Integrated Energy Audit:

College of the Redwoods

Prepared for:
Pacific Gas and Electric Company

Pacific Gas and Electric Company®

Prepared by:
KEMA

Quality Assurance Check by:
Charles Middleton
___(signature line)_____

Date Here
December 22, 2010

KEMA

Pacific Gas and Electric Company

Mailing Address:
Pacific Gas and Electric Company
2555 Myrtle Avenue
Eureka, CA 95501

December 22, 2010

Garry Patrick
College of the Redwoods
7351 Tompkins Hill Rd.
Eureka, CA 95501

RE: Integrated Energy Audit

Dear Garry,

I am pleased to enclose PG&E's Integrated Energy Audit report for **College of the Redwoods at 7351 Tompkins Hill Rd., Eureka**. The report details ways in which you may more effectively manage your daily energy use, reduce your routine and peak demand, and lower your energy costs. It also points you to financial incentives that will reduce the capital cost of new investments.

Our on-site audit explored the full spectrum of energy management options at your facility—including demand response and distributed (on-site) generation, as well as energy conservation, energy efficiency, and time-of-use strategies. The report recommends technologies, procedures, and programs pertinent to your site, your facility, and your operations. In particular, you will find in the report:

- Recommended cost-saving *energy efficiency, time-of-use management and demand response measures.* No-cost, low-cost, and capital-intensive measures can result in lower every-day energy use and costs as well as simplifying your facility management. **9** energy cost saving measures are recommended in this report.

- Opportunities to participate in *demand response programs.*
  Because California energy policy encourages customers like **College of the Redwoods** to reduce electricity consumption during periods of peak demand, PG&E offers several new demand response programs. If you participate in any of these programs you will receive energy bill credits or payments for reducing electric use during short periods of peak demand, potential energy shortages, or very high wholesale electricity prices. **1 new** demand response measure is recommended in this report.

I encourage you to carefully evaluate the technical and financial aspects of the recommendations, and to act on those that meet the fiscal and operational requirements of your facility. PG&E can help you identify synergies among recommended technologies and procedures that might enable you to earn multiple incentives for a single investment. In addition, PG&E will help you facilitate your project implementation by providing seasoned technical specialists, available to assist you as necessary.

I am available to discuss any aspect of this report, as well as any of PG&E's business customer incentive programs. Thank you for participating in the Integrated Energy Audit! I look forward to help you act on the results.

Sincerely,

Ivan Marruffo
Sr. Account Executive
707.445.5631

Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the facility's equipment systems at the College of the Redwoods campus located in Eureka, CA. Appropriate detail is included in sections 1-6 of this report to make decisions about implementing energy efficiency measures at the facility. However, this report is not intended to serve as a detailed engineering design document. The descriptions of the improvements are only diagrammatic in nature in order to document the basis of cost estimates and savings, and to demonstrate the feasibility to construct the improvements. It should be noted that detailed design efforts may be required in order to implement several of the improvements evaluated as part of this energy analysis. As appropriate, costs for those design efforts are included as part of the cost estimate for each measure.

While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary. As a result, Pacific Gas and Electric Company (PG&E) and KEMA Services, Inc. (KEMA) are not liable if projected estimated savings or economics are not actually achieved. All savings and cost estimates in the report are for informational purposes, and are not to be construed as a design document or as guarantees.

In no event will PG&E or KEMA be liable for the failure of the customer to achieve a specified amount of energy savings, the operation of customer's facilities, or any incidental or consequential damages of any kind in connection with this report or the installation of recommended measures.

Contents

Section 1 Executive Summary

Pacific Gas and Electric Company (PG&E) sponsored this Integrated Energy Audit Report for College of the Redwoods in Eureka, CA. The comprehensive audit identifies several lucrative energy efficiency and demand response opportunities: more-efficient ceiling lighting, more-efficient outdoor lighting, and more efficient boilers.

The study was conducted by KEMA Services, Inc. (KEMA), in collaboration with PG&E, as part of a comprehensive effort to assist PG&E customers in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

On March 18, 2010, KEMA, as a PG&E contractor, performed a detailed integrated energy audit of the College of the Redwoods campus at 7351 Tompkins Hill Rd. in Eureka, CA. The KEMA team met with Garry Patrick, Director Maintenance & Operations to review facility operations and focus the investigation on specific systems of interest.

Section 1 of this report summarizes KEMA's findings regarding electricity and natural gas usage at College of the Redwoods in Eureka. Section 1.1 summarizes cost reduction opportunities identified for College of the Redwoods, Section 1.2 shows emissions reductions expected from the implementation of the energy savings measures, and Section 1.3 discusses how PG&E can help with implementation planning.

Based on results from the integrated energy audit, it was determined that some energy cost reductions can be achieved at relatively low investment levels, while others will require substantial capital investment. Cost-effective projects are identified in the areas of lighting efficiency improvements, lighting controls, and installation of more efficient boilers.

A previous PG&E demand response[1] study at the College of the Redwoods identified 8 potential demand response measures and KEMA identified one additional measure. The results of the previous study were updated for current operations and the new Peak Day Pricing plan now in effect at College of the Redwoods. In total, the remaining 6 measures provide an opportunity for a demand response of 85.1 kW. The audit also identified 1 new demand response measure that can be controlled from the building automation system. These include shutting down a fountain pump on critical peak days.

The energy savings and costs summarized in Tables 1.2 and 1.3 are detailed in Section 4 of this report. These include low-cost measures (LCM), capital-intensive measures (CIM), and demand response (DR) measures. The savings estimates are based on current average or marginal energy prices as appropriate to each recommendation. The payback periods shown for each recommendation are "simple payback" calculated by dividing the net implementation costs by the annual dollar savings. For the purposes of this audit, low-cost measures have been defined as

[1] Demand Response Audit, College of the Redwoods, prepared by Information & Energy Services, July 27, 2007.

energy conservation, energy efficiency, or time-of-use management projects with a capital cost of less than $10,000. This definition may differ from that of the building owner.

Where applicable, PG&E incentives are identified in the report and included in the financial analysis of specific energy and demand reduction measures.

1.1 YOUR FACILITY ELECTRICITY AND NATURAL GAS USAGE

During the 12-month period ending December 2009, the annual cost for energy at the College of the Redwoods campus was approximately $617,103.62 with electricity accounting for $447,193.24 and natural gas accounting for approximately $169,910.40. During this period, College of the Redwoods consumed 3,508,587 kWh of electricity, with a summer peak demand of 808 kW, and 212,388 therms of natural gas.

Electric energy usage for the campus can also be viewed through PG&E's InterAct II web site. As a participant, you will receive access to your electricity usage for each half-hour, updated every morning for the prior day's usage. You can compare one day to another, one week to another, or another time period of your choice. You'll also be able to see how changes in weather (temperature) affect your usage. Seeing when you use electricity and how that compares in various ways should give you the power to make changes that reduce total use, shift use from peak to off-peak hours, and otherwise save money on your electric bill. Contact your PG&E account representative for more information.

The scope of this project includes College of the Redwoods campus located in Eureka, CA which was founded in 1964. College of the Redwoods manages a campus of 2-story and single-story educational offices, a library, theater, classrooms, childcare center, dormitories, and maintenance and sports activity buildings with the total combined floor space area about of 430,000 square feet. There is also a non operational indoor swimming pool and an outdoor event stadium. Regular operating hours for the majority of the buildings are from 8 a.m. until 8 p.m. Monday-Friday with a partial operation on Saturday and Sunday. College of the Redwoods operates year round with reduced operation from the middle of May through August (summer classes for the school students), a five-week break for the Christmas and New Year holidays and a one-week of spring break.

The building's Energy Use Index (EUI) for the 12-month period ending November 2009 is shown in Table 1.1.

Table 1.1: Energy Use Index

Building Area sq. ft.	Electric Usage kWh/yr	Electric EUI kWh/yr/sf	Natural Gas Usage therms/yr	Natural Gas EUI therms/yr/sf
428,264	3,508,587	8.2	212,388	0.5

The average electric use of the buildings studied is 8.2 kWh per square foot per year (kWh/sf/yr). This is lower than the average of 16.09 kWh/sf expected for typical buildings of this kind, and reflects the low energy use of ventilation equipment since these buildings have no space air

conditioning in the cool Eureka climate. The natural gas energy use index (EUI) is 0.5 therms/sf/yr. This is very close to the expected average of 0.49 therms/sf/yr for these types of buildings and reflects gas usage for space heating, kitchen equipment and domestic hot water needs.

Section 2 of this report describes facility information in more depth. Section 3 breaks down the energy use and costs in more detail. Section 4 explains measures recommended for reducing energy consumption.

1.2 YOUR COST REDUCTION OPPORTUNITIES

KEMA identified seven (8) projects that, if implemented together, could reduce yearly electricity use by 458,838 kWh/yr with 64.7 kW peak demand savings and a natural gas savings of 8,923 therms/yr. Total yearly energy costs could be reduced by approximately $65,621 and pay for themselves in approximately 12 years and 10 months. With PG&E incentives, the payback period is reduced to 10 years and 11 months. One demand response measure, DR-9, in addition to those already identified in a previous PG&E DR study[1], could reduce peak electric demand by a further 2.6 kW. The recommended measures are summarized in the tables below and in Appendix C. Detailed descriptions of each measure can be found in Section 4 "Energy Project Opportunities."

Table 1.2: Energy Efficiency Measures

Measure Number	Measure Description	Energy, Cost and GHG* Savings					Project Costs, Incentives, and Payback			
		Peak Savings (kW) **	Electricity (kWh/yr)	Natural Gas (Therms /yr)	Annual Cost Savings ($/yr)	CO2 Saved (Tons /yr)	Estimated Installed Cost ($)	Potential PG&E Incentive ($)	Net Measure Cost ($)	Pay-back Period (Yrs)
EEM-1	LCM-1: Control LRC ceiling lights with photocells	0.0	580	0	$74	0.4	$291	$139	$152	2.1
EEM-2	LCM-2: Install LED lamps in track lights in book store	1.7	10,767	0	$1,372	7.4	$5,584	$0	$5,584	4.1
EEM-3	LCM-3: Install Demand Controlled Ventilation in Library	0.0	0	110	$88	0.6	$996	$110	$886	10.0
EEM-4	CIM1: Install more-efficient T-8 fluorescent lighting	63.0	273,937	-7,893	$28,601	143.1	$520,778	$65,745	$455,034	15.9
EEM-5	CIM-2: Install lighting occupancy sensors in classrooms, offices and conference rooms	0.0	88,223	-2,561	$9,196	46.0	$69,564	$21,174	$48,390	5.3
EEM-6	CIM-3: Install high efficiency hot water boilers on a replacement basis	0.0	39	19,267	$15,419	112.7	$121,631	$19,267	$102,364	6.6
EEM-7	CIM-4: Replace parking lot lighting	0.0	52,940	0	$6,748	36.6	$87,694	$12,706	$74,988	11.1
EEM-8	CIM-5: Install more efficient walking pathway lights	0.0	32,352	0	$4,124	22.4	$33,550	$7,765	$25,785	6.3
Recommended Energy Efficiency		64.7	458,838	8,923	$65,621	369.3	$840,089	$126,905	$713,184	10.9

We also reviewed a previous PG&E demand response study[1], but found after meeting with College of the Redwoods that two of the eight recommended measures can no longer be implemented and that measure costs needed to be updated along with incentives to reflect the new PG&E peak day pricing program (see Appendix B for measure costs). We also found one additional measure that we recommend that the College consider as shown in Table 1.3.

Table 1.3: Demand Response Measures

Measure Number	Measure Description	Demand Reduction		Annual Savings			Payback			
		Maximum (kW)	Average (kW)	Total Event Reductions (kWh/yr)	PDP Program Credits ($/yr)	Potential DR Program Incentive ($/yr)	Measure Cost ($)	Potential PG&E Tech-nology Incentive	Net Measure Cost ($)	Simple Payback (yr)
DRM-1	Disable Heating Hot Water Systems	25.6	25.6	1,229	$3,045	$0	$3,005	$1,502	$1,502	0.5
DRM-2	Disable Swimming Pool Area Lighting	11.6	0.0	0	$0	$0	$7,346	$0	$7,346	N/A
DRM-3	Disable Field House Lighting	20.9	20.9	1,003	$2,486	$0	$2,144	$1,072	$1,072	0.4
DRM-4	Disable GYM Lighting	14.9	14.9	715	$1,773	$0	$2,144	$1,072	$1,072	0.6
DRM-5	Disable Learning Center Lighting	15.1	15.1	725	$1,796	$0	$1,216	$608	$608	0.3
DRM-6	Disable Swimming Pool Filtration Pump	10.6	0.0	0	$0	$0	$405	$0	$405	N/A
DRM-7	Shut Down Networked PCs	6.0	6.0	288	$714	$0	$16,450	$750	$15,700	22.0
DRM-8	Shut Down Sewage Treatment Plant	17.5	0.0	0	$0	$0	$79	$0	$79	N/A
DRM-9	Turn Off Fountain Pump for 4 Hours During Demand Response Events	2.6	2.6	126	$309	$0	$1,154	$329	$825	2.7
Demand Response Measure Totals		124.8	85.1	4,086	$10,124	$0	$33,943	$5,334	$28,610	2.8

For information on what demand response is and options for how to participate in demand response programs, please see Section 4.3.

1.3 EMISSIONS SAVINGS

The energy efficiency and demand response measures reduce the use of electricity. This results in fewer emissions of carbon dioxide (CO_2) and criteria pollutants from PG&E's electric generation sources and from the customer's boilers and furnaces.

The total expected CO_2 reduction of 738,502 lbs/yr from the recommended Energy Efficiency measures is equivalent to removing more than 64 automobiles from our roads for an entire year[2].

1.4 IMPLEMENTATION PLANNING

We encourage you to seriously consider the recommendations contained within this report. The portfolio of the projects identified will bring a significant benefit to your bottom line and in most cases improve reliability. Once you have completed a careful review of the technical and financial aspects of the recommendations, PG&E can assist you by facilitating an implementation planning meeting that will help you act on those measures that meet the fiscal and operational requirements of your facility. In addition, and as a component to the implementation plan, PG&E will help you take full advantage of the financial incentives and technical services that are available to you as a valued customer of PG&E.

A sample 2010 Statewide Customized Offering Agreement application for PG&E program incentives is included in Appendix D for your reference.

[2] Source: EPA's Unit Conversions, Emissions Factors, and Other Reference Data Report (Nov 2004), EIA/DOE 2002.

Section 2 Project Team and Facility Information

2.1 PROJECT CONTACTS

This section of the report identifies the project team members and includes contact information.

Table 2.1: Integrated Audit Contacts

Name	Role	Organization	Contact Information
Garry Patrick	Director Maintenance & Operations	College of the Redwoods	7351 Tompkins Rd. Eureka, CA 95501 (707) 476-4385 Garry-patrick@redwoods.edu.
Ivan Marruffo	Senior Account Executive	PG&E	2555 Myrtle Avenue Eureka, CA 95501 (707) 445-5631 ixm2@pge.com
Jim Kuegle	Supervising Program Manager Integrated Audits	PG&E	245 Market Street (8NA) San Francisco, CA 94177 (415) 973-3745 JAKa@pge.com
Charlie Middleton	Senior Chemical Engineer	PG&E	245 Market Street, (N6G) San Francisco, CA 94177 (415) 973-4008 CEM6@pge.com
Ed Saribay	Demand Response Operations Supervisor	PG&E	245 Market Street, (N3E) San Francisco, CA 94177 (415) 973-2658 EJSf@pge.com
Steven J. Giampaoli, PE	Chief Energy Engineer	KEMA Services, Inc.	155 Grand Ave., Ste. 500 Oakland, CA 94612 (510) 891-0446 steve.giampaoli@KEMA.com
Svetlana Zaburskaya	Senior Engineer	KEMA Services, Inc.	155 Grand Ave., Ste. 500 Oakland, CA 94612 (510) 891-0446 svetlana.zaburskaya@KEMA.com

2.2 COLLEGE OF THE REDWOODS FACILITY

College of the Redwoods (CR) is a public two-year community college whose main campus is located on the southernmost edge of Eureka in Humboldt County, California. The college was founded in 1964 and the majority of the buildings were built in the 1960's. The College of the Redwoods campus includes 2-story and single-story educational offices, a library, theater, classrooms, childcare center, dormitories, and maintenance and sports activity buildings with a total combined floor space area of about 430,000 square feet. There also is a non-operational indoor swimming pool and an outdoor event stadium. Regular operating hours for the majority of the buildings are from 8 a.m. until 8 p.m. Monday-Friday with a partial operation on Saturday and Sunday. College of the Redwoods operates year round with reduced operation from the middle of May through August (summer classes for the school students), a five-week break for the Christmas and New Year holidays and a one-week spring break. There are a total of 4,500 students attending classes with 160 students living on campus.

There are a total of 27 buildings on the campus listed as:

CA – Creative Arts
PS – Physical Science-Math
LS – Life Science
FM – Forum
AD – Administration
HR – Human Resources (Personnel)
BK-SU – Bookstore-Student Union
LK – Cafeteria-Lakeview
T20 – Disable Students Programs
T90 – Light Center
AT – Applied Technology
LRC –Learning Resource Center (Library)
T20 – Academy of the Redwoods
GH – Greenhouse
DH – Del Norte Residence Hall
MH – Mendocino Residence Hall
PE – Physical Education
FH – Field House
CDC – Child Development Center
WH – Warehouse/Mailroom
MN – Maintenance/Grounds
FR – Firing Range
T52 – CalSOAP
FR – Range Complex
AJ – Law Enforcement Center
ST – Community Stadium
SEC – Security Parking

2.3 ENERGY-USING SYSTEMS

From Figure 2.1, it can be seen that lighting, heating and ventilation systems account for the majority of the energy use. Other significant loads include computers, refrigeration and cooking equipment.

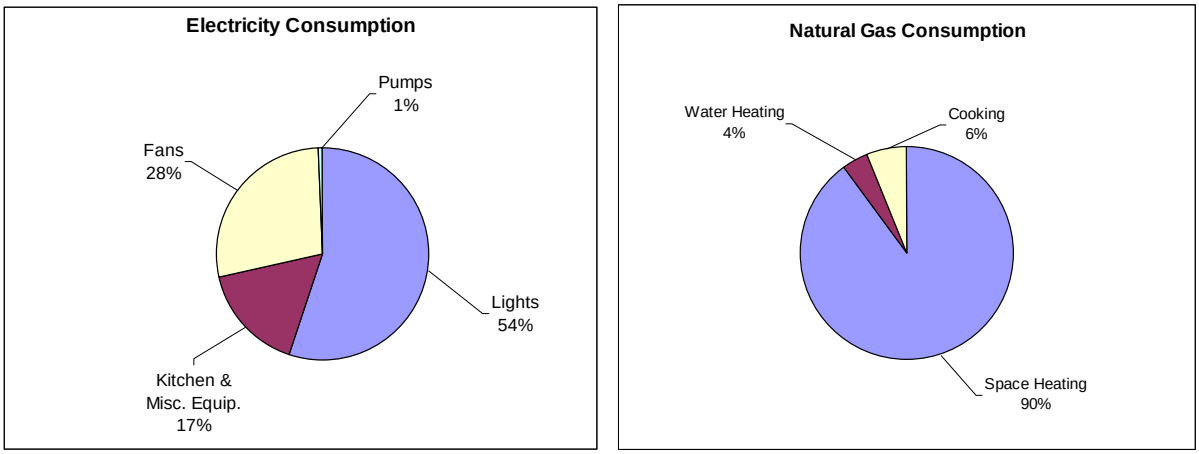


Figure 2.1: Breakdown of Electricity and Natural Gas Consumption

Table 2.2 lists the major equipment loads identified in the building.

Table 2.2: Major Equipment Summary

Equipment	Fuel	Quantity	Capacity (ea)	Location
Boiler	Natural Gas	3	2,730 MBH	FM, LS, PS
Boiler	Natural Gas	1	2,092 MBH	CA
Boiler	Natural Gas	2	2,000 MBH	AT, LRS
Boiler	Natural Gas	1	7,000 MBH	PE
Boiler	Natural Gas	1	775 MBH	CDC
Boiler	Natural Gas	1	360 MBH	AJ
Domestic Water Heater	Natural Gas	1	800 MBH	PE
Domestic Water Heater	Natural Gas	2	250 MBH	SU
Domestic Water Heater	Natural Gas	2	250 MBH	DH
Domestic Water Heater	Natural Gas	2	250 MBH	MH
Domestic Water Heater	Natural Gas	3	250 MBH	CA, LS, Admin, Forum
Domestic Water Heater	Natural Gas	3	250 MBH	Pool
Domestic Water Heater	Natural Gas	2	199 MBH	CDC, AT
Domestic Water Heater	Natural Gas	1	80 MBH	LRC
Domestic Water Heater	Natural Gas	1	53 MBH	PS
Domestic Water Heater	Electricity	1	4.5 kW	AJ
Air Handling Unit	Electricity	1	21,000 cfm,15-hp	LRC
Air Handling Unit	Electricity	1	12,500 cfm,15-hp, 5-hp	CDC
Air Handling Unit	Electricity	1	15-hp, 2-hp	PE
Air Handling Unit	Electricity	2	10-hp, 2-hp	PE
Air Handling Unit	Electricity	12	7.5-hp	PE, CA, AT, AD
Air Handling Unit	Electricity	8	5-hp	Old Library, CA, AJ, AT, AD
Air Handling Unit	Electricity	1	3-hp	AT
Air Handling Unit	Electricity	15	2-hp	PE, Old Library, PS, AT, FM, LS
Air Handling Unit	Electricity	4	1.5-hp	Old Library, PS, FM
Air Handling Unit	Electricity	3	1-hp	AT
Air Handling Unit	Electricity	2	0.75-hp	PS, FM
Fan Coil Unit	Electricity	1	10-hp	AJ
Fan Coil Unit	Electricity	1	3-hp	CDC
Fan Coil Unit	Electricity	2	2-hp	LRC
Fan Coil Unit	Electricity	4	1-hp	LRC
Rooftop Furnace	Electricity, Natural Gas	5	1.5-hp	AT
Rooftop Furnace	Electricity, Natural Gas	3	0.33-hp	AT
Rooftop Furnace	Electricity, Natural Gas	3	0.5-hp, 137 MBH	SU
AC unit	Electricity	1	5-hp	FM
AC unit	Electricity	1	2-hp	FM

Equipment	Fuel	Quantity	Capacity (ea)	Location
AC unit	Electricity	3	1.5-hp	FM, LS, PS
Exhaust Fan	Electricity	2	5-hp	PE
Exhaust Fan	Electricity	3	3-hp	PE, Old Library, AT
Exhaust Fan	Electricity	11	2-hp	Old Library, CA, AT, FM
Exhaust Fan	Electricity	2	1.5-hp	AT
Exhaust Fan	Electricity	14	1-hp	PE, PS, AT, FM, LS
Exhaust Fan	Electricity	12	0.75-hp	PE, PS, AT
Exhaust Fan	Electricity	12	0.5-hp	Old Library, PS, CA, LS
HHW Pump	Electricity	3	7.5-hp	PE, FM
HHW Pump	Electricity	3	5-hp	CA, AT
HHW Pump	Electricity	2	3-hp	LS, PS
HHW Pump	Electricity	1	1.5-hp	AJ
HHW Pump	Electricity	1	1-hp	LRC
HHW Pump	Electricity	2	0.75-hp	CDC
HHW Pump	Electricity	1	0.5-hp	CDC
HHW Pump	Electricity	1	0.33-hp	LRC
Wastewater Pump	Electricity	2	25-hp	Sewage Plant
Air Compressor	Electricity	3	5-hp	PS, FM, MN
Air Compressor	Electricity	2	1.5-hp	AT
Air Compressor	Electricity	1	20-hp	AT
Air Compressor	Electricity	1	15-hp	AT
Air Blower	Electricity	1	15-hp	Sewage Plant
Lighting	Electricity	1	470 kW	Indoor
Lighting	Electricity	1	46 kW	Outdoor

2.3.1 Heating Ventilation and Air Conditioning (HVAC)

The campus buildings have heating systems only (there is no air conditioning except for a small package unit which supplies a server closet).

The main 2-story areas of the LRC building are served by one large two speed air handler located in the basement. All other spaces in this building are served by single zone fan coil units.

The CDC building is served by one air handler with variable frequency drive (VFD) controlled supply and return fans. The distribution ductwork is single duct with variable air volume (VAV) boxes with heating hot water coils in all zones. The kitchen is served by a fan coil unit.

All other buildings have several small (0.5-hp to 10-hp) roof top air handlers with either a gas-fired furnace (SU-LK) or a hot water coil supplied by a gas-fired boiler (The AT building has a combination of both systems). In addition, the majority of the campus buildings are heated by a hydronic heating (fin/tube radiation) system.

The LRC and CDC buildings are controlled by the central Honeywell building management system (BMS). All other buildings utilize local thermostats to control room temperatures. Room temperatures were observed to be 72ºF. The typical heating setpoint was observed to be 70ºF.

2.3.2 Boilers

There are total of 9 hot water boilers that provide the heating hot water used for supply air reheat and the hydronic heating (fin/tube radiation) system for the majority of the buildings. Each boiler is scheduled to operate year round based on its individual building schedule. The supply heating hot water temperature set point is 180ºF and is reset based on building load. Hot water pumps circulate heating hot water through the buildings to the heating coils, and hydronic heating system. Replacement of old hot water boilers with high efficiency condensing boilers is an energy saving opportunity that the customer wants to consider. This measure will be discussed in Section 4.

2.3.3 Lighting

The PE and FH ceiling lighting is metal halide fixtures. Upgrading HID lighting to fluorescent lighting is an energy saving measure. This project is started already and should be completed in the Fall of 2010.

The majority of ceiling lighting in other campus buildings is 4', 3-lamp, 1st generation T-8 fluorescent fixtures with electronic ballasts. There are also some 4', 2-lamp and single-lamp, 1st generation T-8 fluorescent fixtures in some areas. Upgrading to lower wattage state-of-the-art 3rd generation T-8 fixtures is an energy savings measure discussed in Section 4.

Track lighting fixtures in the BK-SU building are equipped with halogen lamps. Upgrading track lighting with LED lamps is an energy savings opportunity that is discussed in Section 4.

Office area and classroom lighting is controlled by manual switches only. Installing lighting occupancy sensor control of classroom and office lighting is an energy saving measure that will be discussed in Section 4.

Outdoor parking lot lights are combinations of different capacities of high pressure sodium and metal halide fixtures controlled by time clocks and photocells. Upgrading these fixtures to more efficient LED lighting is discussed in Section 4.

2.3.4 Domestic Hot Water

Natural gas (electric in AJ) domestic water heaters are installed in the majority of the buildings on the campus to heat domestic water as needed.

2.3.5 Kitchen and Dining Area Equipment

Fully equipped commercial kitchens (BK-SU and CDC) provide food service to students and employees in the main cafeteria and in the executive dining room on a daily basis. Gas ranges, conventional ovens, slicers, blenders, mixers, etc. are used to prepare meals for the students and employees of the college every day.

Commercial refrigerators with and without display cases, cold tables, ice making machines and walk-in refrigerators and freezers run 24 hours per day, 7 days per week.

2.3.6 Miscellaneous Equipment

Other equipment includes auto shop equipment, a dental lab and a nursing classroom. Other equipment in the office areas includes the usual computers, printers, fax machines, copiers, etc.

The campus also operates a small wastewater treatment plant with a 15-hp blower and two 25-hp pumps.

Section 3 Site Energy Use and Costs

3.1 ELECTRICITY CONSUMPTION

The unit cost of energy is an important factor in any energy management study. Energy savings in this study are based on incremental energy prices. There is one electric account and five electric meters for the entire scope of this study, serving all College of the Redwoods campus buildings with outdoor lighting, its sewage plant, sewage plant lab, outdoor stadium and storage barn. PG&E Rate Schedules are E-19P, A-10S, A1P, for commercial and industrial customers, and A-1 for small general service.

The electric rate for meter # 56M156 (main college buildings) is PG&E Rate Schedule E-19P for General Metered Demand Service Customers. The E-19P rate is for commercial and industrial customers that take service at primary voltage from the PG&E distribution system. This is a seasonal, time-of-use rate in which both the demand and energy use in the on-peak, part-peak, and off-peak periods are measured separately and billed at different rates. Customers likely to benefit from this rate schedule have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period.

The electric rate for meter #M07631 (sewage plant) is PG&E Rate Schedule A10S-TOU. This rate is for medium commercial customers that take service at secondary voltage from PG&E's distribution system. Customers with high electric use during peak and partial peak hours generally benefit under this rate schedule. This is a seasonal, time-of-use rate in which both the demand and energy use in the on-peak, part-peak, and off-peak periods are measured separately and billed at different rates. Customers likely to benefit from this rate schedule have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period.

The electric rate for meter #T78501 (stadium) is PG&E Rate Schedule A1P. This rate is for small commercial poly-phase customers that take service at secondary voltage from PG&E's distribution system. Customers with low electric use and low load factors during peak and partial peak hours generally benefit under this rate schedule. This is a seasonally flat rate with flat energy and demand charges.

The electric rate for meters #48E089 (sewage plant lab) and #X52492 (storage barn) is PG&E Rate Schedule A1. This rate is for small commercial single-phase customers that take service at secondary voltage from PG&E's distribution system. Customers with low electric use and low load factors during peak and partial peak hours generally benefit under this rate schedule. This is a seasonally flat rate with flat energy and demand charges.

Detailed monthly electricity usage by individual electric accounts is provided in the Appendix A.

The combined monthly electric demand, consumption, and cost for College of the Redwoods facilities studied are shown in the Table 3.1.

Table 3.1: Monthly Electric Demand, Consumption, and Cost

Month	Maximum Demand (kW)	Electricity Consumption	Electricity Cost ($)
Dec-08	752	303,609	$ 29,832
Jan-09	625	277,132	$ 26,104
Feb-09	783	329,149	$ 31,195
Mar-09	788	305,013	$ 31,319
Apr-09	777	337,364	$ 34,940
May-09	808	301,560	$ 41,357
Jun-09	615	253,014	$ 38,389
Jul-09	567	249,395	$ 41,680
Aug-09	563	227,245	$ 38,989
Sep-09	703	294,116	$ 46,994
Oct-09	749	314,008	$ 47,064
Nov-09	746	316,982	$ 39,331
Totals	**-**	**3,508,587**	**$ 447,193**
Average Total Cost of Electricity ($ / kWh)			**$ 0.13**

From the table, it can be seen that over the 12-month period ending in November 2009, PG&E delivered 3,508,587 kWh at an average cost of $0.13 per kWh.

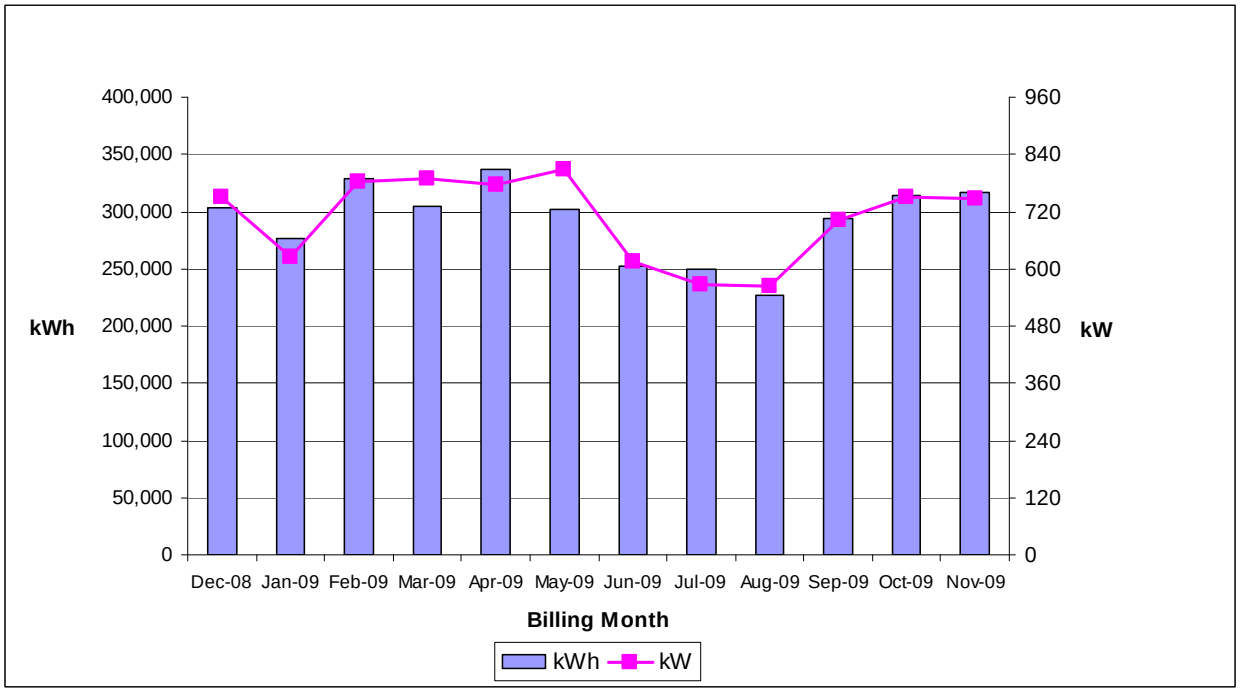


Figure 3.1: Monthly Electricity Consumption and Maximum Demand

Figure 3.1 shows the recent PG&E billing history for the monthly electricity consumption and maximum demand.

The average electricity consumption is 292,382 kWh per month. During February and May the consumption was a little higher which could be explained by the higher activity and more classes during daytime provided on campus. The lower kWh usage during June, July and August 2009 is due to reduced summer class schedules. The lower kWh usage during January 2009 could be explained by the Christmas/New Years break and reduced operation on campus.

The demand profile shown in Figure 3.1 is fairly flat, and there are no unusual peaks during the 12-month period except the lower operation during January, June, July and August 2009.

The 15-minute interval profiles of the actual metered electric use were also studied. The interval data was available for the 12 month period from 12/01/08 until 11/30/09. Interval profiles were analyzed to see if there were any unusual spikes that might indicate opportunities for peak demand control on a monthly basis. Figure 3.2 shows demand profiles for the following days:

- 4/28/2009 was the highest winter weekday peak day in the previous 12 months, with a maximum on peak demand of 806 kW and a total energy use of 12,976 kWh.
- 3/2/2009 was the highest winter weekend peak day in the previous 12 months, with a maximum demand of 786 kW and a total energy use of 13,285 kWh.
- 5/6/2009 was the highest summer weekday peak day in the previous 12 months, with a

maximum on peak demand of 747 kW and a total energy use of 12,921 kWh.

- 5/4/2009 was the highest summer weekend peak day in the previous 12 months, with a maximum on peak demand of 748 kW and a total energy use of 13,137 kWh.

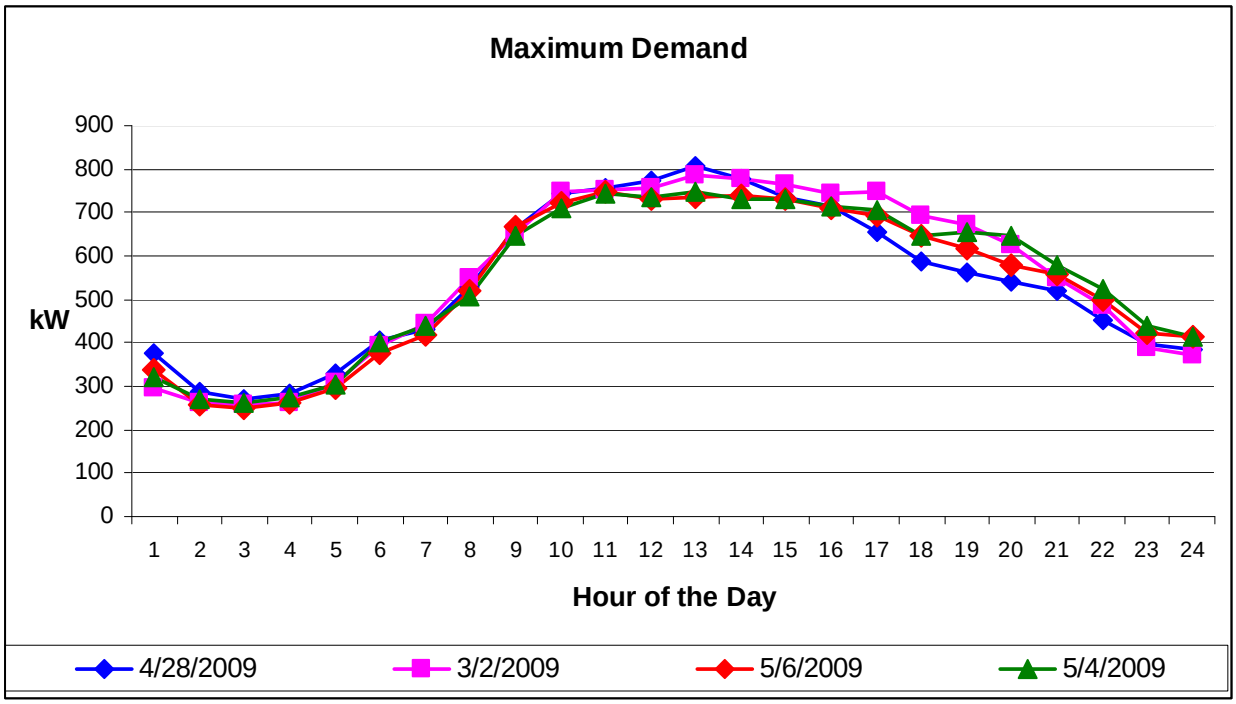


Figure 3.2: Load Shape by day type

The minimum demand of about 230 kW was typical of most days during the previous 12 months and mostly represents the energy used to run overnight air conditioning for the server room, lighting and plug loads, such as computers. This chart shows an expected daily pattern with mid-afternoon summer and winter peaks and does not show any unusual or unexpected peaks. The demand profile does not show any unusual peaks and is very similar for winter and summer time.

Due to variations in operating schedule and the weather, the average load profile during summer changes each month. Figure 3.3 shows how these vary during the on peak summer months, with the highest average load occurring in October and the lowest average load occurring in July.

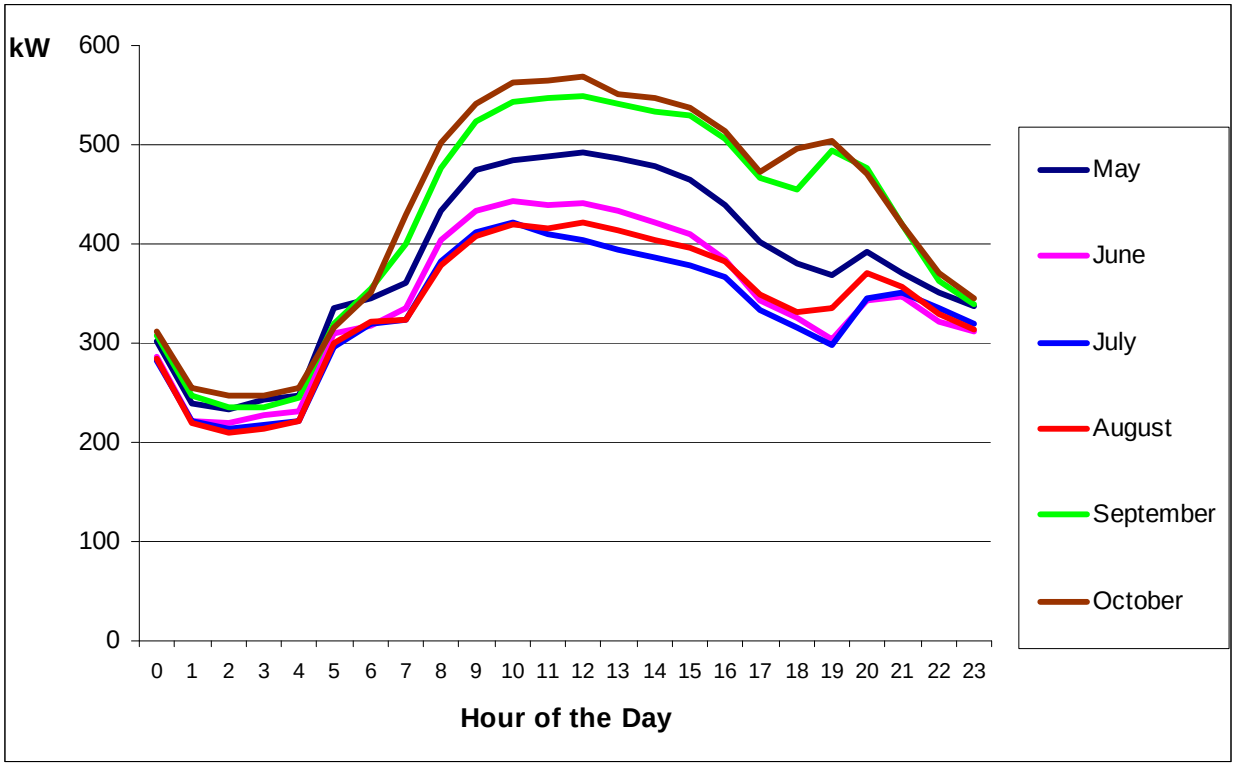


Figure 3.3: Average Monthly Summer Load Profiles

Electricity consumption patterns for College of the Redwoods do vary seasonally due to changes in its operating schedule. Most end-users in California do require more electricity during the hottest hours of mid-summer days. As a result of peak demand periods like this, PG&E is required to provide excess capacity in its generation and transmission systems. Charging consumers a variable price for electricity, with a higher charge for peak periods, can offset the cost associated with providing this added capacity. The College of the Redwoods is enrolled in such a variable rate structure, referred to as Time of Use (TOU).

Table 3-2 summarizes the E-19P Rate Schedule effective June 1, 2010. These rates include an increase in the average total rate from $0.13253 in 2009 to $0.13301 in 2010.

Table 3-3 summarizes the A-10S TOU Rate Schedule effective June 1, 2010. These rates include an increase in the average total rate from $0.15868 in 2009 to $0.16049 in 2010.

Table 3-4 summarizes the A-1 Rate Schedule effective June 1, 2010. These rates include an increase in the average total rate from $0.17924 in 2009 to $0.18075 in 2010.

Table 3.2: 2010 PG&E E-19P TOU Tariff Rate Structure

Rate Schedule	Rate Design	Customer Charge	Season	Time-of-Use Period	Demand Charge ($ / kW)	Energy Charge ($ / kWh)	Average Total Rate (per kWh)
E-19P	Three Period TOU Rate	$19.71253/day Meter charge	Summer	On-Peak	$11.80	$0.15217	$0.13301
				Part-Peak	$2.70	$0.10319	
				Off-Peak	-	$0.08205	
				Maximum	$7.47	-	
			Winter	Part-Peak	$0.84	$0.08898	
				Off-Peak	-	$0.07823	
				Maximum	$7.47	-	

Definitions

Summer Season: May through October

On-Peak: 12:00 pm to 6:00 pm, weekdays (except holidays)

Part-Peak: 8:30 am to 12:00 pm and 6:00 pm to 9:30 pm, weekdays (except holidays)

Off-Peak: 9:30 pm to 8:30 am, weekdays, and all day on Saturday, Sunday, and holidays

Winter Season: November through April

Part-Peak: 8:30 am to 9:30 pm, weekdays (except holidays)

Off-Peak: 9:30 pm to 8:30 am, weekdays, and all day on Saturday, Sunday, and holidays

Table 3.3: 2010 PG&E A-10S TOU Tariff Rate Structure

Rate Schedule	Rate Design	Customer Charge	Season	Time-of-Use Period	Demand Charge ($ / kW)	Energy Charge ($ / kWh)	Average Total Rate (per kWh)
A-10S TOU	Three Period TOU Rate	$3.94251 day Meter charge	Summer	On-Peak	$10.88 -	$0.16289	$0.16049
				Part-Peak		$0.14031	
				Off-Peak		$0.12687	
			Winter	Part-Peak	$6.52 -	$0.11195	
				Off-Peak		$0.10116	

Definitions

Summer Season: May through October

On-Peak: 12:00 pm to 6:00 pm, weekdays (except holidays)

Part-Peak: 8:30 am to 12:00 pm and 6:00 pm to 9:30 pm, weekdays (except holidays)

Off-Peak: 9:30 pm to 8:30 am, weekdays, and all day on Saturday, Sunday, and holidays

Winter Season: November through April

Part-Peak: 8:30 am to 9:30 pm, weekdays (except holidays)

Off-Peak: 9:30 pm to 8:30 am, weekdays, and all day on Saturday, Sunday, and holidays

Table 3.4: 2010 PG&E A-1, A-1P Tariff Rate Structure

Rate Schedule	Customer Charge	Season	Demand Charge ($/kW)	Energy Charge ($ / kWh)	Average Total Rate (per kWh)
A-1, A-1P	Single Phase - $0.29569/day Meter charge Poly phase - $0.44353/day Meter charge	Summer	-	$0.19937	$0.18075
		Winter	-	$0.14373	
Definitions Summer Season: May through October Winter Season: November through April					

3.2 NATURAL GAS CONSUMPTION

There are five natural gas accounts for the entire scope of this study, serving College of the Redwoods campus buildings including all classrooms and educational offices, the student union, dormitories, greenhouse buildings, svc central complex and field house. PG&E Rate Schedules that apply are G-NR1 and G-NTD. In addition, the college purchases its natural gas from a third party supplier. However, we were not provided information on this rate. Consequently, for the purposes of evaluating the economics of energy savings measures in this report, we assumed an average cost of $0.80 per therm (transportation and commodity) which is approximately what other PG&E G-NR1 customers typically pay for natural gas.

The natural gas rate schedule for accounts 1157987717 (student union), 3483360152 (dormitories), 7597827449 (elec/greenhouse bldgs), 9545638648 (svc cen complex) and 9587305312 (field house) is PG&E Rate Schedule G-NR1. The G-NR1 rate is for small commercial customers. This is a seasonal rate. All natural gas for these buildings is used as fuel for natural gas heating furnaces, cooking and hot water domestic water heaters. Table 3.5 summarizes the G-NR1 Rate Schedule effective January, 2010.

Table 3.5: 2010 PG&E G-NR1 Tariff Rate Structure

therms	0 – 5.0	5.1 to 16.0	16.1 to 41.0	41.1 to 123.0	123.1 & Up
Customer	$0.27048	$0.52106	$0.95482	$1.66489	$2.14936

	Summer (per therm)		Winter (per therm)	
	First 4,000	Excess	First 4,000 Therms	Excess
Procurement Charge:	$0.57973	$0.57973	$0.57973	$0.57973
Transportation	$0.29460	$0.09054	$0.35980	$0.11058
Total:	$0.87433	$0.67027	$0.93953	$0.69031

Schedule G-NTD applies to the transportation of natural gas to Nonresidential End-Use Customers on PG&E's Local Transmission and/or Distribution Systems. The distribution level rate applies to customers served from PG&E gas facilities that have a maximum operating

pressure of sixty pounds per square inch (60psi) or less. Usage through multiple non-core gas meters on a single premises will be combined to determine Average Monthly Usage. The major campus gas load is space heating. The rest of the gas used on this account is for domestic water heating.

Table 3.6 summarizes the G-NTD Rate Schedule effective August 1, 2010

Table 3.6: 2010 PG&E G-NTD Tariff Rate Structure

Average Monthly Use (therms)	0-5,000	5000-10,000	10,001-50,000	50,001-200,000	200,001-1,000,000	1,000,000 & above
Customer Access Charge (per day)	$2.03342	$6.05688	$11.27310	$14.79485	$21.46586	$182.08603

G-NTD			G-PPPS		G-NTD with G-PPPS	
Average Monthly Use (therms)	Summer	Winter	Summer	Winter	Summer	Winter
0-20,833	$0.14660	$0.18999	$0.04106	$0.04106	$0.18766	$0.23105
20,834-49,999	$0.10165	$0.12932	$0.04106	$0.04106	$0.14271	$0.17038
50,000-166,666	$0.09247	$0.11692	$0.04106	$0.04106	$0.13353	$0.15798
166,667-249,999	$0.08529	$0.10723	$0.04106	$0.04106	$0.12635	$0.14829
250,000 & above	$0.02630	$0.02630	$0.04106	$0.04106	$0.06736	$0.06736

Detailed monthly natural gas usage for each individual natural gas account is provided in Appendix A.

The monthly natural gas consumption and cost for all the accounts combined, are shown in Table 3.7.

Table 3.7: Combined Monthly Natural Gas Consumption and Cost

Month	Natural Gas Consumption (therms)	Total Natural Gas Cost ($)
Dec-08	24,528	$ 19,622
Jan-09	24,791	$ 19,833
Feb-09	23,669	$ 18,935
Mar-09	24,517	$ 19,614
Apr-09	22,496	$ 17,997
May-09	17,960	$ 14,368
Jun-09	12,888	$ 10,310
Jul-09	10,292	$ 8,234
Aug-09	5,960	$ 4,768
Sep-09	9,556	$ 7,645
Oct-09	15,535	$ 12,428
Nov-09	20,196	$ 16,157
Totals	**212,388**	**$ 169,910**
Average Total Cost of Natural Gas ($ / therm)		**$ 0.80**

From the table, it can be seen that over the 12-month period ending in November 2009, PG&E delivered 21,388 therms at an approximate cost of $169,910 assuming an average cost of $0.80 per therm.

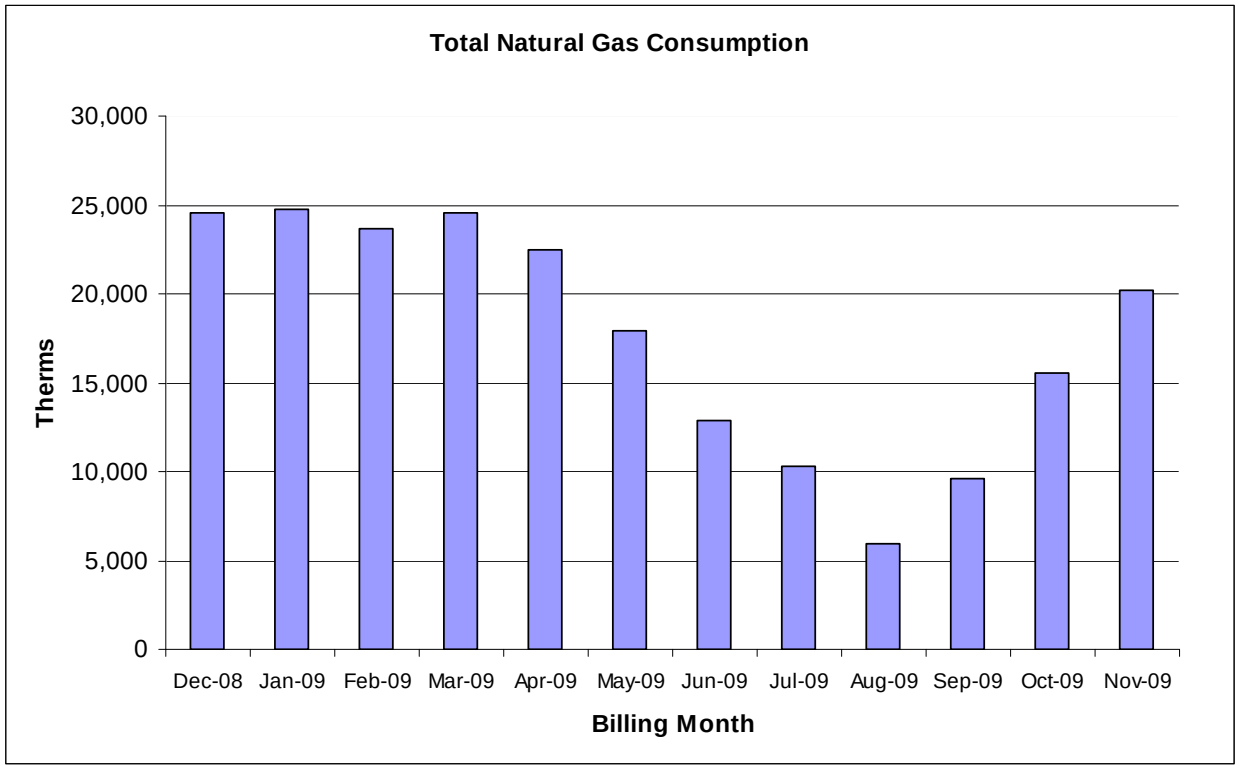


Figure 3.4: Monthly Natural Gas Consumption

Figure 3.4 shows combined average monthly natural gas consumption for the facilities studied for the 12 month period from December 2008 until November 2009.

The average gas consumption for this account during this period was about 17,699 therms per month. From Figure 3.4 it can be seen that gas usage varies based on season and operating schedule. During December 2008 and January, February, March and April 2009 natural gas consumption was much higher than other months due to higher usage for space heating during these colder winter months. The lower therms usage during June, July, August and September 2009 is due to warmer weather and lower activity during these months.

3.3 TOTAL COST OF ENERGY

The approximate total cost for energy used annually at the facility is $617,103.64. Electricity usage represents 72% of the total annual energy cost. HVAC, lighting and office equipment are the highest electricity consuming systems in the building. Figure 3.5 shows the total utility costs by month for the facility.

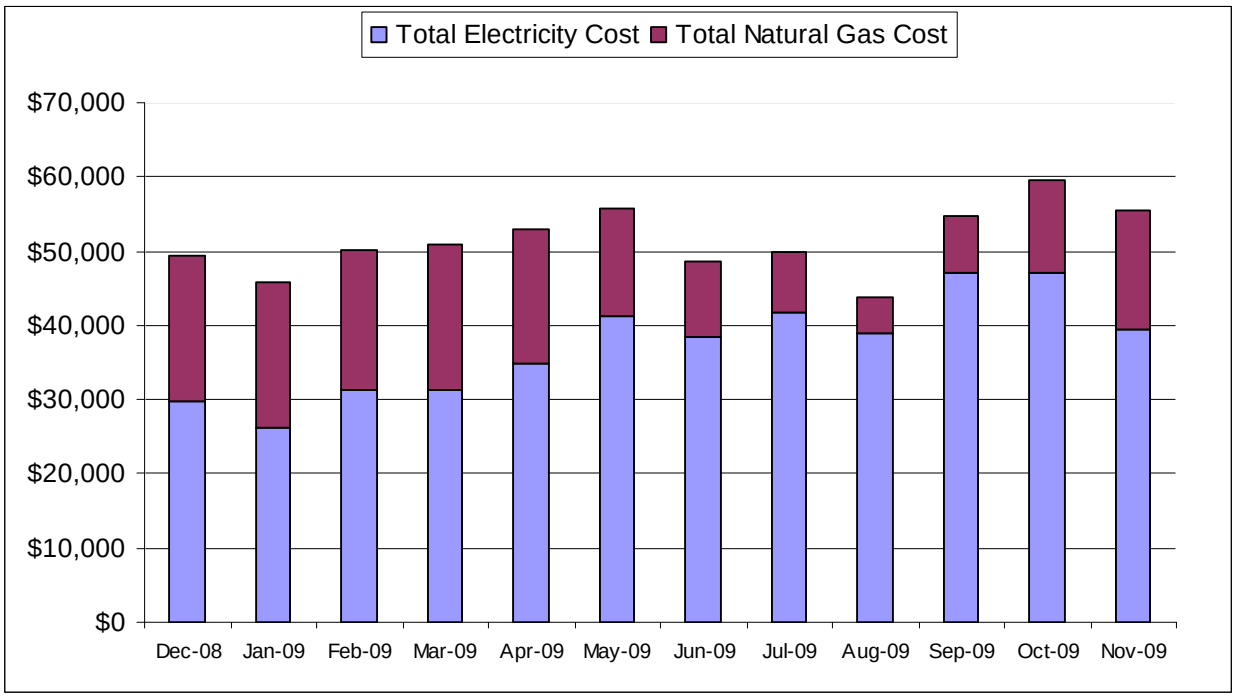


Figure 3.5: Total Monthly Energy Costs

There are several opportunities to improve the efficiency of this campus. High-efficiency lighting could be installed in office spaces and classrooms and occupancy sensors should be installed to turn lights off automatically during unoccupied periods. Parking lot lighting could be replaced with more efficient LED lighting. Old boilers could be replaced with more efficient condensing boilers.

Section 4 Energy Project Opportunities

On March 18, 2010, KEMA, as a PG&E contractor, performed a detailed integrated energy audit of the College of the Redwoods campus at 7351 Tompkins Hill Rd. in Eureka, CA. The KEMA team met with Garry Patrick, Director Maintenance & Operations to review facility operations and focus the investigation on specific systems of interest.

The specific systems of interest include:

- HVAC systems
- Lighting systems
- Building load controls

Operating schedules and data used in this evaluation were based on current building control system observations made during the on-site visit, and descriptions of the operation by building staff. The estimates of savings are intended to be generally conservative.

The following sections detail recommended measures categorized by measure cost and type. Detailed calculations for each measure are provided in Appendix B.

4.1 LOW-COST MEASURES

Low-cost measures are energy conservation, energy efficiency, or time-of-use management projects with a capital cost of less than $10,000. These measures significantly reduce energy consumption and costs while requiring relatively little capital investment.

4.1.1 LCM-1: Control LRC ceiling lights with photocells

Observations

There are total of twenty two 11-Watt BIAX fixtures that face upward to illuminate the ceiling. These fixtures, located next to clearstory windows, were observed to be on during a bright sunny day.

Recommendations

Install photocells to automatically turn off these lights when ambient light levels are high.

Cost Impacts

The measure cost includes the installed cost of a photocell sensor-controller and connecting it to a lighting circuit. Also this measure requires rewiring circuits to isolate these fixtures from other fixtures in the room. It is assumed that the operating time of BIAX lighting will be reduced by at least 5 hours per day during winter and 7 hours per day during summer.

The estimated incentive of $0.24/kWh noted in the summary table is based on incentives available from the 2010 PG&E CCC/IOU Program.

Pre-retrofit and post-retrofit demand and energy usage are based on the energy usage of the existing BIAX fixtures controlled by manual switches.

Calculations are provided in Appendix B.

LCM-1: Control LRC ceiling lights with photocells

Savings Summary	
Pre-Retrofit Demand [kW]	**0.3**
Post-Retrofit Demand [kW]	**0.3**
Peak-Period Savings [kW]	**0.0**
Pre-Retrofit Energy Use [kWh/yr]	**982**
Post-Retrofit Energy Use [kWh/yr]	**402**
Annual Energy Savings [kWh/yr]	**580**
Annual Electric Cost Savings [$]	**$74**
Pre-Retrofit Energy Use [therms/yr]	**233,671**
Post-Retrofit Energy Use [therms/yr]	**233,671**
Annual Energy Savings [therms/yr]	**0**
Annual Gas Cost Savings [$]	**$0**
Total Dollars Saved [$]	**$74**
Cost Summary (no incentives)	
Measure Cost [$]	**$291**
Simple Payback [years]	**3.9**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$139**
Net Measure Cost [$]	**$152**
Simple Payback [years]	**2.1**
Emission Savings Summary	
CO_2 [lb]	802
SO_2 [lb]	2
NO_X [lb]	1

4.1.2 LCM-2: Install LED lamps in track lights in book store

Observations

A total of about one hundred forty five 20-Watt halogen lights in track lighting in the Book Store are used to illuminate merchandise.

Recommendations

The 20-Watt halogen lamps could be replaced with more energy efficient 8-Watt light emitting diode (LED) lamps. Technical data for possible replacement LED lamps can be found on line at http://assets.sylvania.com/assets/documents/RETRO010.011061d6-e734-428b-9be2-cd4063079a11.pdf

Cost Impacts

The measure cost includes the cost of new LED lamps and assumes the cost of one electrician for 0.25 hour to replace the halogen lamps in an average 5-lamp track.

PG&E does not provide incentives for this type of LED lamp. In addition to energy cost savings, this project should also result in significant maintenance cost savings. The expected life of an LED lamp of this type is 50,000 hours while the expected life of a halogen lamp is only 4,000 hours. The use of LED lamps should therefore result in far fewer burnout replacements.

Pre-retrofit and post-retrofit demand and energy usage include energy usage for the existing halogen lights and the new LED lights respectively.

Calculations are provided in Appendix B.

LCM-2: Install LED lamps in track lights in book store

Savings Summary	
Pre-Retrofit Demand [kW]	**2.9**
Post-Retrofit Demand [kW]	**1.2**
Peak-Period Savings [kW]	**1.7**
Pre-Retrofit Energy Use [kWh/yr]	**17,945**
Post-Retrofit Energy Use [kWh/yr]	**7,178**
Annual Energy Savings [kWh/yr]	**10,767**
Annual Electric Cost Savings [$]	**$1,372**
Pre-Retrofit Energy Use [therms/yr]	**233,671**
Post-Retrofit Energy Use [therms/yr]	**233,671**
Annual Energy Savings [therms/yr]	**0**
Annual Gas Cost Savings [$]	**$0**
Total Dollars Saved [$]	**$1,372**
Cost Summary (no incentives)	
Measure Cost [$]	**$5,584**
Simple Payback [years]	**4.1**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$0**
Net Measure Cost [$]	**$5,584**
Simple Payback [years]	**4.1**
Emission Savings Summary	
CO_2 [lb]	14,880
SO_2 [lb]	33
NO_X [lb]	15

4.1.3 LCM-3: Install Demand Controlled Ventilation in Library

Observations

Library spaces in the Learning Center are not always fully occupied during the day, but outside air supply rates to these areas are based on maximum occupancy. Control of carbon dioxide (CO_2) concentration has been used for many years as an energy-conservation measure in partially occupied building spaces like this to reduce outdoor air rates and the energy required to condition the outdoor air when spaces are not fully occupied. Technical data for possible CO_2 sensors can be found on line at

http://www.pexsupply.com/Honeywell-C7232A1032-Non-dispersive-Infrared-NDIR-Carbon-Dioxide-Sensor-Wall-Mount

LCM-3: Install Demand Controlled Ventilation in Library

Savings Summary	
Pre-Retrofit Demand [kW]	**627.2**
Post-Retrofit Demand [kW]	**627.2**
Peak-Period Savings [kW]	**0.0**
Pre-Retrofit Energy Use [kWh/yr]	**3,212,156**
Post-Retrofit Energy Use [kWh/yr]	**3,212,156**
Annual Energy Savings [kWh/yr]	**0**
Annual Electric Cost Savings [$]	**$0**
Pre-Retrofit Energy Use [therms/yr]	**233,671**
Post-Retrofit Energy Use [therms/yr]	**233,561**
Annual Energy Savings [therms/yr]	**110**
Annual Gas Cost Savings [$]	**$88**
Total Dollars Saved [$]	**$88**
Cost Summary (no incentives)	
Measure Cost [$]	**$996**
Simple Payback [years]	**11.3**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$110**
Net Measure Cost [$]	**$886**
Simple Payback [years]	**10.0**
Emission Savings Summary	
CO_2 [lb]	1,291
SO_2 [lb]	0
NO_X [lb]	93

Recommendations

Outdoor air (OA) supply rate could be reduced to 5 cfm/person plus 0.06 cfm/sq.ft. by modulating the minimum outside air rate based on actual occupancy. CO_2 sensors can be used to monitor indoor air quality levels, and signal the building control system to admit more or less outside air to maintain acceptable CO_2 concentrations. Reducing the intake of cold outside air reduces the need for heating and results in lower use of natural gas.

Demand ventilation controls are typically set up so that the outdoor minimum ventilation setpoint is at the *base minimum* ventilation flow rate value until the space *design minimum* ventilation flow rate value and zone CO_2 concentration continues to rise. At this point, the outdoor air ventilation setpoint will be reset upwards towards the *design minimum* ventilation flow rate value and the outdoor air damper will modulate open.

CO_2 concentration only impacts the minimum ventilation flow rate. The economizer control loop takes precedence over the demand-controlled ventilation control loop. Due to the increased complexity of the control sequences, some designers may opt for just controlling the VAV zone and leave the minimum ventilation setpoint for the air handler fixed at the *design minimum* value.

An example operating sequence for controlling both the VAV system and outdoor air damper in a variable air volume system is illustrated below.

The minimum ventilation flow rate setpoint for each VAV zone is at its respective *VAV base minimum* ventilation flow rate value when zone CO_2 concentration is below setpoint. The minimum outdoor ventilation flow rate setpoint for the central air handling unit is at the *AHU base minimum* ventilation flow rate value when **ALL** zone CO_2 concentrations are below setpoint. As an individual zone CO_2 concentration increases above setpoint, the minimum ventilation flow rate setpoint for that VAV zone is reset linearly from the *VAV base minimum* to *VAV design minimum* ventilation flow rate value as the CO_2 control loop output value ranges between 0% and 50%. The minimum outdoor ventilation flow rate setpoint at the central air handling unit remains at the *AHU base minimum* ventilation flow rate value. If the CO_2 control loop output value for **ANY** zone exceeds 50%, the minimum outdoor ventilation flow rate setpoint is reset linearly from the *AHU base minimum* to *AHU design minimum* ventilation flow rate value as the CO_2 control loop output value ranges between 50% and 100%.

This measure reduces the amount of circulated air going to the space (between *VAV base minimum* to *VAV design minimum* ventilation flow rate), supply fan speed and a number of operating exhaust fans during the periods of time when CO_2 concentration is below setpoint.

Cost Impacts

The measure cost includes the cost of one CO_2 sensor, wiring, and programming. Note: if the system serves more than one room, CO_2 sensors should be installed in all spaces served, and the outside air flow rate should be based on the highest CO_2 concentration reading.

The estimated incentive of $1/therm noted in the summary table is based on incentives available from the 2010 PG&E Enhanced Automation Initiative Program.

Calculations are provided in Appendix B.

4.2 CAPITAL-INTENSIVE MEASURES

Capital-intensive measures are energy conservation, energy efficiency, or time-of-use management projects with a capital cost of greater than $10,000. These measures significantly reduce energy consumption and costs, but also require significant capital investment.

4.2.1 CIM-1: Install more efficient T-8 fluorescent lighting

Observations

All linear fluorescent lighting in the campus classroom buildings is 1st generation T-8 fluorescent fixtures.

Recommendations

We recommend upgrading 1st generation T-8 fixtures to lower wattage 3rd generation T-8 fixtures. The measure will save 273,937 kWh annually and reduce on peak demand by 63 kW.

The list of qualifying lamps and ballasts can be found at http://www.cee1.org/com/com-lt/lamps-ballasts.xls

Cost Impacts

The measure cost includes the cost of 19,902 new 28-watt "super" T-8 lamps, 6,634 ballasts and the labor to remove and install new lamps and ballasts in existing lighting fixtures. The number of lamps in the estimate is approximate and should be confirmed through an actual count by facility staff.

The payback period after PG&E incentives will be 15.9 years.

If College of the Redwoods considers lamp replacement only, the savings will be 182,424 kWh/yr with 42.1 kW peak demand savings on demand and the payback period will reduce to 8.1 years.

CIM1: Install more-efficient T-8 fluorescent lighting

Savings Summary	
Pre-Retrofit Demand [kW]	**627.2**
Post-Retrofit Demand [kW]	**564.2**
Peak-Period Savings [kW]	**63.0**
Pre-Retrofit Energy Use [kWh/yr]	**2,537,678**
Post-Retrofit Energy Use [kWh/yr]	**2,263,742**
Annual Energy Savings [kWh/yr]	**273,937**
Annual Electric Cost Savings [$]	**$34,915**
Pre-Retrofit Energy Use [therms/yr]	**233,671**
Post-Retrofit Energy Use [therms/yr]	**241,564**
Annual Energy Savings [therms/yr]	**-7,893**
Annual Gas Cost Savings [$]	**($6,314)**
Total Dollars Saved [$]	**$28,601**
Cost Summary (no incentives)	
Measure Cost [$]	**$520,778**
Simple Payback [years]	**18.2**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$65,745**
Net Measure Cost [$]	**$455,034**
Simple Payback [years]	**15.9**
Emission Savings Summary	
CO_2 [lb]	286,223
SO_2 [lb]	83
NO_X [lb]	-6,246

Labor calculations are based on 2010 RSMeans Electrical Cost Data.

The estimated incentive of $0.24/kWh noted in the summary table is based on incentives available from the 2010 PG&E CCC/IOU Program.

Calculations are provided in Appendix B.

4.2.2 CIM-2: Install lighting occupancy sensors in classrooms, offices and conference rooms

Observations

4 foot long T-8 fluorescent lighting fixtures in offices, classrooms and conference rooms are controlled by wall switches and were observed to be on in some areas during on site visit in unoccupied rooms.

Recommendations

Install occupancy sensors to shut off the lights when offices, classrooms and conference rooms are unoccupied. Some areas, such as offices should be equipped with wall mounted occupancy sensors, while other larger spaces such as classrooms corridors and conference rooms should be equipped with ceiling mounted sensors.

The measure will save 88,223 kWh/yr, but does not reduce peak demand.

CIM-2: Install lighting occupancy sensors in classrooms, offices and conference rooms

Savings Summary	
Pre-Retrofit Demand [kW]	**564.2**
Post-Retrofit Demand [kW]	**564.2**
Peak-Period Savings [kW]	**0.0**
Pre-Retrofit Energy Use [kWh/yr]	**2,263,742**
Post-Retrofit Energy Use [kWh/yr]	**2,175,519**
Annual Energy Savings [kWh/yr]	**88,223**
Annual Electric Cost Savings [$]	**$11,245**
Pre-Retrofit Energy Use [therms/yr]	**241,564**
Post-Retrofit Energy Use [therms/yr]	**244,125**
Annual Energy Savings [therms/yr]	**-2,561**
Annual Gas Cost Savings [$]	**($2,049)**
Total Dollars Saved [$]	**$9,196**
Cost Summary (no incentives)	
Measure Cost [$]	**$69,564**
Simple Payback [years]	**7.6**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$21,174**
Net Measure Cost [$]	**$48,390**
Simple Payback [years]	**5.3**
Emission Savings Summary	
CO_2 [lb]	91,958
SO_2 [lb]	27
NO_X [lb]	-2,028

Occupancy sensors, also known as motion sensors, offer an inexpensive and effective means of reducing energy costs by turning off lights when rooms or areas are unoccupied.

Many different types of occupancy sensors are available that are specifically designed to control lighting for a variety of applications. Most occupancy sensors detect motion based on passive infrared and/or ultrasonic methods of operation. Depending on the space type, the sensor can replace wall mounted light switches or can be mounted remotely retaining the normal switching for use as override switches, allowing the lighting to be kept off even when the space is occupied.

<u>Passive Infrared (PIR) Occupancy Sensors</u>

Passive infrared sensors monitor the patterns of background heat energy in the space. When the sensor detects a significant change in the background heat energy it responds by automatically turning the lights on, or by allowing the lights to be turned on manually. When the background heat energy returns to a stable condition, the sensor turns the lights off. Passive infrared sensors must have a direct "line of sight" to occupants in order to detect human presence. In order to minimize false sensing, the sensors are designed to respond to the heat energy wavelengths that are emitted by humans.

Active Ultrasonic Occupancy Sensors

These sensors broadcast sound waves at frequencies much higher than the human ear can detect. The sound waves bounce off of walls, objects, and people. When the frequency of the sound waves returning to the sensor changes (the Doppler effect), motion is detected and the sensor goes into the occupied mode. When the sound wave frequencies stabilize, the sensor turns the lights off. Unlike passive infrared sensors, ultrasonic sensors can "see" around objects and surfaces as long as there are hard surfaces in the space.

Dual-Technology Passive Infrared and Active Ultrasonic Occupancy Sensors

Utilizing both passive infrared and active ultrasonic technologies, these sensors are designed for use in large areas, in spaces that are difficult to cover, and for areas where maximum reliability is important for safety or productivity reasons.

Dual-Technology Passive Infrared and Microphonic Occupancy Sensors

These differ from the sensors described above in that no sound waves are transmitted by the sensor. The passive infrared technology senses initial movement and continues to monitor the infrared activity. In addition, a microphone monitors sound waves and keeps the lighting on until sound activity stabilizes.

Occupancy Sensors With Daylight Override

Many manufacturers now offer occupancy sensors with built-in daylight sensors. The daylight sensing can be adjusted to keep lights off when there is sufficient daylight, even when the space is fully occupied. These sensors are a great choice for private offices that receive significant amounts of natural light.

Control Strategies:

Fully Automatic or Manual-On/Auto-Off

Until recently, most occupancy sensors were fully automatic, turning the lights on when someone entered the room and turning them off after they left. For areas where there is a significant amount of light from natural daylight or from spillover from adjacent areas, this can be wasteful as the sensor may be turning the lights on when the occupants might have chosen to leave them off. Most manufacturers now offer units that are "off only" occupancy sensors. With these sensors, occupants must manually turn lights on. When the space becomes vacant the lights are automatically turned off and will stay off until the next time they are turned on manually. This style of sensor offers the maximum amount of energy savings.

Advancing Sensor Technology

The performance of modern occupancy sensors is exceptionally good and significantly better than the performance of earlier versions. Manufacturers continue to advance the technology with features that improve performance. Many sensors are now available that incorporate automatic adjusting features that adjust both sensitivity and the time that lights stay on following the last movement sensed. Additionally, newer sensor technology has nearly eliminated false triggering due to airflow and heat/humidity changes within the space.

Adjusting Sensors

Unless the sensors incorporate automatic adjusting features, they will need to be adjusted for both sensitivity and for time-delay. The sensitivity adjustment allows the user to adjust the sensor so that human movement is recognized, while false triggering from other motion is eliminated. Adjusting the time-delay properly prevents the lights from being turned off simply because an occupant has not recently moved, and prevents the lights from being turned on and off frequently if people tend to move in and out of the space during the day.

Wall switch or remote mounted passive infrared sensors work well for this application. If people will be working out of the sight line of the sensor, dual technology sensors should be used.

Cost Impacts

The total cost includes the cost of occupancy sensors installed in the classrooms, offices and conference rooms is based on 2010 RSMeans Electrical Cost Data.

The estimated incentive of $0.24/kWh noted in the summary table is based on incentives available from the 2010 PG&E CCC/IOU Program. Savings calculations are provided in Appendix B.

4.2.3 CIM-3: Install high efficiency hot water boilers on a replacement basis

Observations

Space heating for the majority of campus buildings is provided by 45-year old natural gas-fired hot water boilers. The efficiency of these units was assumed to be not higher than 70-75%. Replacement of these units with high-efficiency condensing boilers will reduce the use of natural gas.

CIM-3: Install high efficiency hot water boilers on a replacement basis

Savings Summary		
Pre-Retrofit Demand [kW]	**627.0**	
Post-Retrofit Demand [kW]	**627.0**	
Peak-Period Savings [kW]	**0.0**	
Pre-Retrofit Energy Use [kWh/yr]	**914,122**	
Post-Retrofit Energy Use [kWh/yr]	**914,083**	
Annual Energy Savings [kWh/yr]	**39**	
Annual Electric Cost Savings [$]	**$5**	
Pre-Retrofit Energy Use [therms/yr]	**226,561**	
Post-Retrofit Energy Use [therms/yr]	**207,294**	
Annual Energy Savings [therms/yr]	**19,267**	
Annual Gas Cost Savings [$]	**$15,414**	
Total Dollars Saved [$]	**$15,419**	
Cost Summary (no incentives)	**Replacement**	**Incremental**
Measure Cost [$]	**$462,679**	**$121,631**
Simple Payback [years]	**30.0**	**7.9**
Cost Summary (with incentives)		
Potential PG&E Incentive [$]	**$19,267**	**$19,267**
Net Measure Cost [$]	**$443,412**	**$102,364**
Simple Payback [years]	**28.8**	**6.6**
Emission Savings Summary		
CO_2 [lb]	225,477	
SO_2 [lb]	0	
NO_X [lb]	16,184	

Recommendations

When it comes time to replace the existing boilers, install high efficiency (95% rating) condensing boilers.

Condensation begins when flue gas temperatures drop to about 130°F. Flue gases tend to be about 7°F warmer than the return water. So the critical factor in ensuring maximum efficiency of condensing boilers is the temperature of the return-water, which must generally be kept below 120°F.

A way to get low return water temperatures much of the time is to reset the supply heating water temperature based on the outdoor temperature. Because outdoor temperatures are usually above design temperatures (there are more warmer days than colder ones), outdoor reset can enable condensing 60-70% of the time.

Generally the supply heating hot water temperature setpoint should be lowered from 180°F until return hot water temperature drops to where water vapor in the flue gas condenses. Operating in this manner, the boiler should on the average be 92% efficient.

The customer should note that the condensate stream generated by a condensing boiler is corrosive. This will require consideration of upgraded metallurgy in all parts of the boiler exposed to wet flue gas including the boiler tubes, economizer tubes, exhaust plenum, and exhaust stack. Also, the customer may also need to neutralize the acidity of the condensate before it enters any drains to mitigate the risk of corroding underground drain piping. The

customer should also confirm that existing heating coil capacity in each system is sufficient to support the lower heating water temperatures of the condensing boiler operation. If coils are undersized, then the customer can consider either adding coil surface area or installing a high efficiency (84%) non-condensing boiler n lieu of a condensing boiler. However, therm savings from an 84% efficient boiler will be only about a third of what is estimated for a new condensing boiler.

Benefits

A high efficiency condensing boiler will use about 12% less natural gas to make the same amount of hot water as a new 80% combustion efficient boiler, which is what would otherwise be required (refer Table E-3 in the 2009 Appliance Efficiency Regulations, http://www.energy.ca.gov/appliances/2009regulations/). This not only conserves natural gas, it reduces atmospheric emissions.

Cost Impacts

A building energy use simulation model was prepared for the college campus using the eQUEST simulation program to estimate the energy savings for replacing existing hot water boilers with condensing boilers. Pre-retrofit and post-retrofit demand and energy usage includes energy usage for heating, fans and circulation pumps. The estimate is believed to be conservative.

The natural gas savings and project cost for this measure are presented in two ways. A quote to install new condensing boilers was obtained from California Hydronics Corporation and is provided in Appendix F. Based on total energy savings of 19,267 therms per year for new condensing boilers vs new 80% combustion efficient boilers, the total cost of the new condensing boilers would pay back in about 28.8 years. However, the cost for the high efficiency boilers is $121,631 more than new 80% efficient boilers. Therefore, when it comes time to replace these units due to reliability issues or excessive maintenance costs, it will be much more cost effective to buy new high efficiency boilers as the payback is reduced to 6years and 7 months after PG&E incentives based on the incremental cost of $121,631. Calculations are provided in Appendix B.

The customer should note that the gas savings for replacing the existing old boilers (assuming an operating efficiency of 75%) with new condensing boilers is 26,045 therms/yr.

The estimated incentive noted in the summary table is based on incentives available from the 2010 PG&E CCC/IOU Program and are based on savings of 19,267 therms/yr for new condensing boilers vs new standard 80% combustion efficient boilers.

Detailed savings calculations are provided in Appendix B.

4.2.4 CIM-4: Replace parking lot lighting

Observations

The outdoor parking lots are lit with seven 150W high pressure sodium, twenty 175W metal halide, twenty 250W high pressure sodium and twenty eight 400W high pressure sodium fixtures mounted on 35' poles. Outdoor lighting is controlled by photocells and a time clock.

Recommendations

We recommend retrofitting:

- The existing seven 150W high pressure sodium and twenty 175W metal halide fixtures with twenty seven 35' pole mounted 106W LED BETA lighting fixtures
- The twenty existing 250W metal halide fixtures with 35' pole mounted 181W LED BETA lighting fixtures
- The existing twenty eight 400W metal halide fixtures with 35' pole mounted 216W LED BETA lighting fixtures.

Cost Impacts

The measure cost includes:

1. The cost of removing existing pole fixtures (heads).
2. The cost of new fixtures (head) and the labor to install fixtures.

CIM-4: Replace parking lot lighting

Savings Summary	
Pre-Retrofit Demand [kW]	**24.7**
Post-Retrofit Demand [kW]	**12.5**
Peak-Period Savings [kW]	**0.0**
Pre-Retrofit Energy Use [kWh/yr]	**107,671**
Post-Retrofit Energy Use [kWh/yr]	**54,731**
Annual Energy Savings [kWh/yr]	**52,940**
Annual Electric Cost Savings [$]	**$6,748**
Pre-Retrofit Energy Use [therms/yr]	**233,671**
Post-Retrofit Energy Use [therms/yr]	**233,671**
Annual Energy Savings [therms/yr]	**0**
Annual Gas Cost Savings [$]	**$0**
Total Dollars Saved [$]	**$6,748**
Cost Summary (no incentives)	
Measure Cost [$]	**$87,694**
Simple Payback [years]	**13.0**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$12,706**
Net Measure Cost [$]	**$74,988**
Simple Payback [years]	**11.1**
Emission Savings Summary	
CO_2 [lb]	73,162
SO_2 [lb]	16
NO_X [lb]	74

Note: The cost of new parking lot fixtures was provided by a quote from Lighting Systems in Appendix D.

There are no peak kW savings shown for this measure because this lighting operates only during off-peak nighttime hours.

Labor calculations are based on 2010 RSMeans Electrical Cost Data.

The estimated incentive noted in the summary table $0.24/kWh is based on incentives available from the 2010 PG&E CCC/IOU Program. Detailed savings calculations are provided in Appendix B.

4.2.5 CIM-5: Install more efficient walking pathway lights

Observations

The outdoor walking pathways are lit with one hundred ten 150W high pressure sodium fixtures mounted on poles. Outdoor lighting is controlled by photocells and a time clock.

Recommendations

We recommend retrofitting all one hundred ten 150W high pressure sodium walking pathway fixtures with one hundred and ten 85W induction fixtures.

A high color rendering index (CRI) is crucial to visibility, safety and comfort. The CRI measures the quality of light from a lamp relative to sun light. The higher the CRI, the closer the light quality is to natural sunlight. Induction lamps with CRI greater than 80 can illuminate much better than the existing high pressure sodium lamps.

Also induction lamps last up to 60,000 hours making them much less maintenance intensive than the existing high pressure sodium fixtures.

Technical data for possible replacement with induction lamps can be found at http://www.eclipselightinginc.com/media/Technical%20Data/PDF/QL%20Induction%20Lighting%20FAQ.pdf or http://www.everlastlight.com/compare_hid_lighting.html or http://docs.google.com/gview?url=http://www.lighting.philips.com/us_en/browseliterature/download/ql_oem_guide.pdf.

CIM-5: Install more efficient walking pathway lights

Savings Summary	
Pre-Retrofit Demand [kW]	**20.9**
Post-Retrofit Demand [kW]	**9.8**
Peak-Period Savings [kW]	**0.0**
Pre-Retrofit Energy Use [kWh/yr]	**60,861**
Post-Retrofit Energy Use [kWh/yr]	**28,508**
Annual Energy Savings [kWh/yr]	**32,352**
Annual Electric Cost Savings [$]	**$4,124**
Pre-Retrofit Energy Use [therms/yr]	**0**
Post-Retrofit Energy Use [therms/yr]	**0**
Annual Energy Savings [therms/yr]	**0**
Annual Gas Cost Savings [$]	**$0**
Total Dollars Saved [$]	**$4,124**
Cost Summary (no incentives)	
Measure Cost [$]	**$33,550**
Simple Payback [years]	**8.1**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$7,765**
Net Measure Cost [$]	**$25,785**
Simple Payback [years]	**6.3**
Emission Savings Summary	
CO_2 [lb]	44,710
SO_2 [lb]	10
NO_X [lb]	45

Cost Impacts

The measure cost includes:

- The cost of removing existing pole fixtures (heads).
- The cost of new fixtures (head) and the labor to install fixtures.

Note: A quote for the cost of the new walking pathway fixtures was provided by Tla-Advantage (Eclipse) in Appendix H.

There are no peak kW savings shown for this measure because this lighting operates only during off-peak nighttime hours.

The estimated incentive noted in the summary table $0.24/kWh is based on incentives available from the 2010 CCC/IOU program.

4.3 DEMAND RESPONSE MEASURES

Demand response programs – are also known as load curtailment, peak load reduction, peak shaving, or load shedding They provide incentives for reducing electricity use during peak demand hours (the 80 to 100 highest demand hours out of 8,760 hours a year). All of these programs ask or cause participating customers to respond to a signal to reduce demand in return for a variety of financial incentives that reflect the value of what the customer is providing: response time and surety of delivery.

Your electricity reduction is the difference between a usage baseline and your actual electricity usage during the event. Your baseline is determined on an hour-by-hour basis using the average electricity used for the 10 similar days prior to the event.

Price responsive demand response programs address supply or price concerns that can be forecasted the day ahead by energy providers, causing them to activate demand response events, and enabling you to initiate your specific solutions to be carried out on the critical day. By contrast, reliability demand response programs are designed for response on very short notice, usually just minutes, to mitigate unpredictable power supply or grid emergencies.

In addition to various incentives in its core demand response programs, PG&E pays project incentives of up to $125 per kilowatt (kW) of test-verified load reduction on the installation of certain recommended technologies that enable participation in DR programs. Customers can earn project incentives for retrofits through the Customized Retrofit – Demand Response program (CR-DR) and for new construction through the Customized New Construction – Demand Response (CNC-DR) program.

There are three levels of response to DR events:

- Manual. After receiving a DR signal from PG&E the customer sheds load by manual shut down of some equipment.
- Semiautomatic. After receiving a DR signal from PG&E load is reduced by the customer through the BMS system.
- Automatic. When an Auto-DR event occurs PG&E's DR automation server sends a signal to the customer site that causes the customer's BMS to automatically reduce load.

For the demand response measures recommended in this section for this customer, the credits and/or incentives are based on PG&E's Peak Day Pricing Plan, assuming a four-hour event that takes place 12 times per year.

Current demand response options include:

• *PeakChoice Best Effort* is the most flexible demand response program. It requires you to curtail at least 10 kW of demand during an event. The incentive rate paid is based on the amount event notification lead-time you choose:

- Two-day notice–$0.40/kWh
- One-day notice–$0.50/kWh
- 4 1/2-hour notice–$0.60/kWh

- 30-minute notice–$1.00/kWh

  Once notified, you have up to two hours to confirm your participation except for 30-minute Best Effort participants who must have their reduction confirmed within 30 minutes of notification. There is no penalty if you are not able to reduce your electricity when asked.

• *PeakChoice Committed* also requires you to curtail at least 10 kW of demand. Whether a peak demand event occurs or not, your company receives monthly incentives from May to October based on the amount of kW you commit to reduce during an event, the lead-time notice you need to participate in events, your desired event durations, the number of events you commit to each year and the number of consecutive days in which you can participate.

The monthly incentive payments under PeakChoice's Committed plan (CR) is determined by multiplying your committed kW load reduction by the PeakChoice Committed incentive rate. The incentive rate is based on your chosen lead-time for event notification, as follows:

- 2 Days notice ($4/kW)
- 1 Day notice ($5/kW)
- 4.5 Hours notice ($7/kW)
- 30 Minutes notice ($10/kW)

The base is increased depending on the choices you make on the options cited in the previous paragraph.

Offsets to the monthly incentive payments are assessed for each actual event hour in the respective months in which you are unable to deliver your committed load reduction amount.

In addition to the monthly incentives, qualified demand reductions during an event provide incentives at a rate of $0.15/kWh. If you are able to deliver at least 50 percent of your committed amount, you will qualify for the additional incentive.

For more information on PeakChoice Committed program and pricing, go to the PG&E Peak Choice tariff at http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_EPEAKCHOICE.pdf

• *Demand Bidding Program (DBP)* – DBP asks you to bid a load reduction quantity on a day-ahead basis. You'll receive $0.50 per kW for your actual event demand reductions.

• *Aggregators* – There are energy-related companies you can sign up with that provide demand response load reduction programs. Incentive structures and load reduction performance requirements vary. PG&E can provide you the list of Aggregators.

• *Peak Day Pricing (PDP)* Plan– PDP customers get power at a reduced price off their Time Of Use rates in non-peak hours during certain summer months, if they agree to pay higher prices when PG&E is facing peak demand. With day-ahead notification from PG&E of these peak demand hours, PDP customers can avoid paying those higher prices by dropping and/or shifting

electrical load between 2 p.m. and 6 p.m. on critical peak days. Customers who are able to reduce demand can experience lower overall energy bills.

For more information on the Peak Day Pricing plan and pricing, go to the http://www.pge.com/mybusiness/energysavingsrebates/demandresponse/peakdaypricing/

• *Automated Demand Response Program* - the Automated Demand Response (Auto DR) program at PG&E utilizes a communications infrastructure to transmit demand response signals to customers and implements load reductions automatically through their facility's control system.

• *Base Interruptible Program (BIP)*
This program pays you a monthly incentive to reduce your facility's load when notified of an event to or below a level that is pre-selected by you. This pre-selected level is called the Firm Service Level (FSL). To qualify for this program you must be able to curtail at least 15 percent of your average monthly load or a minimum of 100 kW, whichever is greater.

The BIP gives you 30 minutes advance notice, and pays you between $8.00/kW to $9.00/kW per month incentive based on the amount of load reduction you commit to. The monthly incentives are determined as follows:

500 kW and below ($8/kW-mo)
501 kW to 1,000 kW ($8.50/kW-mo)
1,001 kW and above ($9/kW-mo)

You will receive a monthly incentive payment even if no events are called. However, failure to reduce load down to or below your FSL during an event will result in a charge of $6.00/kWh for any energy use above the Firm Service Level during the event. There is a maximum of one event per day and four hours per event. The Program will not exceed 10 events per month, or 120 hours per year. Once enrolled, you may adjust your FSL or discontinue participation once each year during the month of November.

• *Permanent Load Shift*
The purpose of this program, often referred to as "Shift & Save," is to store thermal cooling capacity during off-peak hours and/or partial-peak hours in order to meet thermal cooling load in subsequent on-peak hours. Permanent Load Shift (PLS) consists of two implementers, Cypress Ltd. and Trane USA. These implementers will report regularly to a PG&E Program Manager, but the full responsibility for administering the proposed program and delivering the actual load shift results, relative to an established baseline, rests with the implementer.

Current reliability options include:

- *Optional Binding Mandatory Curtailment Program* – This curtailment program exempts you from rotating outages in return for reducing a major portion of the demand on the circuit that serves you to agreed-upon levels with 15 minutes notice.
- *Scheduled Load Reduction Program* – This summer-only program pays you for qualifying load that you reduce regularly on a schedule that you set in advance.

A previous PG&E demand response study done in 2007[1] was reviewed with facility staff during the on site visit. That study found the following DR opportunities:

Table 4-1: Summary of Previously Recommended DR Measures

Measure Number	Demand Response Description	MAX Potential Demand Reduction (kW)	Potential Demand Response Incentive ($)
DRM-1	Disable Heating Hot Water Systems	25.6	$6,410
DRM-2	Disable Swimming Pool Area Lighting	11.6	$2,906
DRM-3	Disable Field House Lighting	20.9	$5,231
DRM-4	Disable GYM Lighting	14.9	$3,720
DRM-5	Disable Learning Center Lighting	15.1	$3,765
DRM-6	Disable Swimming Pool Filtration Pump	10.6	$2,642
DRM-7	Shut down Networked PCs	6.0	$1,500
DRM-8	Shut Down Sewage Treatment Plant	17.5	$0
DRM-9	Turn Off Fountain Pump for 4 Hours During Demand Response Events	2.6	
Total Demand Reduction		124.8	
Total Potential Demand Response Incentive			$26,174

We identified an additional DR measure and reviewed the recommendations from the previous at study. These results, which and reflect PG&E's new Peak Day Pricing (PDP) Plan are shown below.

Table 4-2: Updated Summary of All Recommended DR Measures

Measure Number	Measure Description	Demand Reduction		Annual Savings			Payback			
		Maximum (kW)	Average (kW)	Electricity Savings (kWh/yr)	Electricity Cost Savings ($/yr)	Potential DR Program Incentive ($/yr)	Measure Cost ($)	Potential PG&E Tech-nology Incentive	Net Measure Cost ($)	Simple Payback (yr)
DRM-1	Disable Heating Hot Water Systems	25.6	25.6	1,229	$3,045	$152	$3,005	$1,502	$1,502	0.5
DRM-2	Disable Swimming Pool Area Lighting	11.6	0.0	0	$0	$0	$7,346	$0	$7,346	N/A
DRM-3	Disable Field House Lighting	20.9	20.9	1,003	$2,486	$124	$2,144	$1,072	$1,072	0.4
DRM-4	Disable GYM Lighting	14.9	14.9	715	$1,773	$89	$2,144	$1,072	$1,072	0.6
DRM-5	Disable Learning Center Lighting	15.1	15.1	725	$1,796	$90	$1,216	$608	$608	0.3
DRM-6	Disable Swimming Pool Filtration Pump	10.6	0.0	0	$0	$0	$405	$0	$405	N/A
DRM-7	Shut Down Networked PCs	6.0	6.0	288	$714	$36	$16,450	$750	$15,700	20.9
DRM-8	Shut Down Sewage Treatment Plant	17.5	0.0	0	$0	$0	$79	$0	$79	N/A
DRM-9	Turn Off Fountain Pump for 4 Hours During Demand Response Events	2.6	2.6	126	$309	$16	$1,154	$329	$825	2.5
Demand Response Measure Totals		124.8	85.1	4,086	$10,124	$507	$33,943	$5,334	$28,610	2.8

The measure costs and potential PG&E technology incentives shown in the Payback section of Table 4-2 only apply if the customer chooses to automate his demand response. If the customer instead opts to manually shut down these loads for each DR event, then he will incur no costs for controls, energy management hardware and/or software and will therefore not be eligible for the technology incentives shown.

Measures DRM-2 and DRM-6 are no longer available due to the current inoperability of the swimming pool facility. Consequently, the 122.8 kW of total potential demand reduction that was identified in the previous PG&E DR study (DRM 1-8) should be reduced to 82.5 kW, and potential demand response incentives, applicable to the costs of automation and controls for measures that enable demand response from that study, should be reduced to $5,004. However, implementation of these two measures should be revisited at the time the customer returns the swimming facility to operation.

Since the time of the previous PP&E DR study, measure DRM-1: Disable Heating Hot Water System has been be implemented during demand response periods. However, according to facility staff, none of the other measures have been tried. It is recommended, therefore that the customer revisit and reconsider implementation of the remaining measures. The customer should be aware, though, that current DR incentives for implementation are $125/kW, which is half the incentives paid at the time of the previous study. This could reduce potential incentives to $5,004 to implement the remaining measures, and the customer should consult with its PG&E account representative on current level of available incentives before proceeding.

Also, please note that measure DRM-8 has a demand reduction potential of 0 kW. This is because the sewage facility cannot be shut down. Instead, the previous study recommended running this plant with the emergency backup generator during demand response events to reduce use of power from the grid. However, switching to the emergency power generator during DR events is subject to air pollution operating permit restrictions. Since we have not been informed that this approach has been cleared with agencies, this study excludes this DR measure.

If all of the recommended DR measures in Table 4-2 are implemented, the average demand profile will change as shown in Figure 4-1.

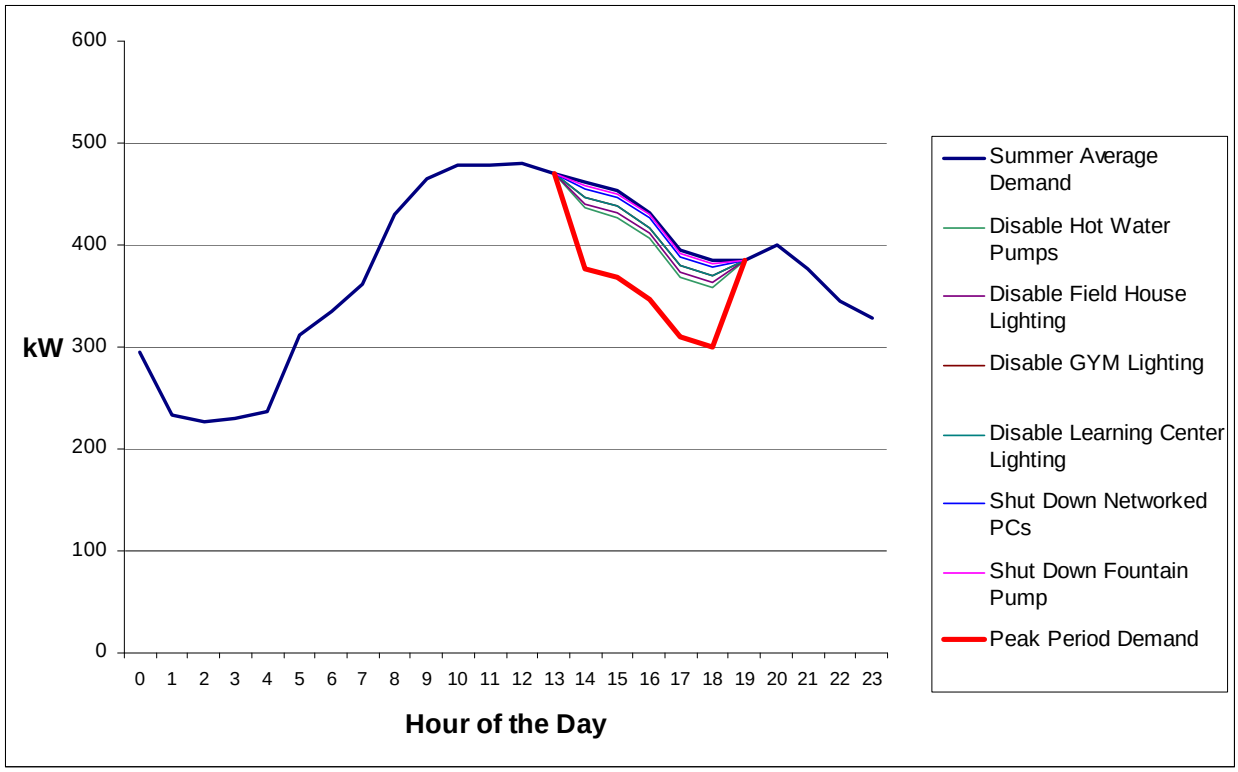


Figure 4-1: Average Summer Day Demand Profiles

PG&E's InterAct tool was used to simulate the combined Peak Day Pricing Plan effects of the DR measures in Table 4-2 assuming 12 events and a 50% reservation capacity. Annual PDP credits were estimated to be $10,123.59. (Refer Appendix G, Cost Savings Summary Table, showing Total Cost of $236,071.75 before applying the 12 events, and $225,948.15 after applying twelve events and the capacity reservation charge level of 50%. The total costs also reflect eh impact of variations in monthly loads.).

KEMA identified and discussed with College of the Redwoods an additional demand response measure, which we will designate DRM-9.

4.3.1 DRM -9: Turn off fountain pump for 4 hours during demand response events

Observations

A decorative landscape fountain operates continuously from 7:30 a.m. until 6 p.m. Monday through Friday.

Recommendations

We recommend shutting down the fountain pump from 2 p.m. until 6 p.m. during demand response events.

Cost Impacts

This measure will require only manually turning off of the fountain pump motor using its on off switch, but could be done automatically after a BMS upgrade. PG&E pays one-time incentives up to $125 up to half of the incremental cost of the measure. For this measure, assumed cost a wireless panel extension connector, control panel extension panel, one point programming labor cost and is based on 2010 Means Electrical Cost Data.

Note, this measure is only eligible for a technology incentive for the costs associated with automation. Consequently, if the customer elects to implement this measure manually, the Potential PG&E Incentive will be $0 and not $329 as shown in the table.

DRM-9: Turn off fountain pump for 4 hours during demand response events

Savings Summary	
Pre-Retrofit Demand [kW]	**694.5**
Post-Retrofit Demand [kW]	**691.8**
Peak-Period Savings [kW]	**2.6**
Pre-Retrofit Energy Use [kWh/yr]	**3,508,587**
Post-Retrofit Energy Use [kWh/yr]	**3,508,461**
Total Event Reductions [kWh/yr]	**126**
PDP Program Credits [$]	**$309**
Total Dollars Saved [$]	**$309**
Cost Summary (no incentives)	
Measure Cost [$]	**$1,154**
Simple Payback [years]	**3.7**
Cost Summary (with incentives)	
Potential PG&E Incentive [$]	**$329**
Net Measure Cost [$]	**$825**
Simple Payback [years]	**2.7**
Emission Savings Summary	
CO_2 [lb]	175
SO_2 [lb]	0
NO_X [lb]	0

Pre-retrofit demand and energy usage includes total campus energy use based on PG&E interval data for 2009. The baseline demand profile (See Appendix A) was developed as the average hourly building demand for each hour of the day for the highest 3 peak on periods in the worst 10 consecutive on peak periods from May 1 to October 31, 2009. Post-retrofit demand and energy use shows the demand and energy usage by the campus after demand response measure implementation. The estimate is believed to be conservative.

4.4 OTHER MEASURES INVESTIGATED

We investigated several other potential energy savings measures but due to project economics or feasibility issues have not included them in our recommended list of projects in Table 1-2.

4.4.1 OIM-1: Install variable frequency drives (VFDs) on hot water pumps.

Observations

There are total of 9 hot water boilers that provide the heating hot water used for supply air reheat and the hydronic heating (fin/tube radiation) system for the majority of the buildings. Existing constant speed hot water pumps circulate heating hot water through the buildings to the heating and reheat coils, and hydronic heating system. Hot water pump motors sizes range from 1/3 hp to 7.5 hp.

Possible Recommendations

Install VFDs on 5 hp and 7.5 hp pump motors.

Cost Impacts

A building energy use simulation model was prepared for the college campus using the eQUEST simulation program to estimate the energy savings for VFD installation on 5 hp and 7.5 hp hot water pump motors. The pre-retrofit model was built with constant speed hot water pump motors. VFD drives were installed on 5 hp and 7.5 hp hot water pump motors in the post-retrofit model.

This result of the simulations was that the measure did not result in any energy savings and instead energy usage increased when the VFD was added. Due to the year round cool climate in the Eureka area, these buildings have a relatively constant high heating demand. Since there is little variation in heating demand, there is no advantage to converting to a variable flow system. When pumps run near 100% capacity, the added electricity consumption of the VFD results in higher total electric demand than the motor would create without the VFD. Consequently this was not recommended.

4.4.2 OIM-2: Walk-in cooler

At the time of the site visit, classes were in recess for the week and the cafeteria kitchen was not in operation and the walk-in cooler was locked. Without access to the cooler, we cannot make specific recommendations. However, based on other coolers of this sort the following recommendations, for which PG&E rebates may be available, are generally applicable.

4.4.2.1 Strip curtains

Strip curtains can be installed to reduce infiltration into refrigerated storage areas. New strip curtains or clear plastic swinging doors must be installed on doorways of walk-in refrigerators to qualify for rebates. The following table provides the calculated energy savings for an average cooler.

Building Type	Annual Savings (kWh/sqft)	Peak Demand Reduction (kW/sqft)
Average	139	0.010

The incentive is based on the square footage of doorway.

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

The incremental measure cost (IMC) is the cost difference between the energy-efficient equipment and the less efficient option. In this case, the strip curtain measure, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not performing the retrofit, is $0.

	Value	Source
Measure Life, yrs	4	SCE
Incremental Measure Cost/sf	$7.77/sf	SCE

$3.0/square foot incentives are available from PG&E for strip curtain or plastic swing doors installation.

4.4.2.2 Door gaskets

Main door walk-in cooler or freezer gaskets seal the interior of the cooler air tight to allow the temperature inside to be maintained. Once the door gaskets are damaged, warm air can enter and lessen the efficiency of the appliance. In addition, walk-in cooler door gaskets also provide effective protection from insects and pests that may damage the food inside. When the gasket on a walk-in cooler door is damaged or worn out, it is very simple to replace.

The savings for this measure shown are taken from DEER for both climate zone 2 and as the average savings across the various PG&E climate zones.

Building Type	Annual Savings (kWh/ft)	Peak Demand Reduction (kW/ft)
Zone 2	20	0.0037
PG&E Average	139	0.010

The incremental measure cost (IMC) is the cost difference between the energy-efficient equipment and the less efficient option. In this case, the door gasket measure, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

	Value	Source
Measure Life, yrs	4	DEER
Incremental Measure Cost/ft	$9.61/ft	DEER

After the end of the useful life (four years since last purchased) PG&E will provide $3.50/linear foot incentives for replacement of worn gasket of insulated main door walk-in cooler.

4.4.2.3 Automatic door closer

This measure is for installing an auto-closer to the main insulated opaque door(s) of a walk-in freezer. The auto-closer must firmly close the door when it is within 1 inch of full closure.

The savings for this measure shown are taken from DEER for both California climate zone 2 and as the average savings across the various PG&E climate zones.

PG&E Climate Zones	kWh Savings Per Door	Peak kW Savings Per Door
Zone 2	2,395	0.401
PG&E Average	2,360	0.322

Savings values resulted from modeling conditions, assume an average 40% reduction in infiltration.

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. We considered the incremental cost of door closers as full cost.

	Value	Source
Measure Life, yrs	8	DEER
Incremental Measure Cost	$433.22	DEER

$75/closer incentives are available from PG&E for walk-in cooler or freezer door installation.

4.4.2.4 Energy efficient evaporator fan motor

Evaporator units are integral components of commercial walk-in refrigerators and freezers. The small fans housed within these units continuously move air across the evaporative coils and circulate it throughout the cooled space. Most come equipped with fans that are driven by relatively low efficiency shaded pole (SP) or permanent split capacitor (PSC) induction type electric fan motors. Utilization of more efficient fan motor is an energy efficient measure.

Replacing the evaporator fan motors with electronically commutated motors (ECM) combines the inherent efficiency of a DC motor design with an electronic drive control and reduces the energy use of the evaporator fans.

The savings shown for this measure are taken from DEER for California climate zone 2 and as the average savings across the various PG&E climate zones.

PG&E Climate Zones	kWh Savings Per Motor	Peak kW Savings Per Motor
Zone 2	258	0.034951
PG&E Average	258	0.031567

The incremental measure cost (IMC) is cost difference between the energy-efficient equipment and the less efficient option shaded pole fan motor.

	Value	Source
Measure Life, yrs	15	DEER
Incremental Measure Cost	$154.01	DEER

Incentives of $50/motor are available from PG&E for replacement of low efficient walk-in evaporator motors with ECMs.

Section 5 Appendices

5.1 APPENDIX A: UTILITY USAGE DATA

ELECTRIC ACCOUNTS

	MAIN COLLEGE BLDGS			FIELDS LDG SEWAGE PLT			SEWAGE PLANT LAB			STADIUM			STORAGE BARN		
	Rate	*Meter #*		*Rate*	*Meter #*		*Rate*	*Meter #*		*Rate*	*Meter #*		*Rate*	*Meter #*	
	E19P	*56M156*		*A10SX*	*M07631*		*A1*	*48 E089*		*A1P*	*T78501*		*A1*	*X52492*	
Month	**Maximum Demand (kW)**	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**	**Maximum Demand (kW)**	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**	**Maximum Demand (kW)**	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**	**Maximum Demand (kW)**	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**	**Maximum Demand (kW)**	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**
Dec-08	734	288,967	$28,070	18	12,078	$1,380	-	724	$108	-	1,840	$264	-	0	$9
Jan-09	607	262,356	$24,352	18	12,167	$1,369	-	689	$102	-	1,920	$271	-	0	$10
Feb-09	765	315,049	$29,519	18	11,492	$1,298	-	688	$100	-	1,920	$269	-	0	$9
Mar-09	769	290,758	$29,514	19	12,053	$1,470	-	602	$92	-	1,600	$234	-	0	$9
Apr-09	758	323,197	$33,127	19	11,697	$1,442	-	550	$85	-	1,920	$278	-	0	$9
May-09	789	288,396	$39,278	19	11,825	$1,783	-	379	$84	-	960	$203	-	0	$9
Jun-09	597	239,685	$36,263	18	11,894	$1,807	-	155	$40	-	1,280	$269	-	0	$9
Jul-09	549	235,448	$39,092	18	11,601	$2,087	-	186	$46	-	2,160	$445	-	0	$9
Aug-09	545	214,758	$36,898	18	10,902	$1,744	-	145	$38	-	1,440	$301	-	0	$9
Sep-09	685	279,685	$44,619	18	12,346	$1,926	-	165	$42	-	1,920	$397	-	0	$9
Oct-09	730	300,701	$44,915	19	11,470	$1,751	-	317	$72	-	1,520	$317	-	0	$9
Nov-09	727	302,936	$37,446	19	11,319	$1,455	-	487	$80	-	2,240	$341	-	0	$9
Totals	**-**	**3,341,936**	**$423,095**	**-**	**140,844**	**$19,512**	**-**	**5,087**	**$889**	**-**	**20,720**	**$3,590**	**-**	**0**	**$108**
Average Total Cost $/kWh			**0.13**			**0.14**			**0.17**			**0.17**			
Total Square Feet															
EUI (kWh/sf)															

Combined Usage College of Redwoods Facility Campus		
Maximum Demand (kW)	**Electricity Consumption (kWh)**	**Total Electricity Cost ($)**
752	303,609	$29,832
625	277,132	$26,104
783	329,149	$31,195
788	305,013	$31,319
777	337,364	$34,940
808	301,560	$41,357
615	253,014	$38,389
567	249,395	$41,680
563	227,245	$38,989
703	294,116	$46,994
749	314,008	$47,064
746	316,982	$39,331
-	**3,508,587**	**$447,193**
		0.13
		428,264
		8.2

NATURAL GAS ACCOUNTS

											Combined	
	STUDENT UNION		DORMITORIES		ELEC/GREENHOUSE BLDGS		SVC CEN COMPLEX		FIELD HOUSE		JR COLLEGE DIST	
	Rate	*Acct.#*	*Rate*	*Acct.#*	*Rate*	*Acct.#*	*Rate*	*Acct.#*	*Rate*	*Acct.#*	*Rate*	*Acct.#*
	GNR1	*1157987717*	*GNR1*	*3483360152*	*GNR1*	*7597827449*	*GNR1*	*9545638648*	*GNR1*	*9587305312*	*GNTD*	*3210081349*
Month	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**	**Natural Gas Consumption (therms)**	**Total Natural Gas Cost ($)**
Dec-08	1,884	$1,801	1106	$403	681	$269	3780	$1,249	13,690	$2,288	24,528	19,622
Jan-09	2,047	$2,141	1252	$468	671	$276	2717	$950	5,259	$1,519	24,791	19,833
Feb-09	2,521	$2,541	1686	$607	590	$244	3038	$1,055	8,430	$1,849	23,669	18,935
Mar-09	2,226	$1,935	1662	$369	540	$231	2956	$597	8,739	$1,116	24,517	19,614
Apr-09	2,182	$1,670	1476	$452	413	$141	2344	$689	8,289	$1,522	22,496	17,997
May-09	1,487	$1,009	951	$307	115	$60	1698	$509	5,492	$1,273	17,960	14,368
Jun-09	773	$625	812	$271	39	$40	1116	$353	7,042	$1,407	12,888	10,310
Jul-09	1,008	$821	831	$275	35	$38	779	$261	5,982	$1,315	10,292	8,234
Aug-09	1,033	$845	721	$245	46	$41	596	$211	4,268	$1,169	5,960	4,768
Sep-09	1,488	$1,107	896	$294	39	$40	764	$258	5,031	$1,236	9,556	7,645
Oct-09	1,761	$1,418	983	$314	224	$88	1177	$367	5,779	$1,295	15,535	12,428
Nov-09	1,761	$1,418	1143	$417	502	$190	2043	$708	7,484	$1,708	20,196	16,157
Totals	**20,171**	**$17,331**	**13,519**	**$4,423**	**3,895**	**$1,658**	**23,008**	**$7,208**	**85,485**	**$17,698**	**212,388**	**169,910**
Average Total Cost $/therm												**0.80**
Total Square Feet												**428,264**
EUI (therms/sf)												**0.50**

5.2 APPENDIX B: CALCULATIONS FOR ENERGY PROJECT OPPORTUNITIES

Energy Efficiency Measures

LCM-1: Control LRC ceiling lights with photocells
CLA80

Total quantity of Biax fixtures	22		
Existing lamp power consumption	13.0	W	Lamp wattage will be verified by College of the Redwoods
Existing average annual operational hours	3,432	hrs	
Existing energy usage, kWh	982	kWh/yr	
Pre-retrofit demand, kW	0.3	kW	
Post retrofit operational hours	1,404	hrs	
Post-retrofit energy usage, kWh	402	kWh/yr	
Post-retrofit demand, kW	0.3	kW	
Annual savings, kWh	580	kWh/yr	
Demand savings, kW	0.0	kW	
Annual cost savings	$74		
Emissions Savings:			
CO_2	802	lb/yr	
SO_2	2	lb/yr	
NO_X	1	lb/yr	
Photocell @ $88.50/photocell	$89		2010 RSMeans Electrical Cost Data
Rewire circuits @$405/100'	$203		2010 RSMeans Electrical Cost Data
Project cost	$291		
Simple pay back (SPB)	3.9	yrs	
Potential PG&E incentives	$139		2010 PG&E CCC/IOU program
Net measure cost	$152		
Simple pay back with incentives, yr.	2.1	yrs	

LCM-2: Install LED lamps in track lights in book store
CLA43

Total quantity of lamps	145		Lamp count will be verified by College of the Redwoods
Existing halogen lamp power consumption	20.0	W	
LED lamp power consumption	8.0	W	http://assets.sylvania.com/assets/documents/ RETRO010.011061d6-e734-428b-9be2-cd4063079a11.pdf
Pre-retrofit demand, kW	2.9	kW	
Existing average annual operational hours	6,188	hrs	
Pre-retrofit energy usage, kWh	17,945	kWh/yr	
Post-retrofit demand, kW	1.2	kW	
Post retrofit operational hours	6,188	hrs	
Post-retrofit energy usage, kWh	7,178	kWh/yr	
Annual savings, kWh	10,767	kWh/yr	
Demand savings, kW	1.7	kW	
Annual cost savings	$1,372		
Emissions Savings:			
CO_2	14,880	lb/yr	
SO_2	33	lb/yr	
NO_X	15	lb/yr	
Cost at $36.06/lamp	$5,229		Sylvania lamp at Home Depo store
Labor @ $49/hr, 0.25 hr per track	$355		2010 RSMeans Electrical Cost Data
Project cost	$5,584		
Simple pay back (SPB)	4.1	yrs	
Potential PG&E incentives	$0		
Net measure cost	$5,584		
Simple pay back with incentives, yr.	4.1	yrs	

LCM-3: Install Demand Controlled Ventilation in Library
CAC00

Pre-retrofit total, kWh	3,212,156	kWh/yr	eQUEST simulation
Post-retrofit total, kWh	3,212,156	kWh/yr	eQUEST simulation
Pre-retrofit total, kW	627.2	kW	eQUEST simulation
Post-retrofit total, kW	627.2	kW	eQUEST simulation
Pre-retrofit energy usage for space heating, therms	233,671	therms/yr	eQUEST simulation
Post-retrofit energy usage for space heating, therms	233,561	therms/yr	eQUEST simulation
Annual savings, kWh	0.0	kWh/yr	eQUEST simulation
Demand savings, kW	0.0	kW	eQUEST simulation
Annual savings, therms	110	therms/yr	eQUEST simulation
Annual cost savings	$88		
Emissions Savings:			
CO_2	1,291	lb/yr	
SO_2	0	lb/yr	
NO_x	93	lb/yr	
CO_2 sensor @ $253.95/sensor	$254		http://www.pexsupply.com/Honeywell-C7232A1032-Non-dispersive-Infrared-NDIR-Carbon-Dioxide-Sensor-Wall-Mount
Installation @$143/hr	$572		
Wiring @ $53.5/100'	$27		2010 RSMeans Electrical Cost Data
Programming @ $143/hr	$143		
Total project cost	$996		
Simple pay back, yr.	11.3	yrs	
Potential PG&E incentives	$110		2010 PG&E CCC/IOU program
Total net measure cost	$886		
Simple pay back with incentives	10.0	yrs	

CIM1: Install more-efficient T-8 fluorescent lighting
CLA12

Total qty of 3-lamp fixtures	6,634		Fixture count will be verified by College of the Redwoods
Total qty of lamps	19,902		Lamp count will be verified by College of the Redwoods
Existing 3-lamp T-8 fixture with electronic ballast power consumption	83	W	
Reduced wattage T-8, 3-lamp fixture power consumption	67	W	
Pre-retrofit lighting energy use, kWh	1,621,737	kWh/yr	eQUEST simulation
Pre-retrofit fans energy use, kWh	904,700	kWh/yr	eQUEST simulation
Pre-retrofit pumps energy use, kWh	11,241	kWh/yr	eQUEST simulation
Pre-retrofit total, kWh	2,537,678	kWh/yr	eQUEST simulation
Post-retrofit lighting energy use, kWh	1,346,986	kWh/yr	eQUEST simulation
Post-retrofit fans energy use, kWh	905,151	kWh/yr	eQUEST simulation
Post-retrofit pumps energy use, kWh	11,605	kWh/yr	eQUEST simulation
Post-retrofit total, kWh	2,263,742	kWh/yr	eQUEST simulation
Pre-retrofit total, kW	627.2	kW	eQUEST simulation
Post-retrofit total, kW	564.2	kW	eQUEST simulation
Pre-retrofit energy usage, therms	233,671	therms/yr	eQUEST simulation
Post-retrofit energy usage, therms	241,564	therms/yr	eQUEST simulation
Annual savings, kWh	273,937	kWh/yr	eQUEST simulation
Demand savings, kW	63.0	kW	eQUEST simulation
Annual savings, therms	(7,893)	therms/yr	eQUEST simulation
Annual cost savings	$28,601		eQUEST simulation
Emissions Savings:			
CO_2	286,223	lb/yr	
SO_2	83	lb/yr	
NO_x	-6,246	lb/yr	
Lamps cost @ $10/lamp	$199,024		2010 RSMeans Electrical Cost Data
Ballasts cost @ $9.50/ballast	$63,024		http://usalight.com/b3x32-multi-fluorescent-ballast-3-lamp-t-8-32watt-1.html
Ballast replacement labor @ $39/ballast	$258,731		
Project cost	$520,778		2010 RSMeans Electrical Cost Data
Simple pay back (SPB)	18.2	yrs	
Potential PG&E incentives	$65,745		2010 PG&E CCC/IOU program
Net measure cost	$455,034		
Simple pay back with incentives, yr.	15.9	yrs	

CIM-2: Install lighting occupancy sensors in classrooms, offices and conference rooms
CLA82

Total quantity of classrooms & offices	341		Rooms quantity will be verified by College of the Redwoods
Total quantity of occupancy sensors	341		Sensors quantity will be verified by College of the Redwoods
Pre-retrofit lighting energy use, kWh	1,346,986	kWh/yr	eQUEST simulation
Pre-retrofit fans energy use, kWh	905,151	kWh/yr	eQUEST simulation
Pre-retrofit pumps energy use, kWh	11,605	kWh/yr	eQUEST simulation
Pre-retrofit total, kWh	2,263,742	kWh/yr	eQUEST simulation
Post-retrofit lighting energy use, kWh	1,261,034	kWh/yr	eQUEST simulation
Post-retrofit fans energy use, kWh	905,335	kWh/yr	eQUEST simulation
Post-retrofit pumps energy use, kWh	9,149	kWh/yr	eQUEST simulation
Post-retrofit total, kWh	2,175,519	kWh/yr	eQUEST simulation
Pre-retrofit total demand, kW	564.2	kW	eQUEST simulation
Post-retrofit total demand, kW	564.2	kW	eQUEST simulation
Pre-retrofit energy usage, therms	241,564	therms/yr	eQUEST simulation
Post-retrofit energy usage, therms	244,125	therms/yr	eQUEST simulation
Annual savings, kWh	88,223	kWh/yr	eQUEST simulation
Demand savings, kW	0.0	kW	eQUEST simulation
Annual savings, therms	(2,561)	therms/yr	eQUEST simulation
Annual cost savings	$9,196		eQUEST simulation
Emissions Savings:			
CO_2	91,958	lb/yr	
SO_2	27	lb/yr	
NO_x	-2,028	lb/yr	
Occupancy sensor @ $204/sensor	$69,564		2010 RSMeans Electrical Cost Data
Project cost	$69,564		
Simple pay back (SPB)	7.6	yrs	
Potential PG&E incentives	$21,174		2010 PG&E CCC/IOU program
Net measure cost	$48,390		
Simple pay back with incentives, yr.	5.3	yrs	

CIM-3: Install high efficiency hot water boilers on a replacement basis
CBA10

Pre-retrofit fans energy use, kWh	905,363	kWh/yr	eQUEST simulation
Pre-retrofit pumps energy use, kWh	8,759	kWh/yr	eQUEST simulation
Pre-retrofit total, kWh	914,122	kWh/yr	eQUEST simulation
Post-retrofit fans energy use, kWh	905,369	kWh/yr	eQUEST simulation
Post-retrofit pumps energy use, kWh	8,714	kWh/yr	eQUEST simulation
Post-retrofit total, kWh	914,083	kWh/yr	eQUEST simulation
Pre-retrofit total, kW	627.0	kW	eQUEST simulation
Post-retrofit total, kW	627.0	kW	eQUEST simulation
Pre-retrofit energy usage for space heating, therms	226,561	therms/yr	eQUEST simulation
Post-retrofit energy usage for space heating, therms	207,294	therms/yr	eQUEST simulation
Annual savings, kWh	38.9	kWh/yr	eQUEST simulation
Demand savings, kW	0.0	kW	eQUEST simulation
Annual savings, therms	19,267	therms/yr	eQUEST simulation
Annual cost savings	$15,419		
Emissions Savings:			
CO_2	225,477	lb/yr	
SO_2	0	lb/yr	
NO_x	16,184	lb/yr	
Project cost:	Replacement	Incremental	
Boilers	$384,437	$108,931	California Hydronics Corporation, 2010 RSMeans Mechanical Cost Data
Piping	$972	$0	California Hydronics Corporation
Programming	$1,170	$0	California Hydronics Corporation
Labor, demo & installation	$76,100	$12,700	2010 RSMeans Mechanical Cost Data
Total project cost	$462,679	$121,631	
Simple pay back, yrs	30.0	7.9	
Potential PG&E incentives	$19,267	$19,267	2010 PG&E CCC/IOU program
Total net measure cost	$443,412	$102,364	
Simple pay back with incentives, yrs	28.8	6.6	

CIM-4: Replace parking lot lighting
CLB51

Existing qty of 150W HPS fixtures	7		Lamp count was provided by College of the Redwoods
Retrofit qty STR-LWY-3M-HT-06-STANDARD FINISH	7	BETA	
Existing qty of 175W metal halide fixtures	20		Lamp count was provided by College of the Redwoods
Retrofit qty STR-LWY-3M-HT-06-STANDARD FINISH	20	BETA	
Existing qty of 250W HPS fixtures	20		Lamp count was provided by College of the Redwoods
Retrofit qty STR-LWY-3M-HT-10-STANDARD FINISH	20	BETA	
Existing qty of 400W HPS fixtures	28		Lamp count was provided by College of the Redwoods
Retrofit qty STR-LWY-3M-HT-12-STANDARD FINISH	28	BETA	
Existing 150W HPS fixtures wattage	190		Lamp count was provided by College of the Redwoods
Retrofit STR-LWY-3M-HT-06-STANDARD FINISH wattage	106	BETA	
Existing 175W metal halide fixtures wattage	215		Lamp count was provided by College of the Redwoods
Retrofit STR-LWY-3M-HT-06-STANDARD FINISH wattage	106	BETA	
Existing 250W HPS fixtures wattage	300		Lamp count was provided by College of the Redwoods
Retrofit STR-LWY-3M-HT-10-STANDARD FINISH wattage	181	BETA	
Existing 400W HPS fixtures wattage	465		Lamp count was provided by College of the Redwoods
Retrofit STR-LWY-3M-HT-12-STANDARD FINISH wattage	216	BETA	
Pre-retrofit hrs/yr	4,368	hrs/yr	
Post-retrofit hrs/yr	4,368	hrs/yr	
Pre-retrofit total, kWh	107,671	kWh/yr	
Post-retrofit total, kWh	54,731	kWh/yr	
Annual savings, kWh	52,940	kWh/yr	
Pre-retrofit total, kW	24.7	kW	
Post-retrofit total, kW	12.5	kW	
Demand savings, kW	12.1	kW	
Peak demand savings, kW	0.0	kW	
Post-retrofit energy usage, therms	233,671	therms/yr	eQUEST simulation
Post-retrofit energy usage, therms	233,671	therms/yr	eQUEST simulation
Annual savings, therms	-	therms/yr	
Annual cost savings	$6,748		
Emissions Savings:			
CO_2	73,162	lb/yr	
SO_2	16	lb/yr	
NO_X	74	lb/yr	
New STR-LWY-3M-HT-06 cost at $720/fixture	$19,440	BETA	Lighting Systems Quote
New STR-LWY-3M-HT-10 cost at $1,118/fixture	$22,360	BETA	Lighting Systems Quote
New STR-LWY-3M-HT-12 cost at $1,248/fixture	$34,944	BETA	Lighting Systems Quote
Labor, replace parking light @ $146/fixture	$10,950		2010 RSMeans Electrical Cost Data
Project cost	$87,694		
Simple pay back (SPB)	13.0	yrs	
Potential PG&E incentives	$12,706		2010 PG&E CCC/IOU program
Net measure cost	$74,988		
Simple pay back with incentives, yr.	11.1	yrs	

CIM-5: Install more efficient walking pathway lights
CLB10

Existing qty of 150W HPS fixtures	110		Lamp count was provided by College of the Redwoods
Retrofit qty of 85W, Philips QL fixtures (inductive lamps)	110		Lamp count was provided by College of the Redwoods
Retrofit qty of 50W LED bi-level boards in one fixture	110		
Existing 150W HPS fixture wattage	190	W	
Retrofit of 85W, QL Philips fixture wattage	89	W	http://docs.google.com/gview?url=http://www.lighting.philips.com/us_en/browseliterature/download/ql_oem_guide.pdf Page 27, Table 23
Pre-retrofit hrs/yr	2,912	hrs/yr	
Post-retrofit 85W inductive hrs/yr	2,912	hrs/yr	
Pre-retrofit total, kW	20.9	kW	
Post-retrofit total, kW	9.8	kW	
Demand savings, kW	11.1	kW	
Peak demand savings, kW	0.0	kW	
Pre-retrofit total, kWh	60,861	kWh/yr	
Post-retrofit total, kWh	28,508	kWh/yr	
Annual savings, kWh	32,352	kWh/yr	
Pre-retrofit energy usage, therms	212,388	therms/yr	PG&E utility bills
Post-retrofit energy usage, therms	212,388	therms/yr	PG&E utility bills
Annual savings, therms	-	therms/yr	
Annual cost savings	$4,124		
Emissions Savings:			
CO_2	44,710	lb/yr	
SO_2	10	lb/yr	
NO_X	45	lb/yr	
Project cost @ $305/fixture	$33,550		tla-advantage quote
Simple pay back (SPB)	8.1	yrs	
Potential PG&E incentives	$7,765		2010 PG&E CCC/IOU program
Total incentives	$7,765		
Net measure cost	$25,785		
Simple pay back with incentives, yr.	6.3	yrs	

Demand Response and Reliability Measures

DR-9: Turn off fountain pump for 4 hours during demand response events
CDA00

Pre-retrofit demand, kW	694.5	kW	PG&E Interval data
Post-retrofit demand, kW	691.8	kW	
Demand savings, kW	2.6		(Motor hp x 0.746)/motor EFF. Motor hp=3 hp
Pre-retrofit energy usage, kWh	3,508,587	kWh/yr	PG&E Utility bills
Annual kWh savings for 12 of 4-hour DR events	126	kWh	
Post-retrofit energy usage, kWh	3,508,461	kWh/yr	
Annual electricity cost savings	$309		
Emissions Savings:			
CO_2	175	lb/yr	
SO_2	0	lb/yr	
NO_X	0	lb/yr	
Wireless panel extention connector	$579		Black Box Network Service
Control Panel Extension, 1 DO point	$326		2010 RSMeans Electrical Cost Data
Relays @ $89.50/relay	$90		2010 RSMeans Electrical Cost Data
Wiring @$53.50/per 100'	$80		2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$79		2010 RSMeans Electrical Cost Data
Total	$1,154		
Simple pay back (SPB)	3.7	yrs	
Potential PG&E technology incentives	$329		2010 PG&E CRI/NRR program
Potential DR program incentives	$16		
Net measure cost	$825		
Simple pay back with incentives, yr.	2.5	yrs	

Costs of DR Measures from Previous Study

DRM-1: Disable Heating Hot Water Systems

Programming (19 nodes shutdown) @$79.07/point	$1,502	2010 RSMeans Electrical Cost Data
Start-up, checkout labor @$79.07/point	$1,502	2010 RSMeans Electrical Cost Data
Total	$3,005	

DRM-2: Disable Swimming Pool Area Lighting

Gateway	$5,202	2010 RSMeans Electrical Cost Data
Wireless panel extension connector	$579	Black Box Network Service
Control Panel Extension, 3 DO points	$979	2010 RSMeans Electrical Cost Data
Relays @ $89.50/relay	$269	2010 RSMeans Electrical Cost Data
Wiring @$53.50/per 100'	$80	2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$237	2010 RSMeans Electrical Cost Data
Total	$7,346	

DRM-3: Disable Field House Lighting

Wireless panel extention connector	$579	Black Box Network Service
Control Panel Extension, 3 DO points	$979	2010 RSMeans Electrical Cost Data
Relays @ $89.50/relay	$269	2010 RSMeans Electrical Cost Data
Wiring @$53.50/per 100'	$80	2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$237	2010 RSMeans Electrical Cost Data
Total	$2,144	

DRM-4: Disable GYM Lighting

Wireless panel extention connector	$579	Black Box Network Service
Control Panel Extension, 3 DO points	$979	2010 RSMeans Electrical Cost Data
Relays @ $89.50/relay	$269	2010 RSMeans Electrical Cost Data
Wiring @$53.50/per 100'	$80	2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$237	2010 RSMeans Electrical Cost Data
Total	$2,144	

DRM-5: Disable Learning Center Lighting

Control Panel Extension, 3 DO points	$979	2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$237	2010 RSMeans Electrical Cost Data
Total	$1,216	

DRM-6: Disable Swimming Pool Filtration Pump

Control Panel Extension, 1 DO point	$326	2010 RSMeans Electrical Cost Data
Programming @$79.07/point	$79	2010 RSMeans Electrical Cost Data
Total	$405	

DRM-7: Shut down Networked PCs

Software cost	$16,450	Verdiem Quote

DRM-8: Shut Down Sewage Treatment Plant

Programming @$79.07/point	$79	2010 RSMeans Electrical Cost Data
Total	$79	

5.3 APPENDIX C: ENERGY EFFICIENCY AND DEMAND RESPONSE MEASURES

Measure Number	Measure Description	Energy, Cost and GHG* Savings					Project Costs, Incentives, and Payback			
		Peak Savings (kW) **	Electricity (kWh/yr)	Natural Gas (Therms /yr)	Annual Cost Savings ($/yr)	CO2 Saved (Tons /yr)	Estimated Installed Cost ($)	Potential PG&E Incentive ($)	Net Measure Cost ($)	Pay-back Period (Yrs)
EEM-1	LCM-1: Control LRC ceiling lights with photocells	0.0	580	0	$74	0.4	$291	$139	$152	2.1
EEM-2	LCM-2: Install LED lamps in track lights in book store	1.7	10,767	0	$1,372	7.4	$5,584	$0	$5,584	4.1
EEM-3	LCM-3: Install Demand Controlled Ventilation in Library	0.0	0	110	$88	0.6	$996	$110	$886	10.0
EEM-4	CIM1: Install more-efficient T-8 fluorescent lighting	63.0	273,937	-7,893	$28,601	143.1	$520,778	$65,745	$455,034	15.9
EEM-5	CIM-2: Install lighting occupancy sensors in classrooms, offices and conference rooms	0.0	88,223	-2,561	$9,196	46.0	$69,564	$21,174	$48,390	5.3
EEM-6	CIM-3: Install high efficiency hot water boilers on a replacement basis	0.0	39	19,267	$15,419	112.7	$121,631	$19,267	$102,364	6.6
EEM-7	CIM-4: Replace parking lot lighting	0.0	52,940	0	$6,748	36.6	$87,694	$12,706	$74,988	11.1
EEM-8	CIM-5: Install more efficient walking pathway lights	0.0	32,352	0	$4,124	22.4	$33,550	$7,765	$25,785	6.3
Recommended Energy Efficiency		64.7	458,838	8,923	$65,621	369.3	$840,089	$126,905	$713,184	10.9

* GHG = Green House Gas

** Peak Savings: For energy efficiency, "peak kW savings" estimate should correspond to the estimated "average grid level impact between 2:00 p.m. and 5:00 p.m. during the three consecutive weekday periods containing the weekday temperature with the hottest temperature of the year" per Section 1.4.8 in the 2010 Statewide Customized Offering Procedures Manual for Business, http://aesc-inc.com/download/spc/2010spcdocs/UnifiedManual/Customized%201%200%20Policy.pdf.

*** NPV = Net Present Value

Net Present Value (NPV) indicates financial attractiveness of a project. It is the value today of a project's future savings minus its cost. Future cash flows are discounted by an assumed annual rate (entered below) to account for risk, the cost of money, and inflation.

Assuming Electricity Cost	$ 0.127	/kWh	(Average for recent 12 months, this account)
Assuming Gas Cost	$ 0.80	/therm	(Average for recent 12 months, this account)
Assuming CO2 Reduction	1.382	/kWh	(Based on CEC/CPUC Greenhouse Gas Estimator)
Equivalents, lbs CO2	11.7	/therm	for marginal energy use reductions)
Assuming NPV Discount Rate	10%		(Default 10%, adjustable)

2010 PG&E Incentives

CRI (NRR) Incentives	Rate
Cost Cap	50%
Peak Electricity Demand	$100.00 per peak kW
Lighting	$0.05 per kWh
Motors / Equipment / Controls	$0.09 per kWh
AC & Refrigeration I	$0.15 per kWh
AC & Refrigeration II	$0.09 per kWh
Gas	$1.00 per therm
Retrocommissioning Incentives	
Electricity	$0.09 per kWh
Gas	$1.00 per therm
Cost Cap (all RCx measures)	50%

Catalog Rebates		Code	Applicable Measure #s Above
Lighting	$11.00 per photocell	L36	EEM-1
Lighting	$55.00 per sensor	L860	EEM-5
Lighting	$1.00 per lamp	L730	EEM-4

Measure Number	Measure Description	Demand Reduction		Annual Savings			Payback			
		Maximum (kW)	Average (kW)	Total Event Reductions (kWh/yr)	PDP Program Credits ($/yr)	Potential DR Program Incentive ($/yr)	Measure Cost ($)	Potential PG&E Tech-nology Incentive	Net Measure Cost ($)	Simple Payback (yr)
DRM-1	Disable Heating Hot Water Systems	25.6	25.6	1,229	$3,045	$0	$3,005	$1,502	$1,502	0.5
DRM-2	Disable Swimming Pool Area Lighting	11.6	0.0	0	$0	$0	$7,346	$0	$7,346	N/A
DRM-3	Disable Field House Lighting	20.9	20.9	1,003	$2,486	$0	$2,144	$1,072	$1,072	0.4
DRM-4	Disable GYM Lighting	14.9	14.9	715	$1,773	$0	$2,144	$1,072	$1,072	0.6
DRM-5	Disable Learning Center Lighting	15.1	15.1	725	$1,796	$0	$1,216	$608	$608	0.3
DRM-6	Disable Swimming Pool Filtration Pump	10.6	0.0	0	$0	$0	$405	$0	$405	N/A
DRM-7	Shut Down Networked PCs	6.0	6.0	288	$714	$0	$16,450	$750	$15,700	22.0
DRM-8	Shut Down Sewage Treatment Plant	17.5	0.0	0	$0	$0	$79	$0	$79	N/A
DRM-9	Turn Off Fountain Pump for 4 Hours During Demand Response Events	2.6	2.6	126	$309	$0	$1,154	$329	$825	2.7
Demand Response Measure Totals		124.8	85.1	4,086	$10,124	$0	$33,943	$5,334	$28,610	2.8

Assuming DR Event Electricity Cost	$ 1.200	/kWh	(Average summer peak period rate, this account)
Assuming NPV Discount Rate	10%		(Default 10%, adjustable)
Assuming DR Measure EUL	5	years	(Default 5 years)

2010 PG&E Incentives

Demand Response	Rate
Enablement Program:	
Technology Incentive	$125.00 per kW
Technology Incentive Cost Cap	50%
Auto-DR Technology Incentive	$250.00 per kW
Auto-DR Technology Incentive Cost Cap	100%
Participation Program:	
PDP DR credit	$5.87 per kW
PDP DR credit	$0.00179 per kWh
Assumed 12 events of 4 hrs each	48 hrs/yr

DR Program Assumptions

Incentives vary widely. These estimates assume the following:

-Demand reductions are for current conditions, before efficiency measures.

-Technology Incentive: manual initiation (not Auto-DR), capped by measure.

-Peak Day Pricing (PDP) participation program, 24 hours notice, 12 actual events of 4 hours.

5.4 APPENDIX D: SAMPLE 2010 STATEWIDE CUSTOMIZED OFFERING AGREEMENT

Appendix A

Sample Statewide Customized Offering Agreement

These are sample 2010 Statewide Customized Offering Agreements. It is subject to change, therefore be sure to review the actual agreement you receive before signing.

PG&E Statewide Customized Retrofit and Demand Response Agreement

2010 CUSTOMIZED RETROFIT AND DEMAND RESPONSE AGREEMENT

This Agreement is entered into by [Pacific Gas and Electric Company] ("UTILITY") and the Project Sponsor (third party entity or UTILITY Customer if self sponsored), as indicated. Project Sponsor agrees to review these terms and conditions. Any implementation of this project will be deemed the Project Sponsor's acceptance of these terms and conditions. If these terms and conditions are not acceptable, the Project Sponsor must notify UTILITY and refrain from any implementation of the project, otherwise will do so at their own risk.

Application Information

Project Name: _____

App. Number: _____

Date Received: _____ o Demand Response o Calculated Approach o M&V Required

Utility Customer Information

_____ _____
COMPANY NAME CORP. PARENT NAME (if applicable)

_____ _____
ADDRESS CITY/STATE ZIP CODE

_____ _____
CONTACT NAME E-MAIL ADDRESS

_____ ( ) _____ ( ) _____
TITLE TELEPHONE NO. FAX NO.

TAX STATUS: o Corp. o Non-Corp. o Exempt Exempt Reason: _____ _____
COMPANY/CORP. FEDERAL TAX ID

Project Sponsor Information

_____ _____
COMPANY NAME CORP. PARENT NAME (if applicable)

_____ _____ _____
ADDRESS CITY/STATE ZIP CODE

_____ _____
CONTACT NAME E-MAIL ADDRESS

_____ ( ) _____ ( ) _____
TITLE TELEPHONE NO. FAX NO.

TAX STATUS: o Corp. o Non-Corp. o Exempt Exempt Reason: _____ _____
COMPANY/CORP. FEDERAL TAX ID

Site Information

_____ _____
SITE NAME SITE I.D. # (if applicable)

_____ _____ _____
SITE ADDRESS CITY/STATE ZIP CODE

_____ _____ _____ _____
SITE CONTACT NAME CONTACT PHONE # ELECTRIC SERVICE AGREEMENT(S) # GAS SERVICE AGREEMENT(S) #

Approved Customized Retrofit Estimate

MEASURE DESCRIPTION	kWh	Permanent kW	therms	$ Amount
Sub-Total				
Measure Cost Adjustment				
Site Cap Adjustment				
Total Incentive				
10% Measurement and Verification Adder				

Approved Demand Response Dispatch-able Peak Demand Reduction Estimate

MEASURE DESCRIPTION	Dispatch-able Peak kW	$ Amount
Total Incentive		
10% Measurement and Verification Adder		

1.0 **PROJECT DESCRIPTION** This Agreement is limited to the **Customized Retrofit and Demand Response** Project(s) ("Project(s)") described on the Customized Retrofit and Demand Response Incentive Application and Form (both together referred as "Application") incorporated by reference into this Agreement. As stated in the Application, UTILITY shall pay incentives in accordance with the terms and conditions of this Agreement.

1.1 **DOCUMENTS INCORPORATED BY REFERENCE** The following documents are incorporated by reference and are made part of this Agreement: Project Sponsor's approved Application, UTILITY acceptance letter(s) based on measures proposed in the Application, and the 2010 Statewide Customized Offering Procedures Manual for Business ("Program Manual").

2.0 **ELIGIBILITY** Customized Retrofit and Demand Response funding is limited and is available on a first come, first served basis. Funds will be reserved only upon UTILITY approval of the Application. The Customized Retrofit and Demand Response Program offers two types of incentives, Customized Retrofit and Demand Response. A Project may be eligible for one or both of these incentives.

Customized Retrofit Projects must meet the following requirements to be eligible for incentives: (1) Project must be nonresidential and be located within UTILITY's service territory. (2) UTILITY Customers must pay the Public Purpose Programs ("PPP") surcharge on their UTILITY bills. (3) Projects will be evaluated using either the Customized Savings Approach or the Measured Savings Approach. (4) Projects must exceed the Title 24 energy efficiency requirements set by the California Energy Commission ("CEC" applicable at the time this Agreement is signed, or current industry standards using UTILITY-approved project baselines if Title 24 standards are not available. (5) Projects must meet all other Customized Retrofit and Demand Response requirements. (6) The Project Sponsor certifies that the energy savings and permanent peak reduction components of this Project have not and will not receive funds from any other energy conservation program funded by the PPP fund, the CEC or the California Public Utilities Commission ("CPUC").

Demand Response Projects must meet the following requirements to be eligible for incentives: (1) Project must be commercial, industrial, or agricultural and be located within UTILITY's service territory. (2) Customer must receive retail electric service from UTILITY. (3) Customer must have an existing electric meter that is capable of recording usage in 15-minute intervals and that

can be read remotely by UTILITY. (4) Project site's associated service agreement must have a maximum demand greater than or equal to 200 kW within the last 12 billing months, or the facility must be able to demonstrate a load reduction greater than or equal to 30 kW. (5) Projects will be evaluated using either the Calculated Savings Approach or the Measured Savings Approach (for measures requiring Measurement and Verification (M&V)). (6) Projects must meet all other Customized Retrofit and Demand Response Program requirements. (7) Project Sponsor certifies that the dispatch-able peak reduction components of the Project have not and will not receive funds from any energy conservation program funded by the PPP fund, the CEC or the CPUC.

3.0 **SUBMITTAL REQUIREMENTS FOR PAYMENT** As a condition of payment, Project Sponsor shall submit to UTILITY the documents described below. Required documents include but are not limited to: 1) Completed, signed Application; 2) Complete engineering calculations and documentation to demonstrate energy savings, permanent peak demand reduction, and dispatch-able peak demand reduction (including archival diskette if applicable); 3) Schematic drawings and/or manufacturer specification sheets if applicable; 4) Invoices and/or documentation to support Project cost at UTILITY'S request; 5) Additional Project-specific documents as requested by UTILITY prior to payment of incentives; and 6) Operating Report if the Measured Savings Approach is used.

4.0 **INSPECTIONS** As a condition of payment, Project Sponsor is responsible for ensuring that UTILITY has reasonable access for all inspections, including but not limited to those as described below: 1) Customized Retrofit and Demand Response Pre-Installation Equipment Inspection to examine the existing/baseline equipment and to check the accuracy of Project Sponsor's equipment survey; 2) Customized Retrofit Post-Installation Equipment Inspection to check installed equipment and to verify accuracy of Project Sponsor's equipment survey; 3) DR Post-Installation dispatch-able load reduction demonstration(s), 4) Customized Retrofit and Demand Response Post-operation inspection to check the energy savings of the Measures after installed equipment has been operating. This inspection can take place after the Operating Report has been submitted or earlier, at UTILITY's discretion.

5.0 **REVIEW AND DISCLAIMER** **UTILITY'S AND/OR ITS CONSULTANTS' REVIEW OF THE DESIGN, CONSTRUCTION, OPERATION OR MAINTENANCE OF THE PROJECT, ENERGY EFFICIENCY MEASURES, OR DEMAND RESPONSE MEASURES DO NOT CONSTITUTE ANY REPRESENTATION AS TO THE ECONOMIC OR TECHNICAL FEASIBILITY, OPERATIONAL CAPABILITY, OR RELIABILITY OF THE PROJECT MEASURES. PROJECT SPONSOR SHALL IN NO WAY REPRESENT TO ANY THIRD PARTY THAT UTILITY'S REVIEW OF THE MEASURES OR PROJECT, INCLUDING, BUT NOT LIMITED TO, UTILITY'S AND/OR ITS CONSULTANTS' REVIEW OR ANALYSIS OF THE DESIGN, CONSTRUCTION, OPERATION OR MAINTENANCE OF THE MEASURES OR PROJECT, IS A REPRESENTATION BY UTILITY AS TO THE ECONOMIC OR TECHNICAL FEASIBILITY, OPERATIONAL CAPABILITY, AND RELIABILITY OF SUCH MEASURES OR PROJECT. PROJECT SPONSOR IS SOLELY RESPONSIBLE FOR THE ECONOMIC AND TECHNICAL FEASIBILITY, OPERATIONAL CAPABILITY AND RELIABILITY OF PROJECT SPONSOR'S PROJECT AND MEASURES.**

6.0 **PAYMENTS** **Incentive payments will only be paid after all Customized Retrofit and Demand Response requirements are met by Project Sponsor to UTILITY's satisfaction. UTILITY retains sole discretion to determine the appropriate baseline values, dispatch-able peak reduction and energy savings calculations used to determine incentive payments. Incentive payments shall only be paid on Customized Retrofits that exceed Title 24 standards applicable when this Agreement is signed or industry standards in the absence of Title 24 standards. DR Projects are not subject to a standard baseline. UTILITY reserves the right to modify or cancel the incentive amount if the actual system installed differs from the installation in Project Sponsor's approved Application(s).**

6.1 **CUSTOMIZED RETOFIT INCENTIVE PAYMENTS** The total incentive payment under the Calculated Savings Approach or Measured Savings Approach shall not exceed the total incentive in the Final Approved Energy Savings Estimate (as presented on Page 2 of this Agreement). Projects with increased measure costs or installation of more efficient equipment are eligible for incentive payments above the total incentive, based on actual installed measure costs and energy savings from the actual installed equipment. Projects using the Measured Savings Approach are eligible for up to an additional 10% of the approved incentive amount in the event that actual energy savings are higher than projected. See Program Manual for details. The total incentive payment may be limited as described in the Program Manual. The calculations shall be in accordance with the Program Manual. The following Energy Savings incentive rates shall apply for the types of retrofit projects: Lighting, 5 cents/kWh; AC & Refrigeration I, 15 cents/kWh; AC & Refrigeration II, 9 cents/kWh; Other (motors, etc), 9 cents/kWh; and Natural Gas, 1.00 cents/therm. The following Demand Reduction rates shall apply for the types of retrofit projects: Lighting, $100/kW; AC & Refrigeration I, $100/kW; AC & Refrigeration II, $100/kW; and Other (motors, etc), $100/kW. UTILITY will make the applicable incentive payment to Customers, in one or more installments, only after the appropriate documents have been submitted and approved, and the appropriate inspections of the Project have been satisfactorily completed, in accordance with the rules set forth in the Program Manual. All Project(s) must be installed and fully operational by June 1, 2011. UTILITY reserves the right to cease making incentive payments, required the return of incentive payments and or/terminate this Agreement if the projects(s) is not installed and fully operational by June 1, 2011. Energy savings for which incentives are paid cannot exceed the actual usage provided by the UTILITY Non-utility supply, such as cogeneration or deliveries from another commodity supplier, does not qualify as usage from the UTILITY (with the exception of Direct Access customers or customers paying departing load fees for which the UTILITY collects PPP surcharges).

6.2 **DR INCENTIVE PAYMENTS** The total dispatch-able peak incentive payment under either the Calculated Savings or Measured Savings Approach shall not exceed the total incentive approved in the Approved Demand Response Dispatch-able Peak Demand Reduction Estimate (as presented in this Agreement), and is limited to $300,000 per customer. The total dispatch-able peak demand reduction (DR) incentive is limited to 50% of the incremental DR measure cost. The calculations

shall be in accordance with the Program Manual. The following dispatch-able peak reduction incentive rates shall apply for the DR program enrollment categories: Category 1, $125/kW; Category 2, $50/kW. Enrollment category 1 includes the following DR programs: AMP, BIP, CPP and PeakChoice with committed load reduction efforts option. Enrollment category 2 includes the following DR programs: DBP and PeakChoice Best Efforts Options. UTILITY will make the applicable incentive payment in one or more installments, only after the appropriate documents have been submitted and approved, and the appropriate inspections of the Project have been satisfactorily completed, in accordance with the rules set forth in the Program Manual. The first installment, 25% of the total DR incentive, will be paid upon successful post-field inspection, and completion and approval of the Post Installation Review. The last installment, and final 75% of the total DR incentive, will be paid after successful load reduction demonstration, completion of the DR Load Verification Review, and enrollment in a Demand Response Program for at least 3 years. Customer must enroll in a DR program upon receiving the first incentive payment installment. The customer is required to stay in a DR program for three years. Customer can move from one DR program to another, within an enrollment category, according to PG&E tariff. Customer can change from Category 2 to Category 1, but not from Category 1 to Category 2. If the customer cancels out of the DR program prior to three years, UTILITY is entitled to a 100% refund of the incentive. The equipment needs to be in place for a period of not less than five years. All 2010 Project(s) must be installed and fully operational by June 1, 2011. UTILITY reserves the right to cease making incentive payments, require the return of incentive payments and or/terminate this Agreement if the Project is not installed and fully operational by December 31, 2011.

7.0 **PAYMENT DISQUALIFICATION** A prorated part of the incentives shall be repaid by Project Sponsor to UTILITY if:

For Customized Retrofit, Customer fails to pay the PPP surcharge throughout the Term of this Agreement.
For DR Projects, Customer ceases to receive retail electric service from UTILTY any time throughout the Term of this Agreement.

For both Customized Retrofit and DR Projects, UTILITY did not receive the energy benefit for which the incentive is paid, for a period of not less than five years.

7.1 Project Sponsor agrees that if 1) Project Sponsor does not provide UTILITY with 100 percent of the related benefits specified in the Application, for a period of five years from the UTILITY approved installation date, or 2) the energy benefit to UTILITY ceases (for example, if UTILITY Customer stops using the equipment, no longer pays the PPP surcharge for energy efficiency projects, or discontinues retail electric service with UTILITY), Project Sponsor will return to UTILITY the prorated portion of the Incentive dollars based on the actual period of time for which UTILITY Customer provided the energy benefit.

7.2 **Project Sponsor shall repay any payments made by UTILITY within 30 days of notification by UTILITY that repayment is required. UTILITY is entitled to offset against payments owed to Project Sponsor any amount due to UTILITY which remains unpaid 40 calendar days after UTILITY'S written demand for payment. Project Sponsor may designate in writing a third party to whom UTILITY shall make incentive payments.**

8.0 **TERM AND TERMINATION** The Term of this Agreement shall commence on the last date that a Party executes this Agreement and shall terminate no later than five years from the Project Installation Report approval date, unless terminated earlier pursuant to this Agreement.

9.0 **ASSIGNMENT** Project Sponsor consents to UTILITY's assignment of all of UTILITY's rights, duties and obligations under this Agreement to the CPUC and/or its designee. Such assignment shall relieve UTILITY of all rights, duties and obligations arising under this Agreement. Other than UTILITY's assignment to the CPUC or its designee, neither Party shall assign its rights or delegate its duties without the prior written consent of the other Party, except in connection with the sale or merger of a substantial portion of its properties. Any such assignment or delegation without written consent shall be null and void. Consent to assignment shall not be unreasonably withheld. If an assignment is requested, the Project Sponsor is obligated to provide additional information if requested by UTILITY.

10.0 **PERMITS AND LICENSES** Project Sponsor, at its own expense, shall obtain and maintain licenses and permits needed to perform its work. Failure to maintain necessary licenses and permits constitutes a material breach of Project Sponsor's obligations.

11.0 **ADVERTISING, MARKETING AND USE OF UTILITY'S NAME** Project Sponsor shall not use UTILITY's corporate name, trademark, trade name, logo, identity or any affiliation for any reason, including to solicit customers to participate in the Project, without UTILITY's prior written consent. Project Sponsor shall make no representations to its customers on behalf of UTILITY.

12.0 **INDEMNIFICATION** Project Sponsor shall indemnify, defend and hold harmless, and releases UTILITY, its affiliates, subsidiaries, parent company, officers, directors, agents and employees, from and against all claims, demands, losses, damages, costs, expenses, and liability (legal, contractual, or otherwise), which arise from or are in any way connected with any: injury to or death of persons, including but not limited to employees of UTILITY or Project Sponsor; (ii) injury to property or other interests of UTILITY, Project Sponsor, or any third party; (iii) violation of local, state, or federal common law, statute, or regulation, including but not limited to environmental laws or regulations; or (iv) strict liability imposed by any law or regulation; so long as such injury, violation, or strict liability (as set forth in (i) - (iv) above) arises from or is in any way connected with Project Sponsor's performance of, or failure to perform, this Agreement, however caused, regardless of any strict liability or negligence of UTILITY whether active or passive, excepting only such loss, damage, cost, expense, liability, strict liability, or violation of law or regulation that is caused by the sole negligence or willful misconduct of UTILITY, its officers, managers or employees.

12.1 Project Sponsor acknowledges that any claims, demands, losses, damages, costs, expenses, and legal liability that arise out of, result from, or are in any way connected with the release or spill of any legally designated hazardous material or waste as a result of the work performed under this Agreement are expressly within the scope of this indemnity, and that the costs, expenses, and legal liability for environmental investigations, monitoring, containment, abatement, removal, repair, cleanup, restoration, remedial work, penalties, and fines arising from strict liability, or violation of any local, state, or federal law or regulation, attorney's fees, disbursements, and other response costs incurred as a result of such releases or spills are expressly within the scope of this indemnity.

12.2 Project Sponsor shall, on UTILITY's request, defend any action, claim or suit asserting a claim which might be covered by this indemnity. Project Sponsor shall pay all costs and expenses that may be incurred by UTILITY in enforcing this indemnity, including reasonable attorney's fees.

12.3 If this Agreement is assigned pursuant to Section 9.0, the Project Sponsor agrees that this indemnification shall continue to apply to UTILITY and shall apply to the assignee.

13.0 **LIMITATION OF LIABILITY** UTILITY shall not be liable for any incidental or consequential damages, including without limitation, loss of profits or commitments to Subcontractors, and any special, incidental, indirect or consequential damages incurred by Project Sponsor or its Customer.

14.0 **CPUC AUTHORITY TO MODIFY** This Agreement shall at all times be subject to such changes or modifications by the CPUC as it may from time to time direct in the exercise of its jurisdiction.

15.0 **INTEGRATION** This Agreement constitutes the entire agreement and understanding between the Parties as to the subject matter of the Agreement. It supersedes all prior or contemporaneous agreements, commitments, representations, writings, and discussions between Project Sponsor and UTILITY, whether oral or written, and has been induced by no representations, statements or agreements other than those expressed herein. Neither Project Sponsor nor UTILITY shall be bound by any prior or contemporaneous obligations, conditions, warranties or representations with respect to the subject matter of this Agreement.

NO AMENDMENT, MODIFICATION OR CHANGE TO THIS AGREEMENT SHALL BE BINDING OR EFFECTIVE UNLESS EXPRESSLY SET FORTH IN WRITING AND SIGNED BY UTILITY'S REPRESENTATIVE AUTHORIZED TO EXECUTE THE AGREEMENT.

16.0 **WRITTEN NOTICE** Any written notice, demand or request required or authorized in connection with this Agreement, shall be deemed properly given if delivered in person or sent by facsimile, email, nationally recognized overnight courier, or first class mail, postage prepaid, to the address specified below, or to another address specified in writing by UTILITY.

UTILITY

UTILITY Project Manager:

Address:

City, State Zip:

Fax # (facsimile):

Email:

PROJECT SPONSOR

Name _____

Company _____

Address _____

City, State, Zip _____

Fax # (facsimile) _____

Email _____

Notices shall be deemed received (a) if personally or hand-delivered, upon the date of delivery to the address of the person to receive such notice if delivered before 5:00 p.m., or otherwise on the Business Day following personal delivery; (b) if mailed, three Business Days after the date the notice is postmarked; (c) if by facsimile, upon electronic confirmation of transmission, followed by telephone notification of transmission by the noticing Party; (d) if by email; or (e) if by overnight courier: on the Business Day following delivery to the overnight courier within the time limits set by that courier for next-day delivery.

17.0 **CONFLICTS BETWEEN TERMS** Should a conflict exist between the main body of this Agreement and the Documents Incorporated by reference, the main body of this Agreement shall control. Should a conflict exist in the Documents Incorporated by reference, the Documents shall control in the following order: 1) Program Manual; 2) UTILITY acceptance letter(s) and incentive estimate(s) based on Measures as approved in Application(s); and 3) Project Sponsor's approved Application(s). Should a conflict exist between an applicable federal, state, or local law, rule, regulation, order or code and this Agreement, the law, rule, regulation, order or code shall control. Varying degrees of stringency among the main body of this Agreement, the Documents Incorporated by reference, and laws, rules, regulations, orders, or codes are not deemed conflicts, and the most stringent requirement shall control. Each Party shall notify the other immediately upon the identification of any conflict or inconsistency concerning this Agreement.

18.0 **CANCELLATION OF AGREEMENT** UTILITY may suspend or terminate the Agreement, without cause, upon written notice to Customer/ Project Sponsor.

This program is funded by California Utility Customers and administered by UTILTY under the auspices of the CPUC.

5.5 APPENDIX E: PARKING LOT LIGHTING QUOTE

Quote

LIGHTING SYSTEMS

Lighting Systems
2322 6th Str.
Berkeley CA 94710
Phone: (510) 982-3900
Fax: (510) 704-4568
From: Lauren Shields
Quoter Ph: [(510) 982-3941]

Date: Sep 15, 2010

Project **College of the Redwoods BETA**
Location
Quote B10-35032-1

To: Svetlana Zaburskaya
KEMA Services, Inc.
155 Grand Avenue
Suite 500
Oakland CA 94607
Phone: (510) 891-0466
EMail: svetlana.zaburskaya@us.kema.

For
Bid Date Sep 15, 2010
Expires Oct 15, 2010
Engineer: KEMA Services, Inc.

QTY	Type	MFG	Part	Price	UQ	ExtPrice
Note			BUDGETARY PRICING DOES NOT INCLUDE TAX OR FREIGHT CHARGES			
7		BETA	STR-LWY-OPTIC-HT-06-STANDARD FINISH: 150W HPS EQUIVALENT	$720.00		$5,040.00
20		BETA	STR-LWY-OPTIC-HT-06-STANDARD FINISH: 175W MH EQUIVALENT	$720.00		$14,400.00
28		BETA	STR-LWY-OPTIC-HT-10-STANDARD FINISH: 250W HPS EQUIVALENT	$1,118.00		$31,304.00
20		BETA	STR-LWY-OPTIC-HT-12-STANDARD FINISH: CLOSEST TO 400W HPS EQUIVALENT	$1,248.00		$24,960.00
SUBTOTAL						**$75,704.00**

Total: **$75,704.00**

.

Notes:

Budget Quote Only: Pricing is for Budget purposes only and represents what an Electrical Contractor could expect to pay for the fixtures when purchased through Electrical Distribution. Actual prices may vary with Qnty change and date of purchase.
Pricing does not include: Freight, Taxes, Lamp and Labor, ETC...

If you need further assistance, please contact Lauren Shields:

T: (510) 982-3941
F: (510) 704-4568
laurens@ltgsys.com

5.6 APPENDIX F: CONDENSING BOILER QUOTES

CALIFORNIA HYDRONICS CORPORATION

2293 TRIPALDI WAY • PO BOX 5049 • HAYWARD, CA 94540-5049
TELEPHONE 510-293-1993 • FAX 510-293-3080
www.CHChydronics.com

ATTN: **Svetlana Zaburskaya**	DATE: 10/20/10	QUOTE:

JOB: Boiler Replacement	BIDS:

ENG: KEMA Services	PGS: 2

We are pleased to offer the following budget proposal for your consideration:

TAG NO. DESCRIPTION

BOILERS Patterson Kelly Mach, condensing 5:1 full modulating Lo NOx burner, cast aluminum heat exchanger, variable speed air blower, microprocessor PID Temp and flame management control, On board digital touch pad use interface, Info access via laptop, accepts 0-10vdc remote set point and remote modulating Signal, automatic freeze protection, up to 95% thermal efficiency. Vent Cat IV. Gas pressure requirement: 3.5"w.c. min/14"w.c. max

Model	Budget Price
C300	$ 9,340
C450	$ 10,745
C750	$ 17,525
C1050	$ 19,995
C1500	$ 33,894
C2000	$ 36,663
C2500	$ 42,184
C3000	$ 50,518

CONDENSATE NEUTRALIZER JM Neutralizing Tubes flue side neutralizing tubes designed to neutralize acidic condensate produced by high efficiency boilers and warm air furnaces. The J.M. tubes raise the PH level to a near to neutral level of 6.0 to 7.0 PH

MODEL	RATING	GPH	DIA. X L	INLET-OUTLET		PRICE
JM-6	600 MBH	3	2" X 12"	1/2"	1/2"	$ 108.00
JM-10	1000 MBH	4	3" X 12"	1/2"	1/2"	$ 114.67
JM-20	2000 MBH	6	4" X 18"	1/2"	1/2"	$ 122.67

BOILER CONTROL SYSTEM Patterson Kelly ENVI Integral Boiler System Controller includes supply water temperature control with header sensor, boiler cascade/sequencing control for up to 24 boilers, system efficiency optimization control, combustion monitoring and control, BMS communication via Modbus operating status and error logging w/time stamp, (4) sensor inputs including operating temp, boiler return temp, boiler supply temp, and hot water header supply temp, general alarm contacts, outdoor air temp reset function, night setback clock, and text based display. BacNet, Lon, N2, Metasys available upon request. $$ INCL

System Sensor	Aquastat w/well, 100-240F w/adj diff. for boiler control, CHC # PenL501 *Shipped loose* for contractor installation and wiring.	$ 110.00

BOILER START-UP

Start-up requires combustion/CO_2 testing, adjust and documentation by qualified technician as per Boiler IOM. Warranty requires written record of start-up and regular maintenance as outlined within IOM. Install & Maintenance responsibility is by others. Start-Up may be performed by qualified contractor or is available as stated below:

Boiler/Burner Start-Up: Cost for an factory authorized CHC technician… Contractor shall be responsible for, and must confirm, pre start-up preparation. CHC is not responsible for external controls or incoming utilities. Site utilities must be purged, tested & connected to system prior to start-up visit. Installing contractor must be present and system load available to properly fire boiler(s). Pre-start-up forms must be returned to CHC Tech. Services.
Site conditions outside of our control which require a second trip or additional day of start-up service will be billed per hour at ……..... ***$ 130.00/hr***

Boiler Notes & Exclusions:

1. Local air quality regulations may require source testing of certain gas fired appliances in order to obtain an operating permit and assure compliance with local emission regulations. The owners or their representative are responsible for meeting all codes and regulations regarding the installation and operation of this equipment. CHC is *not providing* source testing with this quotation.
2. Excludes all combustion air piping, flue venting, fuel piping, control and sensor mounting, wiring or connection unless stated otherwise.
3. Price does not include any seismic calculations or supports, coatings other than factory standard or Low NOx requirements unless stated otherwise.
4. Gas train sized for 1/2 psi unless stated otherwise.
5. Burner voltage and site gas pressure to be confirmed at time of order.
6. ***An approved submittal is required prior to order release***.

Please call me if you have any questions.

Tim Goeppner
Business Development
CHC, Hayward, CA
(510)293-1993 office
(510)566-4124 cell

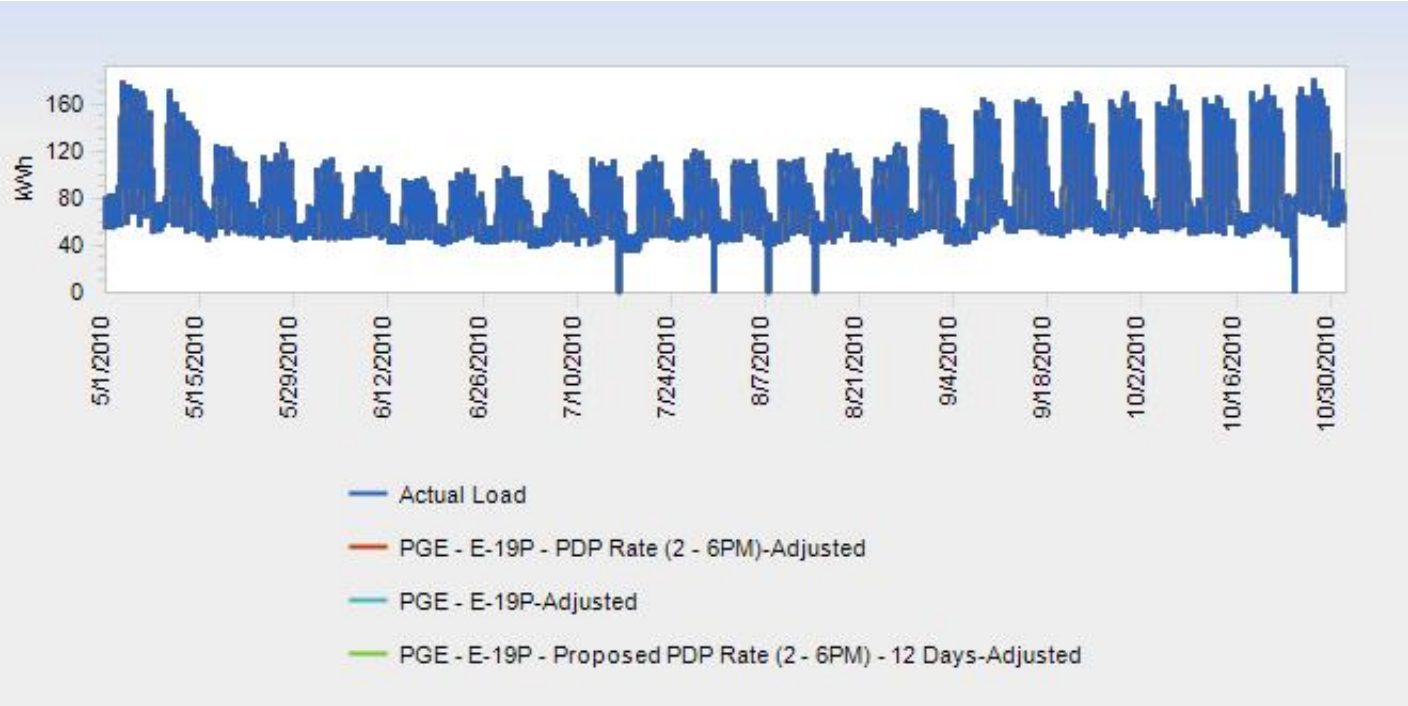
5.7 APPENDIX G: INTERACT ANALYSIS OUTPUT

What If Analysis

Pacific Gas and Electric Company

Report Date	12/1/2010 10:55 AM
Report Span	5/1/2010 - 10/31/2010
Total Days	184

Customer COLLEGE OF THE REDWOODS
Meter Description EUREKA 0637178035 56M156 LF78T-1



Usage Change Summary:

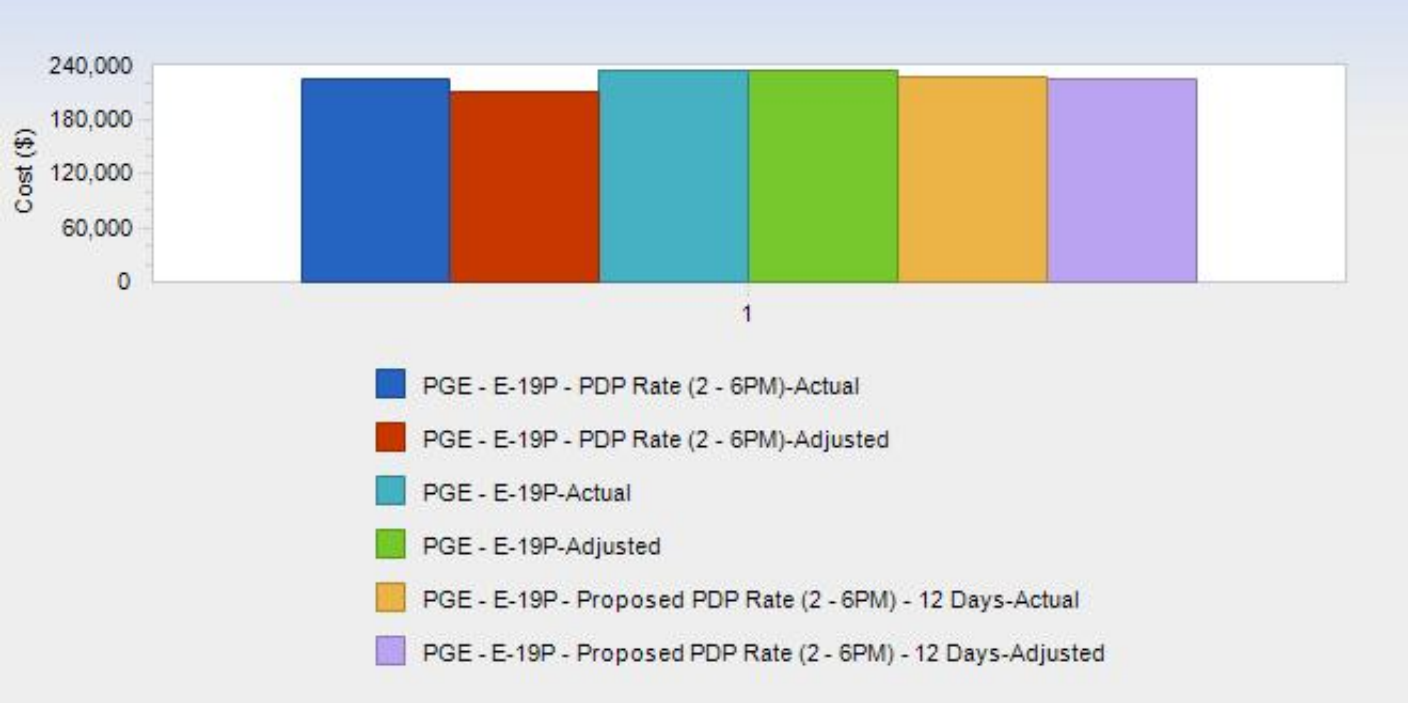
Usage	Units	Before	PGE - E-19P - PDP Rate (2 - 6PM)-Adjusted	PGE - E-19P-Adjusted	PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days -Adjusted
Consumption	kWh	1,439,741.64	1,425,124.80	1,425,124.80	1,424,386.28
MaximumDemand	kW	726.96	726.96	726.96	726.96
Max Demand Time	N/A	10/27/2010 12:45 PM	10/27/2010 12:45 PM	10/27/2010 12:45 PM	10/27/2010 12:45 PM
ReactiveConsumption	kVArh	582,171.60	582,171.60	582,171.60	582,171.60
ReactiveDemand	kVAr	277.92	277.92	277.92	277.92

Load Change Applied:

Applied To	Season	Block	Energy (%)
Time Of Use	Summer (May - Oct)	On Peak	0.00
Time Of Use	Summer (May - Oct)	Off Peak	0.00
Time Of Use	Summer (May - Oct)	Partial Peak	0.00
Time Of Use	Winter (Nov - Apr)	On Peak	0.00
Time Of Use	Winter (Nov - Apr)	Off Peak	0.00
Time Of Use	Winter (Nov - Apr)	Partial Peak	0.00
Time Of Use	Event Period	Event Period	-15.00

Monthly Results:

Date	PGE - E-19P - PDP Rate (2 - 6PM)-Actual	PGE - E-19P - PDP Rate (2 - 6PM)-Adjusted	PGE - E-19P-Actual	PGE - E-19P-Adjusted	PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days-Actual	PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days-Adjusted
5/1/2010 - 5/31/2010	39,053.90	39,053.90	43,923.28	43,923.28	40,921.83	40,921.83
6/1/2010 - 6/30/2010	28,407.27	28,407.27	31,374.33	31,374.33	30,423.59	30,249.62
7/1/2010 - 7/31/2010	29,639.04	28,646.54	31,735.62	31,735.62	30,867.98	30,552.84
8/1/2010 - 8/31/2010	39,140.82	32,908.51	37,251.74	37,251.74	36,164.28	35,184.98
9/1/2010 - 9/30/2010	48,342.79	39,857.79	44,633.01	44,633.01	46,573.62	44,955.37
10/1/2010 - 10/31/2010	42,204.51	42,204.51	47,153.76	47,153.76	44,083.51	44,083.51
Total	226,788.33	211,078.52	236,071.74	236,071.74	229,034.81	225,948.15



Cost Savings Summary:

Rate Name	Before	After	Difference	% Difference	Description:
PGE - E-19P - PDP Rate (2 - 6PM)	226,788.34	211,078.52	-15,709.82	-6.93	EUREKA 0637178035 56M156 LF78T-1
PGE - E-19P	236,071.75	236,071.75	0.00	0.00	EUREKA 0637178035 56M156 LF78T-1
PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days	229,034.81	225,948.15	-3,086.65	-1.35	EUREKA 0637178035 56M156 LF78T-1

Rate Results: PGE - E-19P - PDP Rate (2 - 6PM)

Bill Charges Detail

Charge Type	Before	After	Difference	% Difference
Demand Charges	57,110.38	57,110.38	0.00	0.00
Energy Charges	166,050.03	150,340.21	-15,709.82	-9.46
Fixed Charges	3,627.93	3,627.93	0.00	0.00

Event Details

Event ID	Event Date	Included In Analysis
5447	7/16/2010 2:00:00 PM	Yes
5476	8/16/2010 2:00:00 PM	Yes
5492	8/23/2010 2:00:00 PM	Yes
5499	8/24/2010 2:00:00 PM	Yes
5535	8/25/2010 2:00:00 PM	Yes
5568	9/1/2010 2:00:00 PM	Yes
5576	9/2/2010 2:00:00 PM	Yes
5583	9/3/2010 2:00:00 PM	Yes
5598	9/28/2010 2:00:00 PM	Yes

Rate Results: PGE - E-19P

Bill Charges Detail

Charge Type	Before	After	Difference	% Difference

Demand Charges	81,070.90	81,070.90	0.00	0.00
Energy Charges	151,372.92	151,372.92	0.00	0.00
Fixed Charges	3,627.93	3,627.93	0.00	0.00

Rate Results: PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days

Bill Charges Detail

Charge Type	Before	After	Difference	% Difference
Demand Charges	68,039.81	68,039.81	0.00	0.00
Energy Charges	157,367.07	154,280.41	-3,086.65	-1.96
Fixed Charges	3,627.93	3,627.93	0.00	0.00

Event Details

Event ID	Event Date	Included In Analysis
628104	6/28/2010 2:00:00 PM	Yes
715104	7/15/2010 2:00:00 PM	Yes
716104	7/16/2010 2:00:00 PM	Yes
816104	8/16/2010 2:00:00 PM	Yes
823104	8/23/2010 2:00:00 PM	Yes
824104	8/24/2010 2:00:00 PM	Yes
825104	8/25/2010 2:00:00 PM	Yes
91104	9/1/2010 2:00:00 PM	Yes
92104	9/2/2010 2:00:00 PM	Yes
93104	9/3/2010 2:00:00 PM	Yes
928104	9/28/2010 2:00:00 PM	Yes
929104	9/29/2010 2:00:00 PM	Yes

Bill Attribute Details:

Bill Attribute Option	PGE - E-19P - PDP Rate (2 - 6PM) (Current)	PGE - E-19P (Alternative 1)	PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days (Alternative 2)
Fixed Transition Amount	Non-FTA	Non-FTA	Non-FTA
Tax Exempt - State	Not tax exempt - State	Not tax exempt - State	Not tax exempt - State
PGE Rate E-19 options	Rate E-19	Rate E-19	Rate E-19
Capacity Reservation Charge Base Adjustment (%)	50		50
Capacity Reservation Charge (kW)	50		0

Capacity Reservation Charge (CRC) Details:

Rate Name	Adjusted CRC Value	CRC Value	EffectiveDateRange
PGE - E-19P - PDP Rate (2 - 6PM)	50.00	50.00	5/1/2010-11/1/2010
PGE - E-19P	0.00	0.00	5/1/2010-11/1/2010
PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days	305.48	610.96	5/1/2010-11/1/2010

Rates Used For Analysis:

Rate	Rate Currency	Distribution	Transmission	Commodity
PGE - E-19P - PDP Rate (2 - 6PM)	$	X	X	X
PGE - E-19P	$	X	X	X
PGE - E-19P - Proposed PDP Rate (2 - 6PM) - 12 Days	$	X	X	X

THE RATES AND RATE ANALYSIS DERIVED THEREFROM ARE PROVIDED BY PG&E FOR THE LIMITED PURPOSE OF ASSISTING USERS AND THEIR AUTHORIZED REPRESENTATIVES TO REVIEW AND MANAGE THEIR USE OF ELECTRICITY. ALL USERS AND THEIR AUTHORIZED REPRESENTATIVES HEREBY ACKNOWLEDGE AND AGREE THAT THE RATE ANALYSIS IS AN ESTIMATE OF ENERGY COSTS AND NOT A REPRESENTATION, WARRANTY OR GUARANTEE FROM PG&E THAT A USER WILL HAVE TO PAY THE MONIES SET FORTH IN THE RATE ANALYSIS OR RECEIVE ANY POTENTIAL ENERGY SAVINGS SET FORTH THEREIN.

5.8 APPENDIX H: WALKING PATHWAY LIGHTING REPLACEMENT KIT QUOTE

From: Ray Anderson [ray@tlaadvantage.com]
Sent: Thursday, December 30, 2010 11:59 AM
To: Zaburskaya, Svetlana
Cc: Bill Andeson
Subject: RE: Induction lamp retrofit kit

1. 85 watt retro ~$305.00

2. Eclipse can compose a custom kit consisting of the primary light as induction and supplement it with lower level of LED But this requires time to design and we would need a sample to work with.
It could kick the price up to $495 -$425 per kit versus $715-$745 for new fixture.
Controls by others

Thanks,

Ray Anderson
TLA-Advantage
12925 Alcosta Blvd., Ste. 9
San Ramon, CA 94583
Phone: 925.806.0501 ext. 222
Fax: 925.806.0459
ray@tla-advantage.com

5.9 APPENDIX I: SHUT DOWN NETWORKED PC'S SOFTWARE QUOTE

From: Ryan Nice [rnice@verdiem.com]
Sent: Wednesday, November 17, 2010 12:59 PM
To: Zaburskaya, Svetlana
Subject: Verdiem SURVEYOR

Svetlana,

Good speaking with you earlier and thanks for your call. Verdiem's enterprise level software, SURVEYOR, allows organizations with large PC networks to simply, measurably and verifiably reduce their carbon footprints. SURVEYOR enables customers to centrally control and reduce the energy used by PCs on their network by up to 60 percent without impacting end users or IT.

Academic/Public Sector Pricing for SURVEYOR:

License Fee SUR-PRD-NGE-NA-A $13.00/seat

Maintenance Fee SUR-PRD-NGE-NA-A $1.95/seat

Total Cost per Seat: **$14.95**

There is also a one-time Installation Service charge of $1,500.00 for the install and deployment of SURVEYOR.

So, the total cost for 1,000 seats at University of Redwoods would come to **$16,450.00**

Please let me know if any questions.

Regards,

-Ryan

Ryan Nice

Sr. Account Manager

1601 Second Avenue, Suite 701

Seattle, WA 98101

Tel. (206) 838-2831

Fax. (206) 838-2801