work closely with them to market energy savings opportunities. In addition to cash incentives, KEMA-XENERGY performs energy audits and project proposal reviews for commercial electricity customers in Nevada.

Application of Price-Responsive Load Management to 16 Retail Stores, New York State Energy Research and Development Authority

In the process of becoming a limited customer of the New York Independent System Operator (NYISO), KEMA-XENERGY developed and currently implemented analytical tools and communication strategies for 16 retail stores in New York to bid prices and quantities of load reduction into the day-ahead power market operated by the NYISO. KEMA-XENERGY evaluated NYISO's two demand-response programs and advised the end-use customer, Kohl's Department Stores, on how to participate in these programs. KEMA-XENERGY facilitated communication of price signals, bids, dispatch signals, curtailment notifications, and other needed real-time communications between NYISO and the facilities' Kohls Department Stores and the participating load serving entities, Con Edison. KEMA-XENERGY's bidding-strategy module let Kohl's stores maximize their revenue and minimize their risks and costs of participation. The bid module analyzes weather, load, price and other data, computes current customer baseline loads according to NYISO protocols, and recommends the magnitude and duration of demand-side measures and on-site generation that will best meet the end-user's financial and risk management objectives. KEMA-XENERGY evaluated the NYISO load response programs and the technologies used in this project to implement them.

California Statewide Pricing Pilot Program, PG&E, SCE, and SDG&E

On behalf of Pacific Gas and Electric (PG&E), San Diego Gas & Electric (SDG&E), and Southern California Edison (SCE), KEMA-XENERGY is managing the marketing and enrollment activities for a demand-response pilot program targeted to residential and small commercial customers. This program is designed to test experimental pricing plans, including time-of-use and critical peak pricing rates for residential and small commercial customers and is being offered under the supervision of the California Public Utilities Commission and the California Energy Commission.

Under very tight time schedules, and ongoing input from the major stakeholders KEMA-XENERGY implemented sampling and enrollment strategies, produced enrollment, education, and survey materials, and established an enrollment and customer support call center. The procedures and materials were tailored to each utility, type of customer, and pilot treatment group.

These materials include door hangers alerting customers to the installation of new meters, introductory letters soliciting participation, fact sheets describing the pricing programs, enrollment cards for gathering contact information and education packets providing details on the new rate and tips for saving energy. In addition, KEMA-XENERGY is operating a call center to conduct enrollment activities and respond to customer inquiries and concerns.

Technical Services and Auditing

Nonresidential Audits, Pacific Gas and Electric Company

Under a technical services contract with Pacific Gas and Electric Company, KEMA-XENERGY is providing commercial and industrial audits, feasibility studies, monitoring and evaluation, and technical support for specific industry studies. To date, audited sites have included wineries, refrigerated storage, food processing, and equipment manufacturing facilities. KEMA-XENERGY also provides follow-up contact with each customer to encourage implementation, identify barriers, and suggest ways to overcome the barriers.

Roseville Electric Company, Roseville, California

KEMA-XENERGY is providing technical assistance for industrial and commercial customers of Roseville Electric Company, a California municipal utility. These audits include an evaluation of all electrical systems, including lighting, HVAC, motors, and process end uses. To date, KEMA-XENERGY has performed audits of 30 sites, including city buildings, the municipal wastewater treatment plant, a semi-conductor fabrication facility, a hospital, office buildings, a solid waste treatment facility, a college campus, and a telephone company. In addition, KEMA-XENERGY was selected to help implement the Summer Peak Load Reduction Program for the city. KEMA-XENERGY helped to recruit customers to participate in the voluntary load shedding program, identified and quantified curtailable loads, advised the customers and Roseville Electric on technologies necessary to automate the curtailment, and verified the installation and effectiveness of the measures. KEMA-XENERGY also assisted in developing baseline load profiles for each of 29 participating customers to be used in determining payments by the state program to Roseville Electric and its customers.

Partners in Energy Program, Sacramento Municipal Utilities District

KEMA-XENERGY contracted with the Sacramento Municipal Utilities District (SMUD) to serve as a Prime for the delivery of their *Partners in Energy Program*. The program offered rebate incentives to commercial and industrial customers for the implementation of energy efficiency measures in their facilities. As Prime, KEMA-XENERGY had a dedicated staff of field auditors and engineers to conduct site analyses and make recommendations for cost-effective upgrades. The program addressed all electrical end uses, including lighting, motors, HVAC, and refrigeration. At the 740-plus KEMA-XENERGY project sites located in economically depressed areas, electricity demand was reduced by more than 3.4 MW and energy consumption by over 17 million kWh per year. KEMA-XENERGY contracted directly with the commercial/industrial customers to implement the recommended measures, and used a network of electrical contractors and other trade professionals to install state-of-the-art technologies.

Assistance with Response to California Peak Reduction Programs, Grueneich Resource Advocates.

Under subcontract to Grueneich Resource Advocates, KEMA-XENERGY helped large end-use customers in California develop strategies for participating in the California demand-reduction bidding programs. KEMA-XENERGY addressed both the baseline calculation methodologies

for determining credits for load reductions and estimating the windfall and shortfall incentive payments that can be expected under different weather conditions, market conditions, and curtailment strategies. The assessment was conducted on an aggregate basis across multiple facilities as well as for individual facilities.

HVAC PACT Program – Pacific Gas & Electric Company and New York State Energy Research and Development Authority.

KEMA-XENERGY is currently operating a program that provides training to commercial HVAC contractors in how to market, design, specify, and deliver high-efficiency packaged HVAC systems and related maintenance services. The program consists of the following elements: provision of diagnostic tools to identify HVAC efficiency measures and estimate savings; training in the use of the diagnostic tools. In addition, marketing support is provided through a partnership with Penton Media, the largest publisher of industry and trade journals in the HVAC field. Market support activities include hosting web sites for participating distributors, targeted advertising, and other direct marketing strategies.

Technical Consulting Services, Owens-Brockway Glass Containers

KEMA-XENERGY provided technical consulting services to Owens-Brockway to evaluate cost savings opportunities at 26 of its domestic glass container manufacturing plants. Services included identifying, justifying, developing, designing and installing energy-efficiency and electrical cost-savings opportunities. In addition, KEMA-XENERGY advised Owens-Brockway on utility-related issues such as deregulation, power quality, and on-site generation. KEMA-XENERGY identified an opportunity at the Owens-Brockway glass container manufacturing plant in Oakland, California to reduce annual electric costs by \$1 million per year by upgrading to transmission-level voltage. KEMA-XENERGY negotiated the upgrade with the utility and provided turnkey design and installation of a 115-MW substation on site. In Oregon, under contract to PacifiCorp through its Energy FinAnswer program, KEMA-XENERGY evaluated the plant compressed air system for energy-efficiency savings opportunities. KEMA-XENERGY identified measures that would reduce annual electrical consumption by 1,914,723 kWh per year and overall demand by 219.4 kW. Annual cost savings were expected to be \$70,000 per year. Conservation measures included reductions in end use requirements and an interactive automated control system for nine compressors.

Design and Planning related to Enhanced Automation

This subsection includes a sample of relevant work we provide in the area of design and planning for energy efficiency and peak load reduction programs.

California Commercial Sector Energy-Efficiency Potential Study, PG&E, SCE, and SDG&E

The objective of this study was to identify and estimate the amount of cost-effective electric savings potential in the nonresidential sector for Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company. This study is the first comprehensive update of remaining energy-efficiency potential in California since the early

1990s. Savings potentials are being developed by utility and by market segment. In addition to traditional building type, a key market segment of interest is customer size. Several estimates of potential will be developed including technical, economic, and achievable. Several scenarios will be included that take into account uncertainty in key inputs such as marginal costs, rates, and program funding levels.

Forecasting Energy Efficiency and Demand-Response Potential — Southern California Edison and San Diego Gas and Electric Company. California Investor-Owned Utilities were required to file supply procurement plans based on a 20-year forecast in the spring of 2003. To develop the procurement plans, they required forecasts of the potential effects of investments in additional energy efficiency and demand response. Investments could take the form of increased incentive payments, increased marketing, or increased subsidy of enabling technologies, and other types of customer facilitation. Under separate contracts with two utilities, KEMA-XENERGY used our DSM-ASSYST model to forecast energy efficiency effects under different investment scenarios. To forecast demand response, we developed models of likely participation and response levels at varying levels of benefit to the participant, and with varying investments in participant enabling technology. The work involved extensive discussions with program staff as well as with a panel of national experts on demand response programs. We investigated current enrollment patterns and demand response achievements in existing programs both at the client utilities and around the country.

Assistance with Energy Information Management Pilot, Baltimore Gas and Electric (BG&E) Company

KEMA-XENERGY consulted to BG&E on the design and analysis of a pilot program to test new price-responsive load technology for residential, commercial, and industrial customers. The technology allows customers, or the utility in the case of a control period, to control thermostat settings or other equipment via the Internet. KEMA-XENERGY provided advice on control strategies, types of data to collect, and analysis to be conducted. Analysis addressed both impact evaluation and market research for program planning. The goal is to make the most of the pilot to develop an effective business strategy for using such technology full scale.

Load Response Program Design Assistance, ISO-NE

KEMA-XENERGY assisted the ISO-NE with the design of its load response program and integration of the program with the Standard Market Design (SMD) to be implemented in 2003. The SMD was based on the PJM market structure. The project involved identification of strategic design objectives and program rationale and characterization of program options with respect to its effectiveness in meeting policy and design objectives, including customer response, program structure, and implementation platform in terms of consistency with the high-level plans for 2003 programs and need for any immediate changes in 2002.

Estimation of TOU Consumption in the Commercial Sector, New England Electric System

New England Electric System (NEES) sought to evaluate the potential impact of commercial TOU rates on a pilot group. KEMA-XENERGY determined the TOU usage for the customers before the rates were in effect so that NEES would have a baseline for analysis. KEMA-XENERGY developed an end-use commercial TOU model that (1) allocated annual kWh into monthly kWh for each end use; (2) reconciled the monthly kWh to the bills; and (3) allocated the monthly kWh into monthly peak and off-peak periods for each end use. Application of this model on 128 customers indicated consistency with actual metered load data by time period.

Distributed Power and Load Management *MarketPlanner* Database

KEMA-XENERGY conducted a multi-client research project on business and regulatory strategies for small on-site generation and price-responsive load management in states with deregulated power markets. KEMA-XENERGY maintained the proprietary *MarketPlanner* database for its subscription research clients, providing a web portal to data on over 100 companies currently involved in the U.S. market for price-responsive load management and distributed generation, including leading renewable energy technology and project developers and marketers. The database includes information on key regulatory issues affecting the feasibility of DR, renewable, and distributed power initiatives during the transition to competition, organized on a state-by-state basis, including interconnection standards, net metering, standby charges, and exit fees and exit-fee exemptions for certain classes of distributed power.

Research and Evaluation related to Enhanced Automation

This subsection includes a sample of relevant work we provide in the area of research and evaluation for energy efficiency and peak load reduction programs.

Evaluation of Hawaiian Demand-Side Management Programs

Hawaiian Electric Companies and its two subsidiary utilities contracted KEMA-XENERGY to design the impact and process evaluation plans for all of its DSM programs and to conduct all impact evaluations and various process evaluations for the program years from 1996 to 1999. The residential programs tended to focus on water heating measures such as solar water heaters. XENEREGY designed and implemented an end-use metering study that resulting in estimating of annual energy savings and peak demand impacts or various water heating measures. The commercial and industrial program provided incentives for efficient lighting, cooling equipment, motors, control systems, variable-speed drives, and building shell measures. KEMA-XENERGY utilized site-specific studies involving on-site data collection, monitoring, and engineering analysis to determine the energy savings for the various technologies. More than 500 site studies were done over a 4-year period, over 200 of which utilized time-of-use data loggers. KEMA-XENERGY also designed various telephone surveys to assess free-ridership. KEMA-XENERGY conducted process evaluations of the various programs that addressed issues such as ensuring consistent practices and increasing market penetration.

Development of a Uniform Protocol for Calculating the Baseline for Demand Response Programs, California Energy Commission

KEMA-XENERGY completed a study for the CEC to establish a protocol for the calculation of load reductions by participants in demand response programs. The study included a review of existing methods in use by current ISO and utility programs, interviews with the stakeholders involved in determining those methods, and statistical testing of a large number of methods on load data sets from hundreds of accounts in various types of demand response programs around the country. The study recommendations balanced issues of practicality, costs, equity, gaming, and technical accuracy. The draft document was well received by a wide audience of reviewers. The final recommendations were submitted to the Executive Committee of the International Performance Measurement and Verification Protocols (IPMVP) committee, for adoption as part of that Protocol.

Evaluation of Smart Thermostat Program, San Diego Gas and Electric Company

KEMA-XENERGY recently completed process and impact evaluations of SDG&E's pilot program for air conditioning load control via web-based remote thermostat re-set. The evaluation involved 15-minute kW metering of whole-premise and air-conditioner loads for a sample of program participants. During each control event, half the metered sample had thermostats re-set, and half were left unchanged to serve as a comparison group. KEMA-XENERGY consulted with SDG&E on the sample design and data collection protocols, and conducted the data analysis. The impact analysis determined impacts for the re-set periods, as well as projections to impacts that would be expected for other conditions as a function of outside temperature, degrees increase in thermostat setpoint, and time of day. KEMA-XENERGY completed a process evaluation of the initial offering of the Smart Thermostat Program to assess how efficiently and effectively the program was run and to make suggestions for improvements. The process evaluation involved a review of program materials, interviews with utility staff and contractors, and customer surveys. Suggestions for program refinement were made for program marketing to increase customer response, monitoring of lead tracking and the customer call center to enhance customer satisfaction, and monitoring of the installation process to ensure timely installations.

Evaluation of Load Management Rates, Northern States Power Company

KEMA-XENERGY evaluated the impacts of Northern States Power (NSP) Company's commercial and industrial controllable rates program, one of the oldest and largest load management programs in the country. Included in this evaluation were a peak-control rate, requiring reduction to a pre-agreed demand level upon notification by the utility; a combination peak-control and time-of-use (TOU) rate; and an energy-control rate, similar to the peak-control rate, but with more control periods allowed. The evaluation measured three distinct types of impacts for all of the rates studied: 1) dispatchable impacts, corresponding to the load relief available at the time a control period is called by the utility; 2) anticipatory impacts, corresponding to precautionary actions customers take on days they anticipate a possible control period; and 3) long-term embedded impacts, corresponding to effects of the rate on customers' routine operations.

7.3.2 Staff Experience

This section presents summary biographies for selected key staff.

Richard Barnes, Senior Vice-President of DSM Services, will serve as the Principal in Charge for this program. Mr. Barnes is responsible for all demand-side implementation services offered by KEMA-XENERGY. Mr. Barnes combines considerable technical skills, project management experience, and industry knowledge to address a wide range of research, planning, and implementation challenges. With 20 years of related experience in the energy industry, Mr. Barnes has worked for KEMA-XENERGY since 1990.

Mr. Barnes is the principal in charge of both the California Energy Commission's Innovative Peak Load Reduction Program and Enhanced Automation Campaign, for which KEMA-XENERGY is the program administrator. Since the mid-1990s, he led a number of these projects for KEMA-XENERGY.

Mr. Barnes has a B.A. in Statistics with an emphasis in Mathematics from the University of California at Berkeley. Before joining KEMA-XENERGY he worked at Pacific Gas & Electric Company for nine years.

Julia K. Larkin, Project Manager, will serve as the overall Project Manager for the EA Initiative. She is a senior energy analyst and project manager at KEMA-XENERGY. In this capacity, she performs project management as well as quantitative and qualitative research in the areas of energy policy, energy-efficiency, demand response, market assessment and market transformation, performance measurement and Internet business strategies. Other responsibilities include survey design and implementation, overseeing data collection, quantitative and qualitative data analysis, and market research. In addition, Ms. Larkin has expertise in implementation and evaluation of DSM marketing campaigns.

Currently, Ms. Larkin is the project manager for the Enhanced Automation (EA) Campaign, sponsored by the California Energy Commission. The EA campaign provides education and technical assistance for commercial customers looking to improve their energy management and information systems. The \$2 million campaign specializes in promoting system enhancements that allow for increased participation in demand response programs and tariffs. Ms. Larkin also assists with the Shift & Save program; KEMA XENERGY has been hired by the three major IOUs in California to design and implement the marketing, recruitment, enrollment and education components of the new Critical Peak Pricing Pilot Program for Residential and Small Commercial Customers. Other recent projects include:

- California Statewide Residential Electric and Gas Potential Study
- Impact and process evaluation of the California Standard Performance Contract Program
- Impact and process evaluation of the Demand Control Ventilation Pilot Program

Ms. Larkin has a B.A. in Modern Society & Social Thought from the University of California at Santa Cruz and a Masters in Public Policy from the Goldman School of Public Policy at the University of California at Berkeley. In addition to her policy, economic and statistical analysis expertise, Ms. Larkin brings broad experience in community-based organizing and long-term environmental sustainability issues.

Dan Thomas, P.E., C.E.M., Senior Engineer. Mr. Thomas will serve as the Technical Project Lead for this program. He has over 20 years of energy engineering experience. Currently, he serves as Technical Lead for the Enhanced Automation Campaign, and provides technical consulting services to commercial and industrial customers considering switching in Critical Peak Pricing Tariffs. He has conducted energy audits and analyses, and energy engineering training in a dozen states and five foreign countries. He has extensive experience in all types of commercial and industrial customers. Dan is also part of the project team for the on-going California Public Utilities Commission's 2002-2003 WWTPIP program. Additional duties include:

- Providing energy audits for commercial, industrial, utility, institutional, and government clients. Evaluates and designs energy efficiency measures for industrial and commercial sites.
- Performing independent third-party review of utility industrial and commercial energy efficiency rebate programs.
- Consulting with industrial and commercial clients on energy efficiency and energy cost reduction measures.

Frank Powell, P.E., Senior Engineer. Frank Powell is a senior engineer who provides technical analysis of complex energy technologies in commercial and industrial applications, detailed energy conservation, efficiency, and peak load reduction audits, and prepares customized rebate projects for review by utilities and customers. Formerly, Mr. Powell was the Director of Engineering and Regional Director for the National Energy Management Institute. Mr. Powell graduated from Cornell University with a BS in Engineering and a Master's in Engineering. Frank is one of the senior engineers providing technical assistance and facility assessments as part of the Enhanced Automation Campaign offered by the California Energy Commission. Frank is also part of the project team for the California Public Utilities Commission's 2002-2003 WWTPIP program.

Svetlana Zaburskaya, Project Engineer, is a controls expert with over 15 years of experience. She is one of the project engineers providing technical assistance for the CEC's Enhanced Automation Campaign. As part of the field team working on the Commercial End Use Survey, she also conducts site surveys of medium and large sized commercial sites using a complex survey instrument designed to catalogue all end uses of energy at commercial sites for input to a building simulation modeling program. Data collected includes building use and occupancy schedules, shell attributes, HVAC configuration, thermal zoning, lighting equipment, office equipment, and utility metering data. Ms Zaburskaya has a Masters in Mechanical Engineering from Ural Polytechnic University.

Erik Dyrr, Project Engineer, brings 10 years of technical experience in energy efficient design/retrofit, evaluation, and data acquisition. Mr. Dyrr has managed projects involving coordination of data collection on contracts with utilities throughout the country. Mr. Dyrr has completed numerous engineering studies, on-site audits, and data collection activities for residential, commercial, and industrial customers. He specializes in data acquisition, metering, and analysis of measured data. He has developed metering strategies, installed instrumentation, and process data collected for many utility and industrial customers. He also provides assistance in recruiting, training, and supervising teams of energy auditors throughout the Western United States and Canada. Mr. Dyrr has a B.S. in Industrial Technology from California Polytechnic State University, San Luis Obispo.

Karen Maoz, P.E., Project Engineer, specializes in energy analysis, program implementation and evaluation, and quantitative research. She has conducted energy audits, interviews and case studies relating to the State of California's Large Nonresidential Standard Performance Contracting program. Her work also includes implementation of the Innovative Peak Load Reduction Program; this \$14 million statewide program offers small grants for projects that reduce peak electric demand. Ms. Maoz is also on the technical staff of the CEC's Enhanced Automation Campaign, and played a major role in writing the Enhanced Automation Technical Options Guidebook. Other relevant technical and implementation experience includes:

- Nevada Sure Bet Program, Sierra Pacific Resources, 2003-Present.
- Emerging Renewable Technologies Account, California Energy Commission, 2002-Present.
- Energy Audits, Pacific Gas and Electric, 2002-Present.
- Business Energy Services Team, California Public Utilities Commission 2002-Present.

Ms. Maoz holds a Master of Science degree in Mechanical Engineering degree from the University of California at Berkeley. She also holds a Bachelor of Science degree in Mechanical Engineering from the University of Texas at Austin.

Dianne Anderson, Energy Analyst, will serve as the Program's Administrative Coordinator. Currently, Ms. Anderson works on the implementation team of the Nevada Sure Bet Program targeting small commercial customers, and California's Innovative Peak Load Reduction Program. Her specialty is quality control and technical review of project applications and inspections. She is also part of the field team for the Commercial End Use Survey, for which she provides quality control/technical review for site surveys of small and medium sized commercial sites. Prior to joining KEMA-XENERGY, Ms. Anderson worked at Newcomb Anderson Associates, where she oversaw day-to-day operations of the \$8 million PowerSavers Program targeting small businesses in San Francisco. She has a B.S. in Environmental Studies from San Jose State University, with a concentration in Energy.

8.1 BUDGET SUMMARY

The summary of the budget for the Enhanced Automation Initiative is shown in Table 8-1.

Table 8-1
EA Initiative PG&E Budget Summary

Item	Administration Costs	Marketing Costs	Direct Implementation Costs	Evaluation Costs	Total
Labor	\$ 29,000	\$ 20,550	\$ 66,250	\$ 31,250	\$ 147,050
HR Support & Development	\$ 39,695			\$ 2,438	\$ 42,133
Overhead	\$ 130,053				\$ 130,053
Travel	\$ 9,850				\$ 9,850
Incentives			\$ 350,000		\$ 350,000
Total	\$ 208,598	\$ 20,550	\$ 416,250	\$ 33,688	\$ 679,086

Table 8-2 displays our incentive projections by measure.

Table 8-2
Total Incentives Per Measure

Measure Name	Unit Goals	Unit Definition	Financial Incentive Per Unit	Financial Incentive Per Measure
EMS Software Enhancement	25	Building	\$5,000	\$125,000
EMS Hardware Enhancement	15	Building	\$15,000	\$225,000
TOTAL				\$350,000