

Title:

PUBLIC SWIMMING POOL PUMP ENERGY EFFICIENCY 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:

Public Swimming Pool Pump Energy Efficiency Program
For SCE Service Territory

Lodging Industry Energy Efficiency Program
for SCE Service Territory

Lodging Industry Energy Efficiency Program
for PG&E Service Territory

Lodging Industry Energy Efficiency Program
For SoCalGas Service Territory

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I. PROGRAM OVERVIEW

I.A PROGRAM CONCEPT

AEV, Inc. (AEV) proposes to implement a Public Swimming Pool Pump Energy Efficiency Program as a Local Non-Utility Nonresidential Energy Efficiency Program in PG&E's service territory for Program Years 2004 and 2005. We are proposing to directly install variable frequency drives on the pool filtration pumps of 100 public swimming pools in PG&E's service territory.

I.B PROGRAM RATIONALE

We are proposing the Public Swimming Pool Pump Energy Efficiency Program as a hardware direct install program in the service territory of PG&E.

The rationale underlying our proposed Public Swimming Pool Pump Energy Efficiency Program is that the amount of electricity used for pool pumping can be reduced significantly by installing variable frequency drives on public pool pumps to reduce the flow rate for a pool filtration system. That is, at public facilities with swimming pools (e.g., schools, colleges, municipalities, etc.), it is often standard practice to run the pumps for the pool filtration system continuously even when the pool is not in use. This results in considerable use of electricity. For example, a survey of schools in Florida showed that "schools with swimming pools showed a 16% greater relative energy use than those without them; schools with heated pools showed a 20% increase." Thus, the major reason for increased energy use comes not from heating the pool but from pool pumping.

Because swimming pools in public facilities are generally not open 24 hours a day, there is room to reduce the flow rate of the filtration system pump during those hours when the pool is not in use and thereby reduce the use of energy. As will be shown in Section IV.A, electricity use for pool pumping can be reduced by between 20% and 30% when a variable frequency drive is installed on the pool pump motor.

I.C PROGRAM OBJECTIVES

The performance goal for the Public Swimming Pool Pump Energy Efficiency Program is to install variable frequency drives on pool pump motors at 100 public swimming pools in the service territory of PG&E. Table I-1 provides summary information on the objectives for the proposed Public Swimming Pool Pump Energy Efficiency Program.

Table I-1. Proposal Summary for Public Swimming Pool Pump Energy Efficiency Program

Program Name	Public Swimming Pool Pump Energy Efficiency Program
Utility Service Territory	PG&E
Program Type	Direct Install
Target Sector	Schools and Commercial
NR Customer Size	Very small and small
Performance Target	Install VFDs on pump motors at 100 public swimming pools
Annual kWh Savings Target	1,819,120
Annual Peak kW Reduction Target	N/A
Annual Therm Savings Target	N/A
Total Program Budget	\$560,340
TRC	2.75
PT	12.34

Because of the savings that it provides, the Public Swimming Pool Pump Energy Efficiency Program can contribute to reducing the budgetary burden that schools and other public entities face in operating and maintaining their public swimming pools.

II. PROGRAM PROCESS

II.A PROGRAM IMPLEMENTATION

Implementing the Public Swimming Pool Pump Energy Efficiency Program involves (1) identifying public facilities with swimming pools, (2) recruiting those pools that are good candidates for achieving savings through modifications to their swimming pool pumps, and (3) actually installing the variable frequency drives at the pools of participating facilities. Our marketing plan for achieving the first step is described in Section II.B. Our approach to the other two steps is discussed in this section.

As described in Section II.B., we use on-site visits as the major means to recruit 100 facilities with swimming pools to participate in the program. The original visit to a facility is used to develop the correct application for a variable frequency drive. To determine whether a pool is a good candidate, we collect and examine several types of data.

- We look at the size of the pool pump (as rated in GPM), access to the pump and its associated motor control center, and motor voltage and phase. Generally, only pools with pump motors of 5 or more horsepower will be considered for participation in the program.
- We determine whether a sand filtration system is being used; this is the only type of filtration system that will be allowed for the program. We look at the filter for the required flow rate in GPM and check the flow meter to assess the correct flow rate.
- We determine the size, type and required flow rate of the boiler used to heat a pool.
- Finally we determine the operating schedule of the pool, which we use in programming the VFD.

If examination of these various data shows that the variable frequency drive can be appropriately installed, we obtain a signed installation agreement from the facility that operates the pool.

After obtaining the signed agreement, we undertake the installation of the variable frequency drive on the pool pump motor.

- We acquire the components that are needed for the particular application.
- After we receive the components, we assemble them in an appropriate size and type of electrical enclosure for installation at the pool site.
- If the pool is located in a county where a permit is required for the installation, we obtain any required permits.

We schedule the day and time for installation of the variable frequency drive and attendant equipment in consultation with the pool's operating staff. We install the equipment on the

scheduled day and time. We also document the installation effort. This includes recording the following items of information:

- Facility name;
- Facility address;
- Facility contact person and phone number(s);
- Personnel installing VFD;
- Date on which work was performed,
- Characteristics of pool and equipment (e.g., dimensions, capacity in gallons, required flow rate);
- Characteristics of VFD installed;
- Characteristics of motor VFD was installed on;
- Schedule of operation for VFD; and
- Before and after flow rates.

After we complete the installation, we provide training to allow facility personnel to learn the proper operation of the new equipment. We also remain available for follow-up training or servicing.

II.B MARKETING PLAN

Public facilities with swimming pools are the target market for the Public Swimming Pool Pump Energy Efficiency Program. We identify such facilities using lists that we have compiled from previous work and from industry and utility sources. For example, ADM Associates (our subcontractor for this program) has been a subcontractor to the State and Consumer Services Agency during 2003 to implement the School Energy Efficiency Program in the central valley and have compiled a complete listing of schools in the area. Indeed, they have already developed working relationships with 45 school districts that are participating in the SEE program and that would welcome the installation of energy saving equipment.

We will conduct marketing and outreach to recruit 100 public facilities in PG&E's service territory to participate in the SEE Program. We will use a combination of creative and comprehensive strategies to reach administrators to bring the Program to their attention and to encourage them to sign up. Reaching administrators with messages about energy efficiency is notoriously difficult. Public agencies are eager to save money on energy costs, but often lack the management time and attention to respond to any focus that doesn't answer their pressing concerns.

We will begin our marketing by sending marketing materials to public facilities with swimming pools throughout PG&E's service territory, describing the program and how the facility can use it. However, the heart of our marketing effort will involve individual contacts with facility staff. We follow-up on the mailing of marketing materials by making telephone calls to the facilities. School districts and other public facilities generally have a director of maintenance and operation. With budgets being cut because of California's financial difficulties, they are looking for ways to lower energy use and are therefore should be excellent contacts.

We use these telephone calls to gauge initial interest. For those facilities that express interest in participating in the program, we schedule an appointment to meet with a decision-maker at the facility at a time convenient to that person. We use these on-site visits as the major means to recruit 100 facilities with swimming pools to participate in the program.

II.C CUSTOMER ENROLLMENT

For each public facility that agrees to participate in the Program, we will develop a Facility Participation Plan. While not legally binding, this plan will spell out mutual responsibilities and services and will provide a common ground of understanding for the installation of a variable frequency drive on the pool filtration pump for the facility's swimming pool.

II.D MATERIALS

Through the Public Swimming Pool Pump Energy Efficiency Program, we install variable frequency drives on the pool pump motors at the pools participating in the program. The specifications for the VFDs and the procedures used to procure them are as follows.

The VFDs that we install have the following specifications:

- Shall operate between 200 and 500 volts three phase, and 208-230 single-phase power;
- Torque will be variable over entire range of operation, from 60Hz to 5Hz;
- Speed shall be infinitely variable over entire range of operation;
- Unit shall be listed by an appropriate testing authority such as Underwriters Laboratories;
- Unit shall come equipped with a NEMA one enclosure;
- Unit shall operate from 35 degrees to 110 degrees Fahrenheit; and
- Unit shall be the current model offered by the manufacturer.

The VFDs will also come with a programmable logic controller that meets the following specifications:

- Units input voltage shall operate between 90 volts and 130 volts single phase;

- Unit shall have a minimum of 4 form C contacts rated at 1 ampere, 24VDC;
- Unit shall have a “real time” module to allow time shifting;
- Unit shall come with an integral keyboard for programming on site; and
- Unit shall come with a LCD for visual confirmation of data entry.

We procure this equipment by soliciting bids from prospective suppliers. Candidate suppliers of the VFDs and programmable logic controllers include the following vendors:

- Graybar Electric
- Consolidated Electrical
- Nunn-Royale Electrical
- Controlco
- Abco Wholesale
- Servitech Controls

II.E PAYMENT OF INCENTIVES

We have designed the Public Swimming Pool Pump Energy Efficiency Program to be a direct install program whereby the variable frequency drives are installed at no cost to the facility. No incentives are paid.

II.F STAFF AND SUBCONTRACTOR RESPONSIBILITIES

Our staffing structure and responsibilities for the Public Swimming Pool Pump Energy Efficiency 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>
Meir Ezer	President - AEV, Inc.	Administrative / Technical Advisor	10%
Ivan Varadi	Vice President - AEV, Inc.	Project manager - day to day project supervision	15%
Oscar Krausz	Electrical Engineer - AEV, Inc.	Sizing and selection of Variable Frequency Drives	50%
Muhammad Mueen	Electrical Engineer - AEV, Inc.	Electrical Engineering	30%
Van Nguyen	Engineer – AEV, Inc.	Field engineer	50%
Lon Smith	Senior Associate - ADM Associates, Inc.	Marketing and recruitment	10%
Dan Mort	Senior Associate - ADM Associates, Inc.	Field supervisor	10%

II.G WORK PLAN AND TIMELINE FOR PROGRAM IMPLEMENTATION

Our proposed timeline for implementing the Public Swimming Pool Pump Energy Efficiency Program in PG&E’s service territory is shown in Table II-1. This timeline is for a program covering PY 2004 and PY 2005.

*Table II-1. Timeline for Implementing
Public Swimming Pool Pump Energy Efficiency 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

Public swimming pools within PG&E's service territory represent the target market for the Public Swimming Pool Pump Energy Efficiency Program. Public pools include college/university, school, community, and municipal pools. A study by Lawson, Jones and Martin¹ (LJM) estimated that there were 4,205 outdoor heated public pools and 12,616 indoor heated public pools in California in 1995. While these data do not break down the number of public pools in PG&E's service territory, they do imply that there will be a sufficient number of public swimming pools in PG&E's service territory to allow reaching the target for program participation of 100 public facilities with swimming pools.

Within the educational sector, we expect that colleges/universities and high schools are the types of facilities that are the most likely to have swimming pools. There are over 100 college/university campuses in California area that are sufficiently large to have pools. There are about 870 public high schools in California, but not all of these high schools will have swimming pools.

III.B CUSTOMER ELIGIBILITY

Public facilities with swimming pools will be eligible for the program, providing that the following conditions are satisfied.

- The motor for the pool filtration pump must be 5 horsepower or greater.
- The filtration system must use sand filters.

III.C CUSTOMER COMPLAINT RESOLUTION

To allow for questions or complaints, we establish a toll-free ("800") telephone line that can be accessed by in PG&E's service territory, by plumbers, and by the public. Facilities can use this line to request information about the program or to place a complaint. The same 800-number can also be used to request information or lodge complaints. 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.

¹ Lawson, B.; Jones, R.; and Martin, R., "Annual Energy Consumption of Heated Pools in the United States" in *Vision 2001: energy & environmental engineering* (compiled and edited by J. Flanagan), Fairmont Press, 1996.

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 are proposing to implement the Public Swimming Pool Pump Energy Efficiency Program throughout PG&E's service territory.

IV. MEASURE AND ACTIVITY DESCRIPTIONS

IV.A ENERGY SAVINGS ASSUMPTIONS

Installing a variable frequency drive on a pool filtration pump motor is not a standardized measure that is available in the DEER database. Accordingly, we describe the rationale for electric energy savings from this measure here. Because of the nature of the measure, it does not reduce coincident peak demand, nor does it provide gas energy savings.

The savings achieved at a given pool by installing a variable frequency drive on the pool pump motor will depend on the reduction in the flow rate and the number of hours over which the flow rate can be reduced. As an example to illustrate the savings that can be achieved, consider a pool that is operated year-round but is only in use for 16 hours a day. Many pools now use a flow rate that results in a 6-hour turnover of the water in the pool. Assume that this flow rate can be reduced during hours the pool is not in use such that there is a 8-hour turnover. The power required for the motor running the pump for a pool recirculation system is proportional to the cube of the flow rate. Reducing the flow rate by 25% therefore reduces the power required by half. Thus, suppose that the motor currently installed is 10-hp. By installing a variable frequency drive on this motor that reduces the motor's speed during those hours when the pool is not open, we estimate that the kWh savings are approximately 20,000 kWh per year. The savings would of course be higher for pools where the flow rate can be reduced more than one-fourth or the hours during which the flow rate can be reduced are greater.

Actual evidence of the savings that can be achieved by installing a variable frequency drive on a pool pump is provided by a case study performed at Jesuit High School in Sacramento, California. The pool at Jesuit High School is approximately 5,000 square feet in size and holds about 350,000 gallons of water. The pool is equipped with a 15 HP water circulation pump that is connected to the filtration system and to a boiler for water heating. The pool filtration system utilizes high-rate sand filters for water purification. Under pre-retrofit conditions, the circulation pump ran continuously all the time regardless of whether or not pool was being used.

The case study research effort at the Jesuit High School swimming pool involved installing a variable frequency drive on the existing 15 HP water circulation pump motor at the pool. A programmable logical controller (plc) module was also installed to provide the capability for varying the frequency rates at different times. The plc was used to run the pump at a higher speed during daytime when the pool was being used and at a lower speed at night when pool was not being used. The pool is normally used between the hours of 6 AM and 8 PM every day. However, in programming the plc to run the pump at two different speeds, an additional hour was added to both open and close times to be on the safe side. Therefore, the controller was programmed to run the pump at higher speed from 5 AM to 9 PM and at lower speed otherwise.

The average electric load (in kW) for pump operation was determined through monitoring. The average load for the pump without the VFD was found to be 14 kW, and a weighted average load for the pump with the VFD running at a mix of low and high speeds was found to be 9.8 kW. The annual electricity savings resulting from installation of the VFD were estimated to be about 37,000 kWh. (Data for this calculation are shown in Table IV-1.) Thus, this analysis showed that using a variable frequency drive to reduce flow resulted in considerable energy savings.

Table IV-1. Estimated Annual kWh Savings for Jesuit High School Pool Test Site

Location	Baseline Operation	New Operation	Savings
	<i>Annual Usage (kWh)</i>	<i>Annual Usage (kWh)</i>	<i>Annual kWh Savings</i>
Jesuit HS Pool	123,000	86,000	37,000

To the extent that a pool pump motor is oversized, there can be additional savings even during hours when the pool is use. That is, the oversizing of the pump motor may result in a turnover rate that is faster than required by code. Using the variable frequency drive can then reduce the motor speed and reduce the flow rate, albeit while still maintaining the flow rate within the code requirements.

Although engineering calculations show that it is reasonable to reduce the flow rate below the design flow rate, making this energy saving change also requires taking consideration of water quality and health problems. In installing variable frequency drives on pool filtration pump motors, we ensure that the health standards for public swimming pools are met. The standards we follow are those specified in the following sections of the California Code of Regulations.

- Standards for pool maintenance and operation are contained in Title 22, Chapter 20, Public Swimming Pools. These standards pertain to required flow rates and water quality for public swimming pools.
- Standards that apply to the construction, installation, alteration, addition, relocation, replacement or use of any public swimming pool and to its appurtenant auxiliary areas and facilities and to its mechanical equipment and related piping are found in Title 24, Chapter 31B.

IV.B DEVIATIONS IN STANDARD COST-EFFECTIVENESS VALUES

For the cost-effectiveness analysis, we have used the data for net-to-gross ratio and estimated useful life that are reported for variable frequency drives in the Energy Efficiency Policy Manual and the CEC's DEER database.

IV.C REBATE AMOUNTS

We have designed the Public Swimming Pool Pump Energy Efficiency Program to be a direct install program whereby the variables frequency drives are installed at no cost to the facility.

IV.D ACTIVITIES DESCRIPTIONS

The Program does not include any activities that are not expected to produce measurable energy savings.

V. GOALS

The program performance goal for the Public Swimming Pool Pump Energy Efficiency Program is to directly install variable frequency drives on pool filtration pump motors at 100 public facilities with swimming pools in PG&E's service territory. The target numbers by program year and the expected annual energy savings are shown in Table V-1.

Table V-1. Target Numbers of Public Facilities with Swimming Pools in PG&E Service Territory at Which to Install VFDs on Pool Pump Motors

<i>Program Year</i>	<i>Number</i>	<i>Expected Savings (kWh)</i>
PY 2004	40	727,600
PY 2005	60	1,091,520
Total	100	1,819,120

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 Public Swimming Pool Pump Energy Efficiency Program and to reporting on program progress.

ADM will contract with an independent third party who is not affiliated with ADM to evaluate the Public Swimming Pool Pump Energy Efficiency 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.

We use our program tracking system to identify the facilities who participate in the program. We also use the tracking system to collect information about the characteristics of the pools where the VFDs are installed (e.g., pool size, pump motor characteristics, VFD characteristics) that can be used to calculate and assess the energy savings that can be attributed to the program.

At the end of the program, we provide the data in the tracking system to the independent EM&V contractor to use in preparing the evaluation of the program's effects. This evaluation will include information about all activities undertaken as part of the program, including the number of water heaters that were incented.

VI.B POTENTIAL EM&V CONTRACTORS

Potential EM&V contractors for the Public Swimming Pool Pump Energy Efficiency 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 Public Swimming Pool Pump Energy Efficiency Program.

VII. DESCRIPTION OF QUALIFICATIONS

This section provides information on the qualifications of AEV, Inc. (prime implementor), ADM Associates (subcontractor) and of the personnel who will be the staff for the Public Swimming Pool Pump Energy Efficiency Program.

VII.A QUALIFICATIONS OF AEV, INC. (PRIME IMPLEMENTOR)

AEV Associates, Inc. (AEV) is a consulting engineering firm with over 45 years of experience in the design of building Mechanical & Electrical systems. We enjoy a national reputation as an organization of highly-trained professional engineers that take pride in providing innovative and cost effective designs, using the latest engineering knowledge and analytical tools. The firm has provided engineering services for over 2,000 projects with a construction cost of over one billion dollars.

Our goal is to design the systems within the construction budgets of our clients utilizing the unique mix of qualifications of our staff. Our philosophy in conducting business is: (1) Dedication to serving our clients needs, (2) Sound business management, (3) State of the art energy efficient design of systems, (4) Reduced construction costs by creative use of our extensive experience, and (5) utilized state funds to enhance our design at no cost to the client.

AEV operates under the leadership of Meir Ezer, P.E. as President and Director of Engineering. The Plumbing & Fire Protection Division is headed by Ivan Varadi, C.I.P.E., Vice President. AEV offers services in master planning, feasibility studies, preliminary design, preparation of construction documents, cost estimating, construction administration and building commissioning service. Specific specialties include: (1) the design of heating, ventilating, and air-conditioning (HVAC) systems, central heating/cooling plants, and (2) plumbing, sanitation process piping and fire protection sprinkler systems. AEV provides complete architecture and engineering services when the mechanical disciplines are the major component of the project.

AEV also provides research and energy related studies of buildings. AEV has resources available to conduct studies requiring computer simulations and analysis, and monitoring and evaluation of energy systems. AEV provides comprehensive design evaluations of alternative energy systems, and utilization of Utility and state funds for incorporation of energy efficiency into the design of building systems.

The following tables summarize recent projects performed by AEV, Inc.

OFFICE BUILDINGS

150 Almaden - San Jose	15 story, 600 Tons
1901 Avenue of the Stars - L.A.	20 story, 480,000 SF
Atlantic Pacific - L.A.	30 story, 500,000 SF
California Bank - Beverly Hills	12 story
Cannon Films Office Bldg. - L.A	35,000 SF
Evans Product Building - Portland, OR	18 story, 1800 Tons
Financial Plaza of Pacific - Honolulu-HI	3 Bldgs, 7, 12, & 21 story
First National Bank of Oregon - Portland, OR	40 story, 841,000 SF
Glendale Federal - Beverly Hills	11 story HVAC renovation
Kaiser Permanente Medical Center - L.A	Remodel 3 story, 36,000 SF
Las Vegas office building - Las Vegas, NV	2 story, 37,000 SF
One Wilshire - L.A.	30 story, 670,000 SF
Pacific Gateway II - L.A	10 story, 520 Tons
Rox-San - Beverly Hills	10 story, HVAC renovation
Screen Actors Guild - Burbank	8 story, 410 Tons
Sherman Terrace - L.A.	5 story, 62,000 SF, 130 Tons
The City - Orange	18 story, 400,000 SF
Wilshire Fairfax - L.A.	16 story, 620 Tons

COMMERCIAL CENTERS

Broadway Plaza - L.A.	Shopping Mall; 500 Room, 23 story Hotel; 32 story office, 723,000 SF
Broadway Department Stores	16 locations each 160,000 SF
Culver Studios Parking - Culver City	3 Level underground, 150,000 SF

HOTELS

Beverly Hills Hotel - Beverly Hills	Master Plan & Remodel 300 rooms Addition 150 Room, 4 story
Four Seasons - Newport Beach	19 story, 600 Tons
Harrah's Lake Tahoe - Lake Tahoe, NV	Hotel & Casino 12 story
Hyatt Regency - Phoenix, AZ	735 Room, 14 story, 600,000 SF
Hyatt Regency - Dearborn, MI	700 Room, 14 story
La Mirada Holiday Inn - La Mirada	8 story
MARINA Beach Hotel - Marina del Rey	9 story
Marina Plaza Hotel - Marina del Rey	9 story
Ritz Carlton - Laguna Niguel	440 room, 4 story

Riviera - Las Vegas, NV	Addition & Remodel
Sahara Reno - Reno, NV	Addition 200 Room, 2 story Hotel & Casino

RESIDENTIAL

Century Park Apartments - L.A.	480 Apartment, 20 story
Elysian Apartments - Long Beach	200 Apartment, 13 story
Grand Promenade - L.A.	406 Apartment, 25 story
Merv Griffin Residence - L.A.	Office conversion to residential 3 story, 40,000 SF
Skyline Phase II - L.A.	250 Apartment, 14 story
Sunset Heights - L.A.	200 Apartment, 13 story
The Corinthian - L.A.	18 story
The Diplomat, L.A.	18 story, 177,000 SF
The Evian - L.A.	34 story
Western Addition - San Francisco	200 Apartment, 15 story

HOSPITALS

Beekman Hospital - New York, NY	8 story, 1,800 Tons
Camarillo State Hospital - Camarillo	Remodel 5 wards
Cedars-Sinai Medical Center - L.A	Remodel Outpatient Imaging - 12,600 SF Addition Emergency Dept., 23,000 SF Remodel Emergency Facilities, 33,000 SF
Duke University Medical Center - Durham, NC	2 Bldgs 5 & 8 story, 780,000 SF
Estelle Doheny Eye Hospital - L.A.	Addition, 4 story, 43,200 SF over 2 existing stories & garage
Hawthorne Community Hospital - Hawthorne	Addition, 80 Beds
Hoag Memorial Hospital - Newport Beach	MRI Facility, 5,000 SF
Inter-Community Medical Center - Covina	Off Hour CHW System, 20 Tons HVAC Evaluation, 1,590 Tons
Jewish Home for the Aged - Reseda	99 bed, 3 story
La Mirada Hospital - La Mirada	200 Bed
Martin Luther King Medical Center - L.A.	Remodel Neonatal Intensive Care
Methodist Hospital - Arcadia	3 story
Metropolitan State Hospital - East	Remodel 3 story, 200,000 SF

Norwalk Metropolitan State Hospital - West	Remodel, 3 story
Norwalk Rancho Los Amigos Medical Center - Downey	Patient Support, 3 story, 176,000 SF
Santa Ana Community Hospital - Santa Ana	Addition, 40 Beds
Santa Ana Medical Center - Santa Ana	9,000 SF Addition
Sherman Oaks Community Hospital - Sherman Oaks	3 story, Burn center
Sierra View District Hospital - Porterville	Patient tower 6 story, 85,000 SF
	Addition/Remodel, ER & utilities Remodel ETO sterilizer
Temple Hospital - L.A.	Remodel, 3 story
Timken-Surges Research Lab - La Jolla	Addition, 50,000 SF
University of Wisconsin Medical Center - Madison, WI	2,600,000 SF
Veterans Administration Hospital - Long Beach	Remodel, 3 story
Veterans Administration Hospital - Loma Linda	500 Bed, 640,000 SF
Veterans Administration Hospital - WLA	Addition & Remodel 15,000 SF Replace emergency generator cooling tower

UNIVERSITIES & COLLEGES	
California State University - Fullerton	Auditorium/Fine Arts, 1,200 Seats 92,000 SF
	Audio Visual Center & Library 7 story, 210,000 SF
California State University - Long Beach	Engineering & Computer Science, 6 story with ice storage
California State University - L.A.	Remodel Biological Science, 3 story 15,000 SF
	Library 5 story, 280,000 SF
California State University - Pomona	Music building, 2 story, 26,000 SF
California State University - San Bernardino	Central CHW Plant, 3,200 Ton additions, 1,100,000 gal. TES
	University Hall, 5 story, 135,000 SF
	Campus DOC Energy Management System
	Energy Improvement HTHW

California State University - San Jose	System & CHW distribution
	Engineering & Computer Science,
	4 story addition 171,000 SF
	3 story remodel 153,000 SF
Occidental College - L.A	Central Heating Plant Renovation
Stanford University - Palo Alto	Library 5 story, 330,000 SF
	Dorm Heating Plant
University of California - L.A.	Arts Complex: 1200 & 200 seat
	theaters, support area & art gallery
	Remodel SEAS Boelter Hall, 7
	story, 61,500 SF
	Remodel Ueberoth Bldg
	Library 260,000 SF; Biology
	150,000 SF
	Remodel Faculty Center, 18,000
	SF
	Remodel Murphy Hall-residence
	Hospital Telecommunication
	Center
University of California - San Diego	Fine Arts 91,000 SF
University of California - Santa Barbara	Engineering 5 story 180,000 SF
	Drama 400 Seats
	Office 68,000 SF
	Residence Halls, 1400 units
University of Hawaii - Honolulu, HI	Library 4 story, 107,00 SF

JUNIOR/MIDDLE, HIGH SCHOOLS

LAUSD

Bancroft Junior High

Belmont High

Hale Middle

Washington High

Westchester High

Air Conditioning Addition

Air Conditioning Upgrade

Reconstruction

Culver City High - Culver City

Addition

Lompoc High - Lompoc

North High - Santa Maria

Quartz Hill High - Lancaster

South High - Torrance

Gymnasium

Torrance High - Torrance

Administration Building

New Heating Facilities

ELEMENTARY SCHOOLS

LAUSD

Arlington	
Berendo	
Cahuenga	Bond Repair/Reconstruction
Canoga Park	
Castelar	Bond Repair/Reconstruction
Cienega	
Darby	Air Conditioning Addition
Herrick Street	
Justice Street	
Langdon Avenue	
Osceola Street	
San Pedro	
Sherman Oaks	Air Conditioning Addition
Sierra Park	
Superior Street	
Trinity	
Woodcrest	Reconstruction
Woodland Hills	Air Conditioning Addition
Horace Mann - Beverly Hills	
Madison - Torrance	

PRIVATE SCHOOLS

Art Center - L.A	
Campbell Hall - North Hollywood	
Hillel Hebrew Academy - Beverly Hills	3 story and subterranean parking
McKinley Home for Boys - San Dimas	
School of the Handicapped - L.A	

THEATERS & ENTERTAINMENT CENTERS

Beaver Creek Center of the Arts-Beaver Creek, CO	519 seat Community Theater & Art gallery
California State University - Fullerton	Audio Visual Center & Library, 2 story, 210,000 SF
California State University - L.A	Full Stage Theater, 1,200 seats
California State University - Pomona	Music 2 story, 26,000 SF
Cannon Film Recording Studios - L.A	40,000 SF
Century City Entertainment Center - L.A	2 Theaters & Shopping Center
Compact Video Entertainment Center - L.A	7 story, 120,000 SF
Dance Gallery - L.A	Dance Complex, 77,000 SF 8,500

	SF
Edwards Film Theaters - Alhambra	
Edwards Film Theaters - La Verne	
Edwards Film Theaters - Mission Viejo	
Forum - Inglewood	Sports Arena, 17,500 seat
Hayashi Recording Studios - L.A	4,000 SF
Honolulu Municipal Stadium - Honolulu, HI	500 seats
Laemmle 7 Plex Cinema - Pasadena	
Mann Film Theaters - El Monte	
Mann Film Theaters - San Diego	
Twentieth Century Fox - L.A	Drama 400 seats & Office 68,000 SF
University of California - San Diego	Fine Arts, 91,000 SF
University of California - Santa Barbara	Remodel, 75,000 SF
Warner Brothers Studios - L.A.	2 story, 10,000 SF

MILITARY, INDUSTRIAL & SPECIAL PROJECTS

Air National Guard Facilities - Point Mugu	84,000 SF
Beckman Laser Institute, UCI - Irvine	140 Tons
Camp Pendleton	BEQ Mess Hall
Flight Simulator - El Toro	2 story, 250 Tons
General Motors - Van Nuys	Paint Facility, 6,000 Tons, 900,000 CFM
George Air Force Base - Victorville	Service Building
Long Beach-Los Angeles Rail Transit Shops (Blue Line)	Car Maintenance, 120,000 SF
L.A. County Museum - L.A.	Remodel & Addition
Marine Corps Airfield	Aircraft Training
Norton Air Force - Norton	4 story
Norwalk-El Segundo Rail Transit Shops (Green Line)	Car Maintenance
Point Mugu Naval Airfield - Point Mugu	Technical Building
Sarah Mellon Sciff Pavilion - Pittsburgh, PA	150,000 SF
Turf Paradise - Phoenix, AZ	Race Track

CORRECTIONAL FACILITIES

77th Street Regional Police Facility - L.A	Police & Jail 200 bed, 106,700 SF
Alhambra Police Facility - Alhambra	Police & Jail, 46 bed, 56,400 SF
Chuchawalla Valley State Prison - Riverside	Corrections to Thermal Fluid System
Contra Costa/West County Justice Ctr - Martinez	Detention Facility, 232,000 SF
Imperial County Prison - North	4,200 Ton Central CHW Plant & Propane Systems
Imperial County Prison - South	4,400 Ton Central CHW Plant Emergency Generator & Propane Systems
Los Angeles Reception Center - L.A	Detention Facility 1,450 bed, 520,000 SF

REHABILITATION & HVAC SYSTEM UPGRADES

Atlantic Richfield Plaza - L.A.	Office, two 52 story Towers
Beverly Hills Hotel - Beverly Hills	Energy Utilities Master Plan
Glendale Federal Building - Beverly Hills	Office, 10 story, 500 Tons
LACO South Central Social Services - L.A	Office, 2 story, 200 Tons
LACO Lincoln Heights Social Services - L.A	Office, 2 story, 120 Tons
Long Beach Water Department - Long Beach	Office, 4 story
Music Center/Mall Garages - L.A	Supply & Exhaust systems
Pacific Telephone Company - LA	Utility, 2 story
Rox-San Building - Beverly Hills	Office, 10 story, 160 Tons
State of California - Sacramento	Office, 4 story, 270,000 SF

SHOPPING CENTERS/RETAIL FACILITIES

Emporio Armani - Beverly Hills
Fontana Shopping Center - Fontana
Gardena Mall - Gardena
Giorgio Armani - Beverly Hills
Grand Terrace Shopping Center - Grand Terrace
Guess - Beverly Hills
Hemet Shopping Center - Hemet

Palmdale Shopping Center - Palmdale
 Redlands Shopping Center and Theaters
 - Redlands
 Riverside Shopping Center - Riverside
 Victorville Shopping Center - Victorville

RELIGIOUS INSTITUTIONS

Calvary Church of Pacific Palisades	Sanctuary & Classroom Complex, 100,000 SF
Church of Jesus Christ of the Latter Day Saints - Van Nuys	
Church of the Nazarine - Houston, TX	
Church of the Nazarine - Garden Grove	
Lutheran Church - Anaheim	
Maria Regina Korean Apostle Church - Torrance	
Self Realization Fellowship - Pacific Palisades	
Temple Beth Shalom - Whittier	
Temple Judea - Encino	

CENTRAL PLANTS

California State University - San Bernardino	3,200 ton refrigeration with 1,100,000 gallon CHW storage Campus DOC energy management system Campus energy improvement HTHW system & CHW distribution
Imperial County State Prison, North	4,200 ton refrigeration CHW plant distribution & propane system
Imperial County State Prison, South	4,400 ton refrigeration CHW plant & propane system
Occidental College - L.A	9800 MBH co-generator and boiler plant

STUDIES

9454 Wilshire Blvd. Office Building - L.A.	HVAC Master Plan
Alhambra Police Facility - Alhambra	Energy Efficient measures
California State University - San Bernardino	Chilled Water Master Plan

Four Seasons Hotel - Newport	Campus Energy Management Feasibility
Hillel Hebrew Academy - Beverly Hills	Thermal Storage
Intercommunity Medical Center - West Covina	HVAC Master Plan
Occidental College - LA	Evaluation of HVAC Systems
	Chilled Water Master Plan
	Steam Master Plan

RESTAURANTS

Camachos Restaurant - Universal City Walk
Depot Restaurant - Torrance
Gladstones - Universal City Walk
Health Research, ER Restaurant - Los Angeles
Perfectly Sweet - Alhambra
Rialto Cafe - Torrance
Suzuki Restaurant - Inglewood
Western Bagel - Burbank, Chatsworth, Granada Hills, Northridge
Wizard - Universal City Walk

Commissioning Projects	
Project Name / Location	Description of Commissioning Activities
Koss Wil Center	Chiller Test
1990 Ave. of the Stars	Garage Ventilation CO control system
MaMaison Hotel	AHU Variable Air Volume System
Cal Mart	Chiller system test
6500 Wilshire Blvd	AHU Variable Air Volume System
CBS - TES	Ice Storage system test.
6464 Sunset Blvd.	Chiller and VAV AH systems
Porter - Manufacturer	Chiller and VAV AH systems
Union Center	AHU Variable Air Volume System
USC	AHU System
660 South Figueroa	AHU Variable Air Volume System
Westwood GTY	AHU Variable Air Volume System
JCP Northridge	HVAC System, Chiller AHU & Pumps
JCP Canoga Park	Chiller system test
Eisenberg	Chiller system test
Warner Gaty	Air system test
Robinson May - Loral	Chiller system test

Robinson May - Eagle El-Capitan 77 th Street Police Facility Envest - GSA Holifield	Chiller system test Chiller and Ice Storage system test Complete HVAC test HVAC system, cooling tower, and CO Garage exhaust system
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VII.B QUALIFICATIONS OF ADM ASSOCIATES (SUBCONTRACTOR)

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. We have conducted programs to market energy efficiency services to small business firms for various clients, including the California Energy Extension Service, the Bonneville Power Administration, Entergy Services, Northern States Power, El Paso Electric, and Colorado Springs Public Utilities Department.

Our ability to inform owners/operators of small businesses about energy efficiency opportunities derives more generally from our hands-on experience in collecting and analyzing data on energy use for large numbers of commercial facilities.

- We have conducted energy audits on nearly 3,000 commercial and industrial facilities for such clients as Niagara Mohawk Power, Entergy Services, Northern States Power, El Paso Electric, Wisconsin Electric Power, Iowa Southern Utilities, Centerior Services Company, the Bonneville Power Administration. San Diego Gas and Electric, and Rochester Gas and Electric.
- We have conducted on-site surveys of nearly 10,000 commercial and industrial facilities for clients such as Entergy Services, Northern States Power, Union Electric, Central Illinois Public Service, Florida Power and Light, Alabama Power Company, El Paso Electric, the Bonneville Power Administration, Southern California Edison, Pacific Gas and Electric, the California Energy Commission, the Sacramento Municipal Utility District, San Diego Gas and Electric and other utility companies.

Following are brief descriptions of other projects where ADM has provided energy efficiency services.

- **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.

- **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.

- **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.C DESCRIPTION OF EXPERIENCE FOR KEY PERSONNEL

Our staffing structure for the Public Swimming Pool Pump Energy Efficiency Program was presented in Section II.F. Descriptions of the experience of the key personnel for the program are provided in this section.

Meir Ezer, P.E. is the President & Director of Engineering at AEV Associates, Inc. Mr. Ezer has extensive experience in various aspects of the design and construction supervision of building mechanical systems. Mr. Ezer has been in charge of mechanical design of new and rehabilitation of existing hospitals, medical centers, universities, hotels, casinos, office buildings, condominiums, shopping centers, recording studios, theaters, schools, indoor central bus terminal, and other buildings. The HVAC systems in the previous projects have included all types and sizes of equipment, conventional and highly specialized systems, and various types of solar heating systems. He is expert in the design, control and commissioning of large (over 4,000-ton) central cooling plants and over 3,000 Ton chiller plant with thermal energy storage (TES) systems. The commissioning projects have included the chiller system, the variable frequency drive for air handling units, the pumps & cooling tower, the Garage CO system, and direct digital control system. Some of the commissioning process uncovered improper operation of the variable frequency drives, numerous incorrect control settings and missing some of the control functions. Mr. Ezer received his B.S. in mechanical engineering from the Israeli Institute of Technology, Haifa, Israel. He has completed courses towards an M.S. in Mechanical Engineering from Columbia University, New York. He is a registered professional engineer in California, and Nevada, and a member of the American Society of Heating, Refrigerating, & Air Conditioning Engineers (ASHRAE).

Ivan Varadi is Vice President and Director of Plumbing and Fire Protection Engineering at AEV Associates, Inc. Mr. Varadi has over 28 years of experience in all aspects of the

design and construction supervision of mechanical, plumbing and fire protection systems for all types of buildings, including high-rise, office, industrial, commercial, institutional, hospitals, restaurants, residential complexes, hotels, movie theaters, and educational facilities. Before joining AEV, Mr. Varadi was a project engineer at Helfman/Haloossim and Associates (HHA), where his responsibilities included supervision of all mechanical, plumbing, fire protection and electrical engineering. Mr. Varadi received his B.S. in mechanical engineering from the College of Building Mechanical Engineering, Budapest, Hungary.

Oscar Krausz, P.E. is a Director of Electrical Engineering at AEV Associates, Inc. Mr. Krausz has over 20 years of experience in the design and construction supervision of electrical facilities for all types of buildings. His experience includes the design and analysis of electrical distribution, emergency power, lighting, fire alarm, security and building automation systems. His projects include office buildings, shopping centers, upscale retail stores, churches, schools, laboratories, hospitals, medical buildings, multi-residential units, manufacturing plants, industrial facilities, computer centers and high rise buildings. Mr. Krausz received his B.S. and M.S. in electrical engineering from Polytechnic Institute Romania. He is a registered professional engineer in California.

Dr. Muhammad Mueen, is a specialist in the design and application of Variable Frequency Drives (VFD) in commercial buildings. Dr. Mueen has been responsible for the design of electrical systems in multi-family housing and commercial facilities. He has been involved in several projects which incorporated the use of VFD controllers for fans and pumps. Dr. Mueen has conducted in-depth monitoring of the performance of high efficiency motors and VFDs at 100 sites. The savings for the application of VFDs have exceeded 50% of the baseline. Dr. Mueen received a B.Sc. in Electrical Power Engineering from the University of Engineering and Technology in Lahore, Pakistan. He earned his M.Sc and Ph.D. in Electrical Engineering from George Washington University.

Van Nguyen is a Junior Engineer with AEV Associates, Inc., assisting in the design of electrical and HVAC systems. He also provides field assistance and operates CAD systems. Mr. Nguyen received a Bachelor of Science degree in Electrical/Electronic Engineering from University of California, Irvine.

Lon Smith is a Senior Associate at ADM Associates, Inc., responsible for development and conducting training in the areas of HVAC systems. He has extensive experience in refrigeration, transport and control systems in residential, commercial and industrial buildings. During his previous employment of 20 years with United Refrigeration Inc., Honeywell Inc., and New England Sheet Metal Works, Inc., he has developed an exceptional understanding of not only the theoretical aspects of HVAC and refrigeration systems, but also he has mastered the practical side of these systems as well. In the past, he has provided consultation to HVAC designers, and has conducted training in refrigeration

and control systems. Mr. Smith was an instructor at the State Center College District. He taught classes in pneumatic, electrical and electronic controls for commercial, residential and industrial mechanical systems. He has also taught classes on refrigerant types and their application, refrigerant recovery and power distribution systems, and their application to power line carrier transmissions. Some of the projects that Mr. Smith has been responsible for include:

- For the Mobile Energy Clinic Program that ADM performed for Southern California Gas Company, he prepared field procedures and trained field staff.
- For the Upstream High Efficiency Water Heater Program that ADM performed for Southern California Gas Company, he was responsible for coordination of wholesalers, verification and payment.

Mr. Smith is a licensed Energy Auditor for the Environmental Protection Agency and the California Energy Commission. He earned his Bachelor of Arts in Communications from California State University Fresno.

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.

VIII. BUDGET

Our budget table for implementing the Public Swimming Pool Pump Energy Efficiency Program in PG&E's service territory is detailed in Table VIII-1.

*Table VIII-1. Budget Summary
for Public Swimming Pool Pump Energy Efficiency Program
in PG&E Service Territory*

<i>Budget Item</i>	<i>Amount</i>
Administrative Budget	\$94,737
Marketing Budget	\$50,000
Direct Implementation Budget	\$360,000
EM&V Budget	\$18,947
Other Budget	\$36,658
Budget Total	\$560,342