Demand Responsive Electric Energy And Demand Reduction

A Program Initiative

Submitted to:

California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102
Attn: Loretta Lynch

In response to:
Summer 2000 Energy Efficiency Initiative
Docket No. A99-09-040 et al.
Decision No. D00-07-17

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From:

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Demand Responsive Electricity Demand Reduction

In response to California Public Utilities Commissions' request for Initiative Programs to provide program options that will bring about the largest reductions in electrical demand and/or electrical usage reductions in the shortest period of time, EPRI is pleased to provide this Initiative Program.

This program is primarily aimed at avoiding or minimizing rolling blackouts when power supplies are unable to keep up with demand and electricity production costs are very high. This will reduce peak demand as well as energy use during the Stage 2 Power Emergency Alert hours. In addition, some of the solutions will be equally effective in reducing electricity usage as well as demand during all hours of operation.

This program is conceptualized in coordination with the industry partners to address the industry's immediate need to reduce power demand during this summer (summer 2000) so that power outages may be avoided are substantially reduced. The power outage costs to some of these users are enormous. In some cases it may take up to a week to bring back operations to normal after an outage, even if the outage is a short time. The industry partners include Silicon Valley Manufacturing Group (SVMG), a group of over 150 companies in the Silicon Valley, as well as a group of Major Energy Users Group (MEUG) in the Bay Area.

The proposed program encompasses some of the proven technologies, which are not in common use today. These technologies need to be demonstrated and their savings verified in the field. Hewlett Packard, a member of the SVMG and MEUG as well as other members of the SVMG and MEUG, is very actively involved in the design, planning, pilot demonstration and implementation of the proposed program. The SVGA has created an Energy Task Force (ETF) to address this issue of power shortages and to search for means to reduce demand and improve energy efficiency and increase power reliability. Some of the elements of the program are already under way to mitigate the peak demand related problems this summer. The elements of the proposed initiative have been discussed and debated in the SVMG ETF as well as in a subcommittee of the ETF. In addition, the members have solicited input from researchers at Lawrence Berkeley Laboratory, California Energy Commission and others active in energy efficiency.

The elements of the proposed Demand Responsive Electricity Reduction are outlined here.

1. Conduct Power Emergency 'Fire' Drills

The purpose of this program element is to increase preparedness of member companies to respond to power emergencies and Stage 2 alert. Many companies have contingency plans to turn off loads that are not critical. Others have more elaborate plans that include control of air conditioning systems and lighting.

This task was rated very high at the SVMG ETF group meeting on July 17, 2000. John Wilson, Advisor to Commissioner Art Rosenfeld at California Energy Commission, also attended the meeting. The ETF voted EPRI to lead this ‘drill’. EPRI has proposed to conduct the first drill on Friday, July 28. Several high profile end users including Hewlett Packard, Intel, Cisco, AMD, City of San Jose, and San Jose State University have already signed up on a voluntary basis to participate in the drill. PG&E agreed to provide verification of demand and energy reductions. We are also enlisting support from Silicon Valley Energy and City of Palo Alto. Additional participants are being sought.

In follow up discussions with John Wilson and commissioner Rosenfeld about the proposed drill, they both suggested that we should continue this ‘drill’ on hot days or whenever the cost of electricity is high during this summer to reduce impact of peak demand.

This element of the proposed initiative can provide large amounts of electricity demand in shortest time.

This element also requires some additional subelements or tasks that can be done as part of this task or independently.

<u>1.1</u> Real time communication with end users about the avoided cost of electricity so that end users can make an informed decision to act on the information.

1.2 Investigate if and what incentives could be provided to end users to reduce load during peak hours when energy procurement costs are high

EPRI is seeking funding for coordinating with end users and managing the power emergency drills. The estimated cost is $150,000.

<u>2. Develop a list of Demand and Energy savings Measures:</u>

The SVMG ETF recognized that some end users have quite elaborate plans to reduce demand in several stages where others may not have any plan. The committee voted that EPRI lead in development of a generic list of recommended measures with estimated demand and energy savings. The individual members can select and prioritize these measures based on their specific end use needs.

EPRI proposes to develop this list cooperatively with the end users by taking into considerations the types of lighting, mechanical air conditioning systems, and energy management systems. Field data from the task 1 will help us calibrate analytical tools that could provide verifiable savings.

For us to realize the most demand and/or energy reduction in the shortest time, we have to focus on energy management systems and control strategies. Some EMSs are capable of handling complex control strategies whereas others may be able to handle only simplistic ones. EPRI proposes to develop these strategies that will be able to adapt to the simplicity or the complexity of the EMS by working closely with the end users. Although the final report may take longer to produce, we hope to provide guidance to the end users through informal write-ups and personal contact quickly so that these could be adopted quickly.

The estimated cost for the project is $500,000.

3. Pilots to Demonstrate Demand Responsive Buildings Strategies

Two solutions that are often promoted for reducing peak demand and energy use: turning off or reducing light levels, and raising thermostat set point temperature. Lights can be turned off in perimeter zones, which have natural lighting. Switching off one or more circuits can reduce lighting (if the building is designed with multiple lighting circuits—it is my understanding that buildings built after 1984 must have at least two lighting circuits if the area covered is larger than 100 square foot.) Switching can be manual or through an EMS. More sophisticated dimming switches are now available that can gradually reduce light levels so that it will not strain eyes. However, for immediate demand savings, we will have to work around existing infrastructure.

Raising the set point temperature will cut down on the air conditioning demand, which will eventually translate to less electric demand for cooling. However, how soon the reduction is translated to electric demand savings depend upon many factors—type of air distribution system (constant volume, VAV, dual duct, etc.), type of air conditioning system (e.g., direct expansion, packaged, chilled water, etc.) and the control system.

There are two pilots under way, one with SMUD in Sacramento and the other with LADWP in Los Angeles, to implement these strategies and verify savings. A description of this pilot is enclosed as Appendix A.

EPRI proposes to expand on these concepts and conduct pilots in the Silicon Valley area with members of SVMG and MEUG so that we can identify and resolve any issues and expedite widespread use.

The estimated cost for this project will be $250,000 per pilot, and we recommend three pilots to encompass different types of systems for a total estimated cost of $750,000.

4. Building HVAC System Demand Control through Ventilation Control

This element of the proposed initiative is to develop aggressive but practical solutions that can be implemented in a short time to reduce peak demand, particularly through control of outdoor ventilation air during power emergency stage 2 alert hours. A more detailed description is provided in the enclosed appendix B.

EPRI and Hewlett Packard have teamed up to propose and demonstrate this element in a pilot. We have conducted extensive research on its feasibility with leading experts in this field and determined that an application with monitoring and evaluation would best identify its energy and demand savings potential. The estimated cost for this element is $300,000.

5.   Call up Customer to turn on Back up Generation

Many of the major energy users in the Silicon Valley have back up generation. Its capacity ranges from 5–20% of their peak load. This program element will develop a plan, explore incentives and mechanisms of calling on the customers to turn on their generators to reduce demand at site during power emergency stage 2 alert hours. There may be enough back up power to avoid a rolling black out.

There are, of course, concerns about air quality and permitting requirement. This element will investigate it and work with concerned authorities and the industry to find out a mutually acceptable solution. The first task of the element will be to survey and develop an inventory the back up generation capacity with large energy users and any data on type of fuel used and its exhaust characteristics.

This is a short-term measure. The equipment is already in place. Only operational and control strategies are needed to be developed.

The estimated cost of this project is $500,000.

6.   Use of Personal Fans and Lights to Reduce Energy Use and Demand

The human comfort is a function of six parameters—four of them environmental, i.e., temperature, humidity, radiant heat or temperature, air speed and two of them non environmental, i.e., metabolic activity level and personal clothing level. We give a lot of attention to temperature, and some times humidity, for comfort. However, air motion is mostly considered in context with avoiding cold drafts only.

Moving air through central air handling units is quite expensive—about 1-2 watt per square foot. On the other hand moving air through personal fans can be very energy efficient, .02-.04 Watts per square foot. But using a personal may allow raising of the space temperatures by as much as 6 F, which could provide additional air conditioning or chiller energy savings that may be as high as 3-4 kWh per square foot per year. It could also reduce peak demand by as much as 30-50 Watts per square foot. Having a control with personal fan would increase occupant physiological and psychological comfort levels and increase productivity.

This element of the proposed initiative would provide personal fans to occupants and raise the thermostat set point temperatures in steps and verify energy savings. EPRI and Hewlett Packard have teamed up to conduct a pilot and expand it to the all facilities. Through SVMG and MEUG, other facilities will also be teamed up.

This is a very short-term measure. The personal fans can be easily procured and brought to the site literally in a day.

The estimated project cost will depend upon number of facilities and number of workers in each facility. But for a peak demand savings of 300-500 Watts per worker, or 30 to 50 kWh per year per worker in the building, a cost of $20-100 per worker is still very cost effective.

The estimated cost of this element is $500,000.

Appendix A

Demand Responsive Building Strategy

From:

Arthur H. Rosenfeld
Commissioner
California Energy Commission

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DEMAND-RESPONSIVE BUILDINGS STRATEGY, Version of 7-18-00

Short Term: *A few commercial building pilots to demonstrate 800-1200 MW potential by 2001 by dimming lights and letting indoor temperatures float up by 2 deg. F (pilots underway).*

This Year – 2000: *Avoid outages by turning on emergency generators, 10% of 20 GW of commercial buildings, so 2 GW.*

Medium Term: *Initiate a "cool communities" program (cool roofs, etc), good for 100 MW/year, which will become about 1,500 MW after the program is complete in 15 years.*

Long Term: *Revise Title-24 (efficiency standards for new building) to take effect 2002, taking into account real-time electricity prices. Should save 300 MW/year, or about 3,000 MW after 10 years of new construction, 6,000 MW after 20 years, etc.*

ESTIMATE OF POTENTIAL AVOIDED PEAK POWER

On a very hot afternoon the California ISO sees a peak demand approaching 45,000 MW. Of this, about 35,000 MW (70%) goes to buildings, and of this 35,000, 13,000 MW goes to air conditioning (AC) which can quickly be transformed into a more "flexible" (price responsive) load. With today's communications (internet, cellular phone) it is now cost effective to have indoor temperatures float up 1-2 deg. F on a voluntary, consumer-controlled preset ramp, in response to a rising real time price.

A 2 deg. F ("no-sweat") rise, statewide, should reduce AC demand by about 5 %, i.e., shave 650 MW off the peak. Of this avoided power, about half comes from commercial buildings, which can be lucratively controlled within 1-2 years. The other half is residential, controlled about 10 million thermostats, which unfortunately have a service life of perhaps 10 years. If we assume that smarter thermostats, responsive to real time price, replace present thermostats at 10%/year, then we can avoid another 30 MW each year after we get the residential price incentives right.

We return to the half of commercial building AC, about 325 MW that can be avoided quickly. This number is uncertain because we do not know quite yet what fraction of commercial chillers are undersized, right-sized, or oversized. If they are undersized, or even rightsize, then they can maintain a temperature difference of only about 20-25 deg. F between indoors and ambient temperature. Thus on hottest days, the indoor temperature will float up on its own, and we cannot save power by lettering it float up from its normal 74-75 deg. F. Our Pilot has called for utility data on 4 pm demand vs. 4 pm temperature, to clarify this question. So far we have assumed that half of all buildings are ineligable.

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Another 5 GW goes to lighting commercial buildings, and some of this is discretionary (particularly because peak demand occurs on sunny afternoons). Some buildings are already wired so that exterior and parking-lot lights, and lighting in the peripheral (daylit) zones of buildings, can be dimmed or partly switched off, saving 1/3 of the lighting demand. With installation of some controls it should be cost-effective to quickly cut commercial building lighting demand by 10%-20% during peak demand hours, for saving another 500 to 1000 MW.

BARRIERS AND ECONOMICS

In California, an **average** retail price is about 10 cents per kWh ($100/MWh), but the real-time cost to the distribution companies varies greatly and during peak hours hits 75 cents/kWh ($750/MWh), and during the week of June 12 cost one utility (SCE) $1 billion. But, absurdly, these prices are rarely passed on to customers. The big exceptions are in San Diego, and to direct access customers (~15% of peak load). The most interesting but small exceptions are the pilot real-time rates already offered to a few customers by both PG&E and SCE. But all residences and small buildings see a price stuck at the 10 cent average, and almost all of the large customers with interval meters see only summer-average peak period prices. **This is an almost total barrier to responsiveness – as I understand it, the customers see no more incentive to manage load during a heat wave than during a cool period.**

Communications and switching hardware/software exist that can avoid peak power for about 1 cent/kWh ($10/MWh), but installation is lagging because of this lack of price incentives and of metering. The distribution utilities and the ISO are still thinking in terms of accurate ("revenue quality") real-time ("interval") meters, and only in pilot projects have two utilities announced that they will pay for each avoided kWh at its true value, which for PG&E on the afternoon of June 28 was over $1/kWh for four hours. Restated, that's over $1000/MWh, and is roughly 100 x larger than the load management solutions. Of course in some transmission- or distribution-constrained areas, the true avoided costs are even larger. .

The benefits to all ratepayers is much greater than the savings to the individual participating customers for several reasons.

1. Electric supply is very price inelastic on hot days, so a few % reduction in demand can drastically cut not only **bills** for those that reduce load, but also energy market **prices** for all customers, reducing electric bills for the non-participants as well as participants in peak-reducing programs.
2. The risk of outages such as occurred in the Bay Area in June would be reduced.
3. While we need new generation, transmission, and distribution capacity, but we don't want to **over invest** when load management is a cheaper and greener way to meet peak demands.

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While real time pricing and metering is ideal, much could be done immediately if utilities offered to pay consumers for participating in programs that rewarded demand responsive load reductions without waiting for meters. This leads us to our Pilot Project.

SHORT TERM: PILOT PROJECT FOR COMMERCIAL BUILDINGS

Power plants already in the pipeline will not come on line until 2002-03. Before then, the most practical measures are on the customer side of the meter.

We are planning a demonstration project for this summer (in 2-5 buildings owned by SMUD and DGS in Sacramento, 2-3 DWP buildings in LA) for buildings that already run under the control of an "EMCS" (Energy Management Control System) that already controls lights and thermostats and can listen to real time prices on the internet, but do note have real-time meters. The pilot is to install relatively simple hardware/software, which will dim lights, and let the temperature float up slowly about 2 deg. F along a consumer-selected price-dependent ramp. We will also look at the 24-hour predicted price and temperature and pre-cool the buildings early in the day of a predicted "scorcher."

A qualified engineer will test the system on a hot afternoon and certify how many kW are saved (and for how long) at a few specified test prices and ambient temperatures. This certification will be the basis for payments for peak load reductions.

An occupant comfort survey will be taken on normal days and during hot afternoons when the temperature is drifting up.

After the pilot we propose a workshop for building operators, utilities and vendors, to be sponsored by the CPUC and the CEC at which we will present results (costs of avoided power and any discomfort) and recommend whether the process should "go commercial" for the summer of 2001.

This assumes participation by the major electric distribution companies who must announce that:

1. They will post a real-time price on the web. It may vary by location. This is because only some parts of utility service territories may be transmission- or distribution-constrained.
2. They will give a bill credit to customers (avoided kWh x real time price). Large customers may have interval meters. If not, the rebate will be based on engineering estimates based on reading traditional meters. We repeat that at least

PG&E and SCE presently offer real-time prices, but only to a handful of large customers.

3. They will test the system every hot afternoon, to inspire their own confidence and those of the building operators (i.e., a "notch test" to observe the load reduction by customer and systemwide).

This summer's pilot addressed commercial buildings with EMCS, and not homes, which will go slower because it will be necessary to install "smart" thermostats and controllers. This will occur naturally in new homes, or as the thermostats in existing buildings reach the end of their service life. For the summer of 2001 we should start a Pilot for residential buildings. We should also monitor how fast State and Public buildings (e.g. school) respond – we might need a pilot for schools.

MEDIUM TERM: ACCELERATE "COOL COMMUNITIES"

This will not only save peak power, but it will cool smoggy cities, and is the only way to help them comply with ozone standards while saving money. For new schools it will actually reduce first costs because the white roof is a no-cost or low-cost specification, but one can then downsize the expensive AC by 10-20%.

LONG TERM: REVISE TITLE 24 IN 2002 TO INCORPORATE THE REAL-TIME VALUE OF ELECTRICITY

The California Title 24 building efficiency standards specify efficiency levels that minimize life cycle costs based on average retail rates. Restructuring of the electric industry brought about by AB 1890 will necessitate introduction of real time prices and metering at some point in the near future. Therefore it is essential that buildings be designed to incorporate measures that not only reduce peak demand, but can respond to varying real time prices.

The CEC proposes to update T-24, re-running all the calculations under the modern assumption that new buildings will see real-time prices. This will change existing requirement (for example the optimum efficiency for air conditioning systems), but also at least double the list of emerging technologies which must be evaluated for potential incorporation in the standards. Some examples are:

- Cool roofs
- Selective window glazings
- Variable speed motor and drive systems for pumps and fans
- Controls for lighting, air conditioning, elevators, escalators, etc,
- Increasing the wiring size inside buildings (where 2-5% of peak power is lost),
- Efficient transformers in commercial buildings,
- Thermal storage in large buildings (cost effective, but somewhat forgotten),
- HVAC systems optimized for peak power, with non-leaky ducts.

- Cooling without electric chillers (multi-stage evaporative, "thermally" driven, …). The thermal energy can come from "CHP" (combined heat and power), from gas, or from the sun.

The list of emerging technologies that have not been evaluated for use in T-24 is long, and growing with R&D efforts around the country, including the CEC's PIER program.

A Title-24 "recommended" list of measures could be used by both new building designers and retrofitters to beat Title 24 and thus be eligible for proposed federal tax credits (S. 2718). We could formally call it "Tier 2" and consider California tax credits for these measures. The federal treasury now figures that tax credits for commercial buildings stimulate investments with such large benefit/cost ratios (typically 7:1) that they significantly increase profits (and hence business taxes) and actually make money for the treasury.

Annual Savings. California peak power is now growing about 1 GW/year, of which 700 MW is attributed to buildings. Excluding cool roofs (which alone should save 100 MW each year) a revised T-24 could reduce demand by another 300 MW for each year of new construction (for example 3 GW by 2012), all at lucrative payback times, since T-24 calls only for cost-effective investments.

RESOURCES NEEDED

Steve Larson and Scott Matthews will complete this section.

Appendix B

Prevention of Industry Rolling Blackout and Economic Loss From Stage 2 Emergency Power Alert

Building HVAC System Demand Control

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Appendix B

A Proposal For
Prevention of Industry Rolling Blackout and Economic Loss
From Stage 2 Emergency Power Alert

Building HVAC System Demand Control

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Project Objectives:

The primary objective of this proposed project is to find aggressive but practical solutions that can be implemented in a short time to reduce peak demand, and particularly, investigate the control of ventilation during power emergency stage 2 alert hours. A secondary objective is to develop long term control strategies that maximize the amount of energy demand reduction during stage 2 power alerts for California high energy use industry.

Background and Discussion:

Rolling blackouts cause severe economic losses to industry from lost productivity, devastating impact on the State's economy, and disastrous effects from expensive equipment failure during such power interruptions. The disruption in business may take several hours to a few days to bring it back to normal, even though the actual power outage may last for a brief time.

Large energy users such as Hewlett Packard take several measures to curtail demand when they are notified of Emergency Stage 2 Power alerts (i.e., when Electricity Operating reserves fall below 5%). These measures include turning off lights and idling office equipment, as well as other measures to reduce air conditioning needs. However, more aggressive measures must be found to assure power reliability and avoid rolling blackouts.

Paul Stephens, Energy Manager at Hewlett Packard, approached EPRI to investigate one innovative new measure: controlling ventilation during Stage 2 Power emergency alert hours. This measure could be adopted after all other measures such as raising thermostat set point have been exhausted. Ventilation air may account for 10 to 20+% of the total air conditioning load during the emergency stage 2 alert hours, since the ambient air temperatures are quite high at these hours. In addition, generally the ambient air quality is also poor at the same time and restricting ventilation may even be helpful.

The first reaction to the proposed approach is that 'it can not be done! Or, the codes would not allow it.' But a closer look at the codes and potential loss from disruption due to rolling blackout if power demand is not curtailed argues that this approach may have some merit. The California Title 24 code allows air conditioning system shut down for up to 90 hours a year for maintenance or when utility power supply is constrained. The ASHRAE standard permits closing of outdoor air damper if out door air quality is worse than inside. Moreover, although the current standards call for some 15 to 20cfm per person in office environment, yet only 5cfm per person were accepted in non-smoking buildings between mid 70's to late 80's. This would suggest that the ventilation could be reduced for very short periods of time (a couple of hours at a time) during Stage 2 power emergency alerts, which may last for only a few hours and for just a few days a year. And to compensate it, the ventilation can be made up increasing outdoor air during off peak hours.

There are several issues, however, that must be addressed before such a measure could be adopted in practice. These issues primarily revolve around consequences of resultant indoor air quality from reducing ventilation during the alert hours on building occupant's health and productivity. These temporary reductions are not likely to increase indoor air pollutants in normal office buildings to any appreciable levels. But, if a suitable solution could be found for the few hours of the emergency stage 2 alert, it could provide much needed relief for the state's electricity operating reserve as well as mitigate economic loss. On the other hand, increasing ventilation during off peak hours can boost productivity. Preliminary data suggests that doubling ventilation can cut down absenteeism by 30%!

Approach:

Our approach is to address the project on two fronts: On the first front, we will explore practical solutions that can be implemented in the next couple of weeks, prior to the onset of summer. This short-term objective is the most important driver for Hewlett Packard and other major energy users. On the second front we will conduct research, and collect and analyze information and data to develop and support practical solutions for the long term. We have discussed this approach with Dr. W. Fisk at LBL and plan to team up with LBL in the design of the field demonstration/experiment and data collection protocol so that the data can be analyzed scientifically.

The following approach is proposed on the first front.

1. Controlled Facility Tests:

   We will conduct testing of ventilation control strategies in controlled settings so that we can document resultant air quality different control schemes. Ventilation (out side air, not necessarily the airflow) will be cut back in a stepwise fashion and the resultant power savings will be determined. The effect on health and productivity from short time reductions could not be practically measured. Instead, we will record incidence of complaints. We plan to conduct tests in two wings of the same office building, and rotate control of ventilation between the two wings. Prior to actual tests, analysis will be performed to roughly predict what will happen to the IAQ and study different scenarios of control strategies in order to guide the tests. These activities will be supported with information gatherings, data collection and analysis, which will also be useful for the second front.

2. System Wide Implementation:

   The primary interest and the most benefit can be achieved by implementing the strategies on system wide basis where they could be activated on the emergency stage 2 alert hours. The system could be installed and activated only when it is necessary to curtail peak. The strategies learned from the controlled tests can be implemented at the larger number of facilities. This will provide the most benefit to the facility owners and the state. We propose to select Pilot Buildings to test system wide applicability and potential of the technology.

The following activities are proposed on the second front. These will provide rigorous scientific support for the experimental work on the first front. Our approach here is designed to meet the following five objectives.

1. To determine when increasing ventilation rates in the morning of an expected peak-demand day, can enable reduced ventilation during the afternoon peak-demand period without increasing indoor pollutant concentrations.
2. To determine if temporary reductions in ventilation rates in particular buildings are likely to result in unacceptable indoor pollutant concentrations or an unusual level of occupant health complaints;
3. To determine the reasonable minimum ventilation rate during periods of peak demand.
4. To identify the procedures for temporarily reducing ventilation rates; and
5. To estimate the reductions in electrical power demand that result from reducing ventilation rates.

Time Frame:

The project must start immediately in order to provide meaningful curtailment of power during this summer. The first task on the first front must start immediately, with the second task for a pilot batch of buildings to be completed this summer. The tasks on the second front can begin now, but will be accomplished over longer period spanning next summer.

Budget:

The estimated budget for Task 1 is about $100,000 to $300,000 for planning, management, instrumentation, testing, data collection, strategy implementation, analysis, etc. The budget for other tasks will be estimated later. What is learned from this study will be applicable to other facility owners in the state. This falls under the public interest energy research, and we are seeking funds from the state of California and public utilities. The project scope of work can be broken up into several phases to accommodate funding limitations.

Key Players:

Hewlett Packard has pledged the availability of their facilities for testing and energy managers' time required for coordinating and implementing the strategies.

EPRI would provide rapid overall design of the project, experimental design and project management. EPRI and EPRI's subcontractors will collect and assemble the information described above, provide this information to the client, and discuss the implications with the client. Decisions to temporarily reduce ventilation rates will be made by HP. EPRI and EPRI's subcontractors will provide information enabling HP to make informed decisions.

The project will be coordinated with LBL either as an advisor or as a sub-contractor to ensure that our test and monitoring plans are sound and that we will get scientifically valid data. Bill Fisk at LBL has already provided valuable advice in strategic approach to addressing the issues and particular tasks that should be undertaken.