

Title:

**BEVERAGE VENDING MACHINES
ENERGY SAVINGS PROGRAM
FOR PG&E SERVICE TERRITORY**

Submitted to:

**California Public Utilities Commission
R.01-08-028
2004/2005 Non-Utility Energy Efficiency Program Selection**

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Other Programs Proposed:

**Beverage Vending Machines Energy Savings Program
for SCE Service Territory**

Mobile Energy Clinic Program for SCE Service Territory

Mobile Energy Clinic Program for PG&E Service Territory

Mobile Energy Clinic Program for SoCalGas Service Territory

Mobile Energy Clinic Program for SDG&E Service Territory

**Upstream High Efficiency Gas Water Heater Program
for PG&E Service Territory**

**Upstream High Efficiency Gas Water Heater Program
for SoCalGas Service Territory**

**Upstream High Efficiency Gas Water Heater Program
for SDG&E Service Territory**



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I. PROGRAM OVERVIEW

I.A PROGRAM CONCEPT

ADM Associates, Inc. (ADM) proposes to implement an Beverage Vending Machines Energy Savings Program as a Local Non-Utility Nonresidential Energy Efficiency Program in PG&E's service territory for Program Years 2004 and 2005. Under our proposed Beverage Vending Machines Energy Savings Program, we install weekly programmable electronic cycling units on beverage vending machines to control the amount of time that the machines operate. The beverage vending machines on which we install the control devices are those located in spaces that are not accessible some hours of the day (e.g., in businesses that close for the evening). Such vending machines can be controlled by weekly programmable electronic cyclers that turn the machines off during hours when they will not be used.

I.B PROGRAM RATIONALE

We are proposing the Beverage Vending Machines Energy Savings Program as a hardware direct install program.

Typical existing beverage vending machines have a peak load of 700 to 1,200 watts, using electricity not only for cooling the beverages but also for lighting. All of these machines are normally left running 24 hours per day, using from 7 to 12 kWh of electricity per day. In aggregate, the electricity use of beverage vending machines is significant. The California Energy Commission has estimated that beverage vending machines in California use 1.889 billion kWh per year.

However, there are significant numbers of beverage vending machines that do not need to operate continuously. Energy savings can be achieved by turning the machines off completely in hours when it is unlikely that they will be used or by cycling them off and on. The major market barrier to reducing the electricity use of existing installed beverage vending machines is that the issue of split incentives is at work. Neither the machine owner nor the vendor/distributor of the products in the machine pays the energy bill for lighting and cooling the machine; the energy bill is paid by the owner or operator of the facility in which the machine is installed. Consequently, there is no financial incentive for the machine owner or the product vendor/distributor to make the machines energy efficient. Indeed, although the energy use for new refrigerators has been reduced by at least 60 percent over the last twenty years, the same has not been true for vending machines. In fact, a vending machine uses more energy than the least efficient refrigerator.

Through our proposed Beverage Vending Machines Energy Savings Program, we install external control devices (i.e., weekly programmable electronic cycling units) on beverage vending machines to control the amount of time that the machines operate. We install the control devices on beverage vending machines that are located in spaces that are not

accessible some hours of the day (e.g., in businesses that close for the evening). The programmable electronic cyclers then control the vending machines by turning them off during hours when they will not be used.

As discussed in Section IV.A, significant savings can be achieved through this control strategy.

I.C PROGRAM OBJECTIVES

Table I-1 provides summary information on the objectives for the proposed Beverage Vending Machines Energy Savings Program in PG&E's service territory.

Table I-1. Proposal Summary for Beverage Vending Machines Energy Savings Program in PG&E's Service Territory

Program Name	Beverage Vending Machines Energy Savings Program
Utility Service Territory	PG&E
Program Type	Direct Install
Target Sector	Commercial
Performance Target	4,500 timer controls installed to turn beverage vending machines off when business is not open
Annual kWh Savings Target	6,984,000 kWh
Annual Peak kW Reduction Target	25.2 kW
Annual Therm Savings Target	n/a
Total Program Budget	\$433,350
TRC	8.56
PT	33.48

The Beverage Vending Machines Energy Savings Program accomplishes a number of other objectives.

- It provides long-term annual savings in electricity by reducing the amount of electricity used by beverage vending machines on which control devices are installed.
- It addresses the split incentives that create a major market barrier for installing devices to reduce the electricity use of beverage vending machines.
- It is innovative, addressing a market that heretofore has not received much attention in energy efficiency programs.

II. PROGRAM PROCESS

II.A PROGRAM IMPLEMENTATION

Our process for implementing the Beverage Vending Machines Energy Savings Program builds directly on the process and procedures that we used in implementing a similar program in the service territory of Southern California Edison Company during 2001. We have already developed the procedures and have the personnel and equipment in place to implement Beverage Vending Machines Energy Savings Program in PG&E's service territory during PY 2004 and PY 2005.

Vending machines are basically refrigerators, cycling on and off to maintain a steady internal temperature. In addition, newer machines often have lights that operate continuously. A typical vending machine stocks 450 cans of cold drinks, has a peak load of 700 to 1,200 watts, and uses 7 to 12 kWh per day. The major energy-using components in a vending machine include the compressor, evaporator fan, lighting, and the vending/coin changer. We would note that new vending machines now are equipped with electronic controls that allow them to be programmed to control compressor and lights (but not circulating fans). Machines in the future are expected to have capabilities to control all three.

Through our proposed Beverage Vending Machines Energy Savings Program, we install external control devices (i.e., weekly programmable electronic cycling units) on beverage vending machines to control the amount of time that the machines operate. We install the control devices on beverage vending machines that are located in spaces that are not accessible some hours of the day (e.g., in businesses that close for the evening). The programmable electronic cyclers then control the vending machines by turning them off during hours when they will not be used.

For some vending machines, we may also recommend having the machine owner remove the lighting (where appropriate). The average beverage vending machine uses two high-output fluorescent bulbs, which light nearly the entire front of the machine. Depending on the lighting configuration and counting the electricity used for the ballast, a beverage vending machine may use from 2 to 4 kWh of electricity per day just for lighting. Thus, removing the lighting from a vending machine may save from 730 to 1,460 kWh per machine per year.

However, because lighting is used to advertise the machine, we work with facility operators and machine owners to determine what machines can have their lighting removed. There are some type of locations and businesses that need to have the lighting continuously in operation. The decision to control a machine's lighting must be at the discretion of the vendor. Note, however, that the electronic cyclers will turn lighting off when the compressor of a vending machine is off.

For each facility where removal of lighting from the vending machines appears warranted, we provide the facility operator with a form that requests the owner(s) of the vending machines to remove the lighting. We attach this form to the vending machine(s) so that the lights can be removed at the next restocking of the machine(s). We expect that removing the lighting will be more acceptable for machines that are located inside a building. Vending machine owners generally do not want lights removed if the vending machines are located outside. They believe that the lighting attracts more customers to use the machines. However, the final decision on removal of any lights in the vending machines is made by the facility operator.

We document each installation of a time clock on a vending machine on a Controller Installation Form, as shown in Figure II-1. The overall installation effort is tracked using a program tracking system that is set up to contain the information collected on the Controller Installation Form.

II.B MARKETING PLAN

We market the Beverage Vending Machines Energy Savings Program through several activities, which include the following:

- Developing partnerships with Pepsi Cola, Coca Cola and other beverage distributors to facilitate the installation of vending machine controllers;
- Working with the distributors to identify the targeted customer group where the greatest saving can be achieved (e.g., office buildings, repair services, warehouses, and wholesalers); and
- Preparing plans and advertising and promotional materials for door-to-door marketing.

In working with Coca Cola and other distributors, we have learned that some facilities have begun asking distributors to remove vending machines because the facilities are concerned about the amount of electricity being used. In approaching other distributors to participate in the program, we can point out that their participation in the program can be used to show facilities that the distributors are also concerned that the facilities not be paying too much for the electricity that they are using for keeping the vending machines.

We prepare informational and marketing material that we can use to market the program and recruit sites to participate. Information is provided that describes the control strategy (i.e., programmable electronic cyclers). The information will include graphical presentation of energy use for the vending machine with and without the device. It will explain how the control device works and how savings are achieved. The informational material is a relatively straightforward presentation of the kWh and cost savings that can be achieved by installing a control device.

Refrigerated Soft Drink Vending Machine Controller Installation Form							
Installer: _____				Date Installed: _____			
Business Name: _____				ID: _____			
Address: _____				City: _____			
Contact Name: _____				Phone: _____			
Manufacturer of Vending Machine			Model #		Amps		
<input type="checkbox"/> Dixie-Narco <input type="checkbox"/> Royal <input type="checkbox"/> Vendo <input type="checkbox"/> _____							
Product: <input type="checkbox"/> Coke <input type="checkbox"/> Pepsi <input type="checkbox"/> 7-Up <input type="checkbox"/> Other			Controller SN:				
Area: <input type="checkbox"/> Conditioned <input type="checkbox"/> Non-conditioned			Lamps Controlled? : <input type="checkbox"/> Yes <input type="checkbox"/> No				
Descriptive Location of Vending Machine:							
Manufacturer of Vending Machine			Model #		Amps		
<input type="checkbox"/> Dixie-Narco <input type="checkbox"/> Royal <input type="checkbox"/> Vendo <input type="checkbox"/> _____							
Product: <input type="checkbox"/> Coke <input type="checkbox"/> Pepsi <input type="checkbox"/> 7-Up <input type="checkbox"/> Other			Controller SN:				
Area: <input type="checkbox"/> Conditioned <input type="checkbox"/> Non-conditioned			Lamps Controlled? : <input type="checkbox"/> Yes <input type="checkbox"/> No				
Descriptive Location of Vending Machine:							
Timer Schedule	Mon	Tues	Wed	Thur	Fri	Sat	Sun
On 1							
Off 1							
On 2							
Off 2							
On 3							
Off 3							
On 4							
Off 4							
On 5							
Off 5							

Figure II-1. Example of Controller Installation Form

As a final aspect of our marketing, we promote the program site-by-site. We select areas that have facilities that have a high likelihood of having beverage vending machines. For these areas we send our installation teams door-to-door to market the program and install the control devices. Our experience with the beverage vending machine program that we implemented for SCE indicated that door-to-door marketing was an effective means for getting controllers installed in beverage vending machines.

II.C CUSTOMER ENROLLMENT

The customer enrollment procedure for the Beverage Vending Machines Energy Savings Program is twofold.

- First, we bring machines into the program by working with vending machine distributors who can enroll their machines in groups.
- Second, we undertake door-to-door marketing to bring machines into the program. This customer enrollment is straightforward in that a small business is enrolled into the Program at the time of the on-site visit.

II.D MATERIALS

The service that we provide through the Beverage Vending Machines Energy Savings Program is to install electronic programmable cyclers on the vending machines. The cyclers that we install have the following specifications:

- Heavy Duty Digital Timer
- 7-day programming
- Up to 14 On/Off Settings per day
- To-the-minute accuracy
- LCD digital clock and readout
- 15 Amp, 120 Volts AC, 1,875 Watts contact rating
- 3-prong grounded plug and receptacle
- battery backup for programmed settings

We procure the cyclers by soliciting bids from suppliers. Candidate suppliers include:

- Graybar Electric
- Home Depot
- Graingers
- Lowe's

II.E PAYMENT OF INCENTIVES

No direct incentives are paid to the businesses that participate in the Beverage Vending Machines Energy Savings Program. Rather, we install electronic cyclers on beverage vending machines at no cost to the businesses.

II.F STAFF AND SUBCONTRACTOR RESPONSIBILITIES

Our staffing structure and responsibilities for the Beverage Vending Machines Energy Savings Program are shown in Table II-1.

Table II-1. Staffing Structure and Responsibilities

<i>Name</i>	<i>Title</i>	<i>Responsibilities</i>	<i>% Avail.</i>
Taghi Alereza	Principal in Charge	Overall technical and administrative	10%
Dan Mort	Project Manager	Daily project management	30%
Donald Dohrmann	Tracking System &M&V Coordinator	Development of tracking system and M&V coordination	10%
Mugimin Lukito	Associate	Field supervisor	30%
Khoi Tran	Associate	Field supervisor	25%
Richard Burkhart	Assistant	Marketing material development	15%
Other Field Staff	Associate	Field staff	100%
Other Field Staff	Associate	Field staff	100%
Other Field Staff	Associate	Field staff	100%

II.G WORK PLAN AND TIMELINE FOR PROGRAM IMPLEMENTATION

Our proposed timeline for implementing the Beverage Vending Machines Energy Savings Program in PG&E's service territory is shown in Table II-2. This timeline is for a program covering PY 2004 and PY 2005.

Table II-2. Timeline for Implementing Beverage Vending Machines Energy Savings Program

<i>Activity</i>	<i>Target Date</i>
Program Begins	February 2, 2004
Program Implementation Plan	February 20, 2004
Evaluation, Measurement & Verification Plan	March 15, 2004
First Quarter Report	April 30, 2004
Second Quarter Report	July 31, 2004
Third Quarter Report	October 31, 2004
Fourth Quarter Report	January 31, 2005
Fifth Quarter Report	April 30, 2005
Sixth Quarter Report	July 31, 2005
Seventh Quarter Report	October 31, 2005
Eighth Quarter Report	December 31, 2005
Program Deadline	November 30, 2005
Final Report	December 31, 2005

III. CUSTOMER DESCRIPTION

III.A CUSTOMER DESCRIPTION

Businesses that will have highest priority for being included in the Beverage Vending Machines Energy Savings Program are those with beverage vending machines and that have well-defined open and closed hours. Businesses that close during weekends or that are closed at least 12 hours each day offer the most potential for significant energy savings from installing cyclers on their beverage vending machines. Such businesses include large retail stores, office buildings, warehouses, and repair shops. Other businesses that can also be good candidates include the following:

- Barber Shops
- Beauty Shops
- Garages
- Tire Centers
- Dry Cleaners
- Car Lots
- Retirement Centers
- Bowling Alleys
- Car Washes

III.B CUSTOMER ELIGIBILITY

Customers eligible for the Beverage Vending Machines Energy Savings Program are those commercial or institutional facilities that have beverage vending machines. Such facilities include those businesses just listed in Section III.A.

Businesses with beverage vending machines can of course differ considerably in type, size, and financial resources. The focus of the Beverage Vending Machines Energy Savings Program is on businesses that have beverage vending machines that are located in spaces that are not accessible some hours of the day. Based on our work for SCE, these machines are often found in small service-type businesses (e.g., auto repair garages) that close for the evening. Such vending machines can be controlled by weekly programmable electronic cyclers that turn the machines off during hours when they will not be used.

III.C CUSTOMER COMPLAINT RESOLUTION

To allow for questions or complaints, we establish a toll-free (“800”) telephone line that can be accessed by businesses in SCE’s service territory. Businesses can use this line to request information about the program or to place a complaint. We respond to any requests or complaints within 3 days.

Each information or complaint call is documented on a computerized form. This form provides for the recording of caller profile information, date and time of the call, nature of the call, resolution of the call, and any other relevant information. All complaint forms are maintained in a computerized database that will be accessible by PG&E and CPUC personnel for verification and auditing purposes.

Corrective actions for complaint calls are taken as appropriate and documented on the form. Cases where actions or verification visits are pending are kept in an active status file. Closed cases where problems have been resolved are retained to ensure documentation of problems and their solutions.

Periodic reports that summarize the number of information/complaint calls, the complaint backlog, and the time required for resolving complaints are prepared and included in the quarterly reports to PG&E.

III.D GEOGRAPHIC AREA

We propose to implement the Beverage Vending Machines Energy Savings Program throughout PG&E's service territory. Areas with higher density of beverage vending machines are targeted. The service territories of municipal electric utilities are not part of the target market for the program because customers in those territories do not pay the electric public goods charges that the program will be funded through.

IV. MEASURE AND ACTIVITY DESCRIPTIONS

IV.A ENERGY SAVINGS ASSUMPTIONS

Installing electronic cyclers to control the on/off operation of beverage vending machines is not a standardized measure for which data are available in the DEER database. However, from the vending machine control program that we implemented in SCE's service territory, we do have estimates of the savings that resulted from installing timer controls on 1,540 vending machines.

With timers installed, the annual kWh usage of the machines was reduced because there were hours during which the machines would be off. From the data collected during the timer installations, the average number of hours off per week for machines that had timers installed was 87.3 hours. When the wattage of the different machines was taken into account, it was estimated that annual electricity use for the vending machines with timers installed was reduced by 2.980 GWh. The average annual savings from installing a timer was therefore about 1,940 kWh per machine per year.

Because the electronic cyclers only turn off the machines those hours of the day when the business is not open, there are generally no reductions in coincident peak demand.

IV.B DEVIATIONS IN STANDARD COST-EFFECTIVENESS VALUES

None of the variables that we have used to determine the cost-effectiveness of the Beverage Vending Machines Energy Savings Program deviate in value from those prescribed in the Energy Efficiency Policy Manual or the CEC's DEER database.

IV.C REBATE AMOUNTS

No rebates are paid to the businesses that participate in the Beverage Vending Machines Energy Savings Program. Rather, we directly install electronic cyclers on beverage vending machines at no cost to the businesses.

IV.D ACTIVITIES DESCRIPTIONS

There are no other program activities that are expected to produce measurable energy savings.

V. GOALS

The program performance goal for the Beverage Vending Machines Energy Savings Program in PG&E's service territory is shown by the target numbers of beverage vending machines to be controlled in Table V-1.

Table V-1. Targets for Numbers of Beverage Vending Machines and kWh Savings in PG&E Service Territory

<i>Program Year</i>	<i>Number of Machines</i>	<i>Electric Savings (kWh)</i>	<i>Demand Reduction (kW)</i>
PY 2004	1,800	2,793,600	10.1
PY 2005	2,700	4,190,400	15.1
Total	4,500	6,984,000	25.2

VI. PROGRAM EVALUATION, MEASUREMENT AND VERIFICATION

VI.A APPROACH TO PROGRAM EM&V

This section discusses our approach to performing the evaluation, measurement and verification work for the Beverage Vending Machines Energy Savings Program and to reporting on program progress.

ADM will contract with an independent third party who is not affiliated with ADM to evaluate the Beverage Vending Machines Energy Savings Program and to measure and verify its claimed energy savings and measure installations. To assist the independent contractor in performing the M&V work, we collect needed data during the implementation of the program.

The evaluation of the program will include information about all activities undertaken as part of the program. We assess the number of vending machines controlled and the kWh savings that result from controlling these machines. We will have collected the information on the number of machines controlled during the course of the program, using the tracking system discussed below.

For a sample of the machines on which we install electronic cyclers, monitoring can be conducted to determine the savings being realized for these units. A sampling plan is developed that specifies the types and number of vending machines to be monitored to provide the savings information. Plug-in loggers can be used to measure the on/off operation of the vending machines, from which the change in operating hours of a machine as a result of its being controlled can be estimated. The data collected through this monitoring allow calculation of savings per machine that result because of a control device being installed.

Together, the data on the number of machines being controlled and on the average savings per controlled machine (for different types of control devices) will allow estimates of the aggregate savings attributable to the program to be developed.

From our work in implementing and evaluating energy efficiency programs, we know the importance of having good information in a program tracking system in order to track the progress of the program and to evaluate its effects. For the Beverage Vending Machines Energy Savings Program, we already have in place the system for tracking the work, based on the work on a similar program that we have conducted as a Third Party Initiative for Southern California Edison. The system is up and running and will require little modification to tailor it to meet the data collection and reporting requirements involved in our implementing of the Beverage Vending Machines Energy Savings Program.

Our tracking system includes all of the procedures, policies, protocols, forms, data entry and the data storage methods needed to meet the data collection and reporting requirements

involved in our implementing this program. We track specific types of information that enable us to evaluate the progress of the program and our efforts. We use *Excel*[™] and *Access*[™] as the platforms on which we store the data for the program.

In particular, the tracking system will provide information on the following items:

- Total number of businesses contacted and recruited;
- Number of programmable electronic cyclers installed at each facility; and
- Other information on impacts of the program, such as anecdotal feedback from market actors.

VI.B POTENTIAL EM&V CONTRACTORS

Potential EM&V contractors for the Beverage Vending Machines Energy Savings Program include the following firms:

- Robert Mowris and Associates
- Sisson and Associates
- Ridge and Associates
- Itron (RER)

Each of these firms was an EM&V contractor for programs funded by the CPUC for 2002/2003 and have the capabilities and experience required to perform the evaluation of the Beverage Vending Machines Energy Savings Program.

VII. DESCRIPTION OF ADM'S QUALIFICATIONS

This section provides information on the qualifications of ADM Associates and of the personnel who will be the staff for the Beverage Vending Machines Energy Savings Program.

VII.A QUALIFICATIONS OF ADM ASSOCIATES (PRIME IMPLEMENTOR)

ADM's ability to implement the Beverage Vending Machines Energy Savings Program is based on our considerable experience in working with small business firms to improve energy efficiency. Since beginning business in 1979, ADM Associates, Inc. has worked with utilities throughout the country to implement large-scale programs to help small commercial firms use energy more efficiently.

In proposing to implement the Beverage Vending Machines Energy Savings Program, we draw on our hands-on experience in implementing a similar program for Southern California Edison during 2001. Under SCE's 2001 Third Party Initiative, we implemented a program to install control devices (i.e., electronic cyclers or VendingMisers™, as appropriate) on beverage vending machines in SCE's service territory. We installed 1,540 electronic cyclers (timers) and 1,937 VendingMisers™ on beverage vending machines through this program during the last half of 2001. From our experience in implementing this program for SCE, we have first-hand experience in working with beverage vendors/distributors in getting control devices installed on vending machines and have the infrastructure for implementing and administering such a program already in place. Because we are not a manufacturer or distributor of vending machines or vending machine products, we are able to work with distributors for various brands of beverages without raising any questions of conflicts of interest.

ADM also has considerable experience in designing, implementing and administering other energy efficiency programs. Following are brief descriptions of projects that illustrate the qualifications and experience of ADM for designing and implementing an energy efficiency program such as the Beverage Vending Machines Energy Savings Program.

- **Upstream High-Efficiency Gas Water Heater Program**

For: Southern California Gas Company

Under a contract with Southern California Gas, ADM implemented an upstream gas water heater program to increase the market penetration of high efficiency gas water heaters. For this program, we worked with wholesalers and distributors of gas water heaters as well as with plumbers to increase the sales of the higher efficiency gas water heaters. We provided rebates to wholesalers and distributors for each high efficiency gas water heater that they stocked and sold, but with two-thirds of the rebate going to reduce the price at which the water heaters were sold to plumbers and with one-third going to the wholesaler/distributor to defray his administrative costs. All of the major

wholesalers/distributors in SoCalGas's service area participated in the program, which increased the sales of high efficiency gas water heaters significantly.

- **Mobile Energy Clinic Program**

For: Southern California Gas Company and Southern California Edison Co.

Under contracts with Southern California Gas and Southern California Edison, ADM designed and implemented the Mobile Energy Clinic energy efficiency program. In this program, we focus on improving energy efficiency for small businesses by making no-cost/low-cost improvements for energy efficiency and by providing diagnostics of energy-using equipment for small businesses. Small businesses that participate in this program have actual no-cost/low-cost improvements made to their equipment. They also have their HVAC performance tested, condenser coils cleaned, filters changed, lighting systems evaluated, and other energy using equipment such as water heaters, compressors and process equipment checked for proper use. Owners/managers are given a checklist of other energy efficiency actions that they can take.

- **Beverage Vending Machine Program**

For: Southern California Edison Company

Under contract with SCE, we implemented an Energy Savings Program for Beverage Vending Machines. We installed VendingMisers™ or time clocks (as appropriate) on 3,400 vending machines in SCE's service territory. The control strategies are defined by (1) whether the vending machine is lighted and (2) whether the location of the machine will permit use of a time clock or requires use of a VendingMiser™. Most of these savings will go to small commercial customers, who are a particular target for the program.

- **Lodging Industry Energy Education Program**

For: Southern California Gas Company

Through the Lodging Industry Energy Education Program, ADM visited hotels/motels in SoCalGas's service territory and offered their operators hands-on assistance to identify ways in which they can improve energy efficiency and save energy in their facilities. The Lodging Industry Energy Education Program demonstrated that a hands-on approach is a very effective approach to getting small business owners to think about energy and to take actions to improve energy efficiency. We visited over 900 lodging facilities during 2000 and have visited over 400 more in 2001.

- **Duct Efficiency Programs**

For: Pacific Gas and Electric
Southern California Edison

Southern California Gas
San Diego Gas and Electric

Under the California Board for Energy Efficiency's third party program, ADM was under contract with the four major investor-owned utilities in California (i.e., Pacific Gas and Electric, Southern California Edison, San Diego Gas and Electric, and Southern California Gas) to implement residential duct efficiency programs throughout California. The Duct Efficiency Programs were aimed at institutionalizing good duct design and establishing retrofit duct repair as a component of HVAC maintenance. Through the Duct Efficiency Program, we provided HVAC and/or sheet metal contractors with the information, procedures, and technologies that they could use to market duct leakage inspection and repair services to residential single-family and multi-family houses. Through the program, contractors were educated and trained on how to provide duct inspection and repair services as a viable business venture. Contractors were taught new techniques and procedures that were explicitly designed under this program in order to be effective and not too expensive. Contractors who participated in the programs were also assisted in identifying households who are interested in having their duct system inspected and repaired.

- **RCP Training**

For: Southern California Gas
Southern California Edison

ADM conducted training workshops to provide training to HVAC contractors to better equip them to participate in the Residential Contractors' Program. One aspect of the training was to provide training in central air conditioner/central heat pump diagnostic tune-up, duct testing and duct sealing in conjunction with SCE/SoCalGas Installation Standards. The other aspect was to provide an overview of the RCP fulfillment process from consideration of installation of energy efficiency measures through completion of work and contractor payment. This overview included proper completion of program-related paperwork, including Incentive Voucher/Application and Customer Information and Declaration forms.

- **Local Energy Assistance Program**

For: Southern California Edison
Pacific Gas and Electric
Southern California Gas

ADM developed a program that we implemented throughout California to provide assistance to the planning departments in selected communities to encourage energy efficiency in new industrial and commercial developments that are being proposed in those communities. This program included directly influencing specific development plans and providing assistance to the planning departments of the local governments to

plan/approve planning and zoning areas, based on energy use as well as other infrastructure criteria presently used. We also disseminated information regarding the results of these energy planning activities to other communities. Our program in California was funded at \$1.2 million by the major utilities (i.e., Pacific Gas and Electric, Southern California Edison, and Southern California Gas).

- **Energy Efficiency Site Surveys of Commercial, Industrial, and Agricultural Facilities**

For: Pacific Gas and Electric

In this project for PG&E, we are conducting surveys of commercial, industrial, and agricultural customer facilities to identify and analyze the energy efficiency opportunities using the 1-2-3 tiered approach to energy conservation. For Tier 1, we identify and analyze the no-cost energy efficiency opportunities in each customer facility. For Tier 2, we identify and analyze the low-cost energy efficiency opportunities in each customer facility. For Tier 3, we identify and analyze customer facilities with a view to identifying energy efficiency opportunities that will require major financial investments on the part of the customers. All recommendations target and prioritize measures and technologies that deliver both immediate and long-term peak-period kW demand savings and annual kWh and therm savings.

- **Energy and Water Efficiency Services Support**

For: Colorado Springs Utilities

Under this contract with the City of Colorado Springs Utilities, ADM provided energy and water efficiency services for CSU's industrial and large commercial customers. We provided feasibility evaluations for energy and water efficiency projects and provided design plans for energy and water efficient projects. In addition, we provided training on energy and water efficiency projects for CSU staff.

- **Technical Support to Demand Side Management Unit**

For: Jamaica Public Service Company, Ltd.

Under a contract with the Jamaica Public Service Company, ADM provided technical support to JPSCo's Demand Side Management Unit. We provided a Resident Consultant who worked with JPSCo staff in planning demand-side management programs for JPSCo's customers. Subject areas for which we provide technical support included program planning and implementation, cogeneration feasibility studies, energy auditing, building codes, simulation modeling, monitoring, and program evaluation.

- **Technical Audits for Large Industrial Customers**

For: Power Agency of California

Under contract with the Power Agency of California, we conducted audits of large industrial electricity customers in order to identify appropriate energy efficiency improvements. To support this activity, we developed the audit form to be used in data collection, conducted on-site interviews of plant personnel on facility operations, collected other relevant data on-site, evaluated the collected data, and prepared engineering estimates of the energy savings for energy efficiency improvements for each of the audited facilities. Estimates of expected savings were developed through engineering calculations or through simulations with computerized energy analysis models.

- **Business Energy Advocates Program for Small Business**

For: California Energy Extension Service

ADM provided marketing and technical support services on energy conservation for a program to encourage small business firms in California to adopt techniques and technologies that reduce energy consumption and costs. The program was also intended to reduce the barriers encountered by business firms in gaining access to energy management techniques and practices. We identified energy conservation measures that are particularly applicable to given types of businesses and supported their applications for utility company incentive payments and low-interest small business loans.

- **Commercial Audits Project**

For: Entergy Services, Inc.

For Entergy, we performed the Commercial Audits Project. We performed on-site audits at about 650 commercial facilities throughout Entergy's service area. Using the data collected through these audits, we prepared customer-specific DOE-2 analyses of energy savings from conservation measures. We prepared audit reports for the individual customers and also aggregated the data to prepare system-level estimates of the saturations of various end-use technologies and DSM measures.

- **Energy Audit Services for Small and Medium Commercial and Industrial Customers**

For: El Paso Electric

For El Paso Electric, ADM provided energy audit services to its small- and medium-size commercial and industrial customers. We conducted energy audits for approximately 250 small C&I customers and for approximately 75 medium C&I customers. The audit services included collecting data on-site, preparing an analysis of energy use and potential energy efficiency measures (using our *CPA 123* model), and preparing an audit report for each customer audited.

VII.B DESCRIPTION OF EXPERIENCE FOR KEY PERSONNEL

Our staffing structure for the Beverage Vending Machines Energy Savings Program was presented in Section II.F. Descriptions of the experience of the key personnel for the program are provided in this section.

Taghi Alereza, P.E., who is President of ADM, will be the Principal-in-Charge of the work. Mr. Alereza is a nationally recognized expert in building energy simulation and modeling. He has pioneered the development of several state-of-the-art simulation procedures and models. Mr. Alereza has led ADM's effort to develop and implement two statewide residential programs during the 1998 program year. He conceived and developed the "Residential Duct Efficiency Program," which was implemented in the service territories of Pacific Gas and Electric, Southern California Edison, Southern California Gas and San Diego Gas and Electric. Mr. Alereza also conceived the Local Energy Assistance Program (LEAP), which was implemented in the PG&E, SCE and SCG service areas. This program provided extensive training to developer/builders, local government staff and elected officials. He has directed program design and implementation including

- "Upstream High Efficiency Residential Water Heater Program" - implemented for Southern California Gas Co.
- "Refrigerated Vending Machine Cycling Program" - designed and implemented for Southern California Edison Co.
- "Performance Assurance Project" - designed and implemented simplified building commissioning project for Southern California Edison Co. and San Diego Gas and Electric Co.
- "Mobile Energy Clinic" – designed and implemented for Southern California Gas Co.
- "Lodging Industry Education And Audit Program" – designed and implemented for Southern California Gas Co.

Mr. Alereza holds a Bachelor of Mechanical Engineering degree from Auburn University and has completed an MS and the coursework for D.Sc. in mechanical engineering from the George Washington University. He is a member and past chairman of ASHRAE Technical Committee 9.6 (Energy Utilization), which is responsible for developing and applying protocols for assessing energy use in buildings, and the cognizant TC for the ASHRAE Standard 90.2. He is a registered professional engineer in California.

Daniel Mort, is the Manager of Monitoring, and a Senior Associate at ADM. He was the program manager of ADM's Vending Machine Controllers program, conducted for SCE. Under this program, several thousand vending machine controls were installed. Mr. Mort has been directing end-use metering projects conducted for San Diego Gas and Electric, Southern California Edison, Portland General Electric Co., Entergy Services, the New York State Energy Research and Development Authority, and the Texas Engineering

Experiment Station. He has been responsible for supervision and development of metering plans, data verification, and monitoring equipment diagnostics for monitoring in over 500 buildings throughout the U.S. Examples of projects that Mr. Mort has participated in include:

- He completed an evaluation of the baseline energy use of refrigerators replaced by ARCA, under a program funded by the California Public Utilities Commission.
- Directed the evaluation of the Variable-Speed Motors Program for Northern States Power Co. This effort included end-use monitoring of the HVAC supply fan systems, and industrial applications of VSD controllers.
- He has been directing the end-use monitoring effort of refrigeration systems for Southern California Edison Co. for the past five years. This project provides very valuable information on the operation and energy use of refrigeration systems in grocery facilities.
- He directed and participated in audits and end-use monitoring of non-residential buildings for Entergy Services Co. in four states, for a period of three years.

Mr. Mort received a B.S. in physics from California State University, Sacramento.

Dr. Donald Dohrmann is a Principal of ADM Associates and Director of Economic Studies. He will be responsible for market analysis and measurement, evaluation, and verification for the program. Dr. Dohrmann has technical expertise in economics, survey design, and statistical analysis. He has developed and applied analytical methodologies for evaluating DSM programs, including evaluations of Portland General Electric's commercial new construction programs, Northern States Power's high efficiency motors and adjustable speed drives programs, Pacific Gas and Electric's Commercial New Construction Program and its Nonresidential Energy Management Services Programs. He has been responsible for designing the statistical sampling plans for surveys of residential, commercial and industrial firms that ADM has conducted for various companies, including Pacific Gas and Electric Company, Southern California Edison Company, the Bonneville Power Administration, Florida Power and Light, B.C. Hydro, Kansas City Power and Light, El Paso Electric, Southern California Edison Co., the Sacramento Municipal Utility District, San Diego Gas and Electric Co., and many other utilities. Dr. Dohrmann received his B. S. in economics from Iowa State University and his M. A. and Ph. D. in economics from Yale University.

Mugimin Lukito is a Mechanical Engineer with ADM Associates, Inc. His responsibilities include site surveys, building energy end-use analysis, technical evaluation of energy conservation retrofits in commercial and industrial applications, and coordination of surveys for energy efficiency programs. Mr. Lukito is currently working on the retro-commissioning of the Arco Arena and Sacramento Airport Terminal A, sponsored by

Sacramento Municipal Utility (SMUD). He is was responsible for coordinating surveys for the Residential Contractor Program (RCP) evaluation sponsored by PG&E, SDG&E and SCE. Prior to joining ADM, Mr. Lukito was working as a Graduate Assistant (GA) for the University of Notre Dame Industrial Assessment Center (NDIAC) while completing his post-graduate studies. The primary goal of this program sponsored by the U.S. Department of Energy was to provide free energy, waste and productivity assessment for small to medium size local manufacturing companies. In this capacity, he was responsible for coordinating site visits, managing ongoing projects and training new staff. During his tenure at the NDIAC, he participated in more than 60 energy audits. He has also written numerous technical reports related to these assessments. Mr. Lukito earned a B.S. and M.S. in Mechanical Engineering from the University of Notre Dame.

Khoi Tran is a field Engineer at ADM Associates, Inc. His responsibilities include site surveys, building energy end-use analysis, technical evaluation of energy conservation retrofits in commercial and industrial applications, and preparation of energy audit reports. Mr. Tran is currently working on the Mobile Energy Clinic Program. The Mobile Energy Clinic is a program that is focused on improving energy efficiency for small businesses by implementing low-cost/no-cost measures, providing diagnostics of energy using equipment, and identifying cost intensive energy efficiency measures. This program is funded by California Public Utilities Commission and administrated by Southern California Edison Company. Under Southern California Edison's Vending Machine Cycling program, Mr. Tran has been responsible for installing controllers on vending and beverage machines located in commercial facilities throughout Southern California region. Mr. Tran received a Bachelor of Science degree in Mechanical Engineering from University of California, Long Beach.

Richard Burkhart serves as the Senior Technical Editor and desktop publisher at ADM Associates, Inc. As technical editor, his responsibilities include copy-editing, graphic design and production for documentation, marketing materials, survey questionnaires, and web page layout and design for ADM projects. He is responsible for the production of a quarterly newsletter and accompanying website for the Southern California Gas Co. *Lodging Industry Education Program*. He was in charge of designing and publishing marketing materials for the Duct Efficiency Training Program, Upstream High-Efficiency Gas Water Heater program and several other energy efficiency marketing programs performed for California utilities. He was responsible for the production of a series of Commercial / Industrial site audit reports for Entergy Services, Inc. For Kansas City Power and Light Co. he developed automated templates using the data linking functions in Microsoft Word and Excel to generate site reports, and was responsible for final copyediting and cleanup of the reports. He has also performed similar work for projects for Southern California Edison Co. He is well versed in the advanced techniques for a wide variety of production software packages and web page design software, under multiple operating systems. Prior to joining ADM, he worked as a freelance editing assistant,

performing editing, graphic production and page layout for a series of operating manuals for computerized production equipment. Mr. Burkhart earned his B.A. degree in Communications from California State University, Fullerton.

VIII. BUDGET

Our summary budget table for implementing the Beverage Vending Machines Energy Savings Program in PG&E's service territory is detailed in Table VIII-1.

*Table VIII-1. Budget Summary
for Beverage Vending Machines Energy Savings Program
in PG&E Service Territory*

<i>Budget Item</i>	<i>Amount</i>
Administrative Budget	\$75,364
Marketing Budget	\$5,636
Direct Implementation Budget	\$307,800
EM&V Budget	\$16,200
Other Budget	\$28,350
Budget Total	\$433,350