PERALTA COMMUNITY COLLEGE DISTRICT
ITEM # 21

Board of Trustees Agenda Report
For the Trustee Meeting Date of May 20, 2008

ITEM TITLE:

Approval to Negotiate with Chevron Energy Solutions for an Energy Conservation and Renewable Energy Early Action Program District-Wide.

SPECIFIC BOARD ACTION REQUESTED:

The administration requests authorization to negotiate a partnership agreement with Chevron Energy Solutions to design, finance and implement an Early Action Program (EAP) to reduce energy usage district-wide and install renewable energy.

ITEM SUMMARY:

These measures are the priority projects within a long-term partnership and multi-phased Energy and Sustainability Implementation program delivering energy efficiency retrofits, renewable energy and infrastructure upgrades District-Wide.

Early Action program includes:

- 1.2 MW of solar PV at Merritt College (hillside and solar parking canopies in lot B & C;
- Reducing HVAC equipment run-time for all sites through schedule changes;
- Retrocommissiong (RCx) of Laney Art Building HVAC, Laney Central Plant, Merritt Central Plant, Berkeley City College complete facility;
- Boiler replacement at College of Alameda in 2008;
- Submetering of electrical, gas and water usage by building; and
- Assistance in the creation of a solar laboratory to prepare students for green jobs in the emerging green economy, at Laney and Merritt campuses;
- Use of local companies for PV installation.

BACKGROUND/ANALYSIS:

The Early Action Program (EAP), scoped by Chevron Energy Solutions, with constant consultation from the Department of General Services, focuses on the installation of energy meters at individual college buildings, retrocommissioning of HVAC systems as well as the potential for photovoltaic solar power systems (PV) at various District sites. Chevron ES also examined a number of other energy and water conservation measures including hot water boiler replacement at the College of Alameda, variable frequency drives at some of the District's air handling units, etc.

This suite of projects has the combined potential to save the District millions of dollars in energy costs over 25 years. The total cost of the Early Action Program is not to exceed $13 Million and total savings range from $1.47 million to $17 Million depending on the structure of the agreement (Third Party Ownership/Financing vs. District Dollars).

Table 1 lists and briefly describes the projects recommended in the EAP. The recommendations closely represents the final list of projects will be decided in conference with Department of General Services staff.

Table 1: Early Action Program – List of Recommendations

EARLY ACTION PROGRAM			
OPPORTUNITY	**LOCATION**	**EXISTING CONDITION**	**OPPORTUNITY DESCRIPTION**
Install Solar Photovoltaic Panels	**Merritt College - Ground Mount System**	No renewable energy systems exist at this location	Take advantage of existing developed hillside to install ~800 kW of solar panels - ground mounted
Reduce Equipment Run Time	**Laney College Campus**	Currently, most units are starting at 4am (many at 3:30am) and running to 10pm (Mon thru Sat) and one hour on Sunday.	Change schedules so that units will start at 6am (reducing 2 hours of runtime per unit) Monday through Saturday, turn off units 5 hours earlier on Saturdays, and don't allow units to run on Sundays (saving one hour of runtime per unit). This is a savings of ***18*** hours per week per unit.
	Merritt College Campus	Currently, most units are starting at 4am (Mon & Tues), 5am (Wed thru Fri), 6am on Sat, and running to 10pm (Mon thru Sat).	Change schedules so that units will start at 6am (reducing 2 hours of runtime per unit Mon & Tues and 1 hour per unit Wed thru Fri) and turn off units 5 hours earlier on Saturdays. This is a savings of ***12*** hours per week per unit.
	College of Alameda	Except for two units (S-F-1 & S-4-G), most units are starting at 4am (Mon thru Fri). Most of the units (except for S-4-G and the two Gym units) run for either only one hour on Saturday and Sunday or not at all on weekends.	Change schedules so that units will start at 6am (reducing 2 hours of runtime per unit Mon thru Fri) and turn off any units (except for S-4-G and the two Gym units) on Saturdays and Sundays. This is a savings of ***12*** hours per week per unit.
Retrocommissioning	**Laney College - Art Building**	All HVAC units are on 24/7. Exterior lighting also operates 24/7	Integrate buildings into existing Delta Energy Management system
	Laney College - Central Plant	Central plant does not operate efficiently, there is no control strategies to reset chilled and hot water supply temperatures based on load and/or outside air temperature.	Develop control strategies for central plant and auxiliary equipment
	Berkeley City College	This facility is almost 2 yrs old, however, it energy usage is above average for the type of facility and occupancy	Retrocommission entire facility for optimum performance
	Merritt College	Central plant not operating at maximum efficiency	Develop control strategies for central plant and auxiliary equipment
Submetering	**Laney College**	Even though there are some buildings currently being monitored via electric metering by the Delta Controls system throughout the campus, many of the meters are not providing accurate data.	Replace and/or provide new electric meters to all buildings and put on the Delta Controls system.
	Merritt College	The buildings do not have electric metering.	Provide new electric meters to all buildings and put on the Delta Controls system.
	College of Alameda	The buildings do not have electric metering.	Provide new electric meters to all buildings and put on the Delta Controls system.
	Berkeley City College	The buildings do not have electric metering.	Provide new electric meters to all buildings and put on the Delta Controls system.
New Hot Water Boilers	**College of Alameda**	Existing boilers are at the end of their useful life. Out of three original boilers only one currently work and its in bad conditions.	Replace existing boilers with new high efficiency units. Convert constant primary flow to variable primary/secondary system for maximum performance

The Early Action Program (EAP) has incorporated a systematic approach towards determining how best to meet the Peralta Community College District Board Policy 2.40: Environmental and Sustainability plan and financial goals of the District. Various system and technologies have been evaluated for cost-effectiveness and technical consistency with Board policy objectives, Facilities Master Plan assessments and objectives, and stakeholder wishes. Several local contractors also provided not only valuable input regarding construction cost data and project schedule, but also excellent advice on the constructability of the recommended systems. This input is a key reason why Chevron Energy Solutions is confident in the technical, operational, and resulting economic benefits of this project.

Pursuant to Board Policy 2.40 Environmental Sustainability goal to reduce the District's current greenhouse gas emissions (GHG) caused by energy consumption by 50% within five years; the Early Action Program is expected to reduce the District's GHG by 14% from 2007 levels.

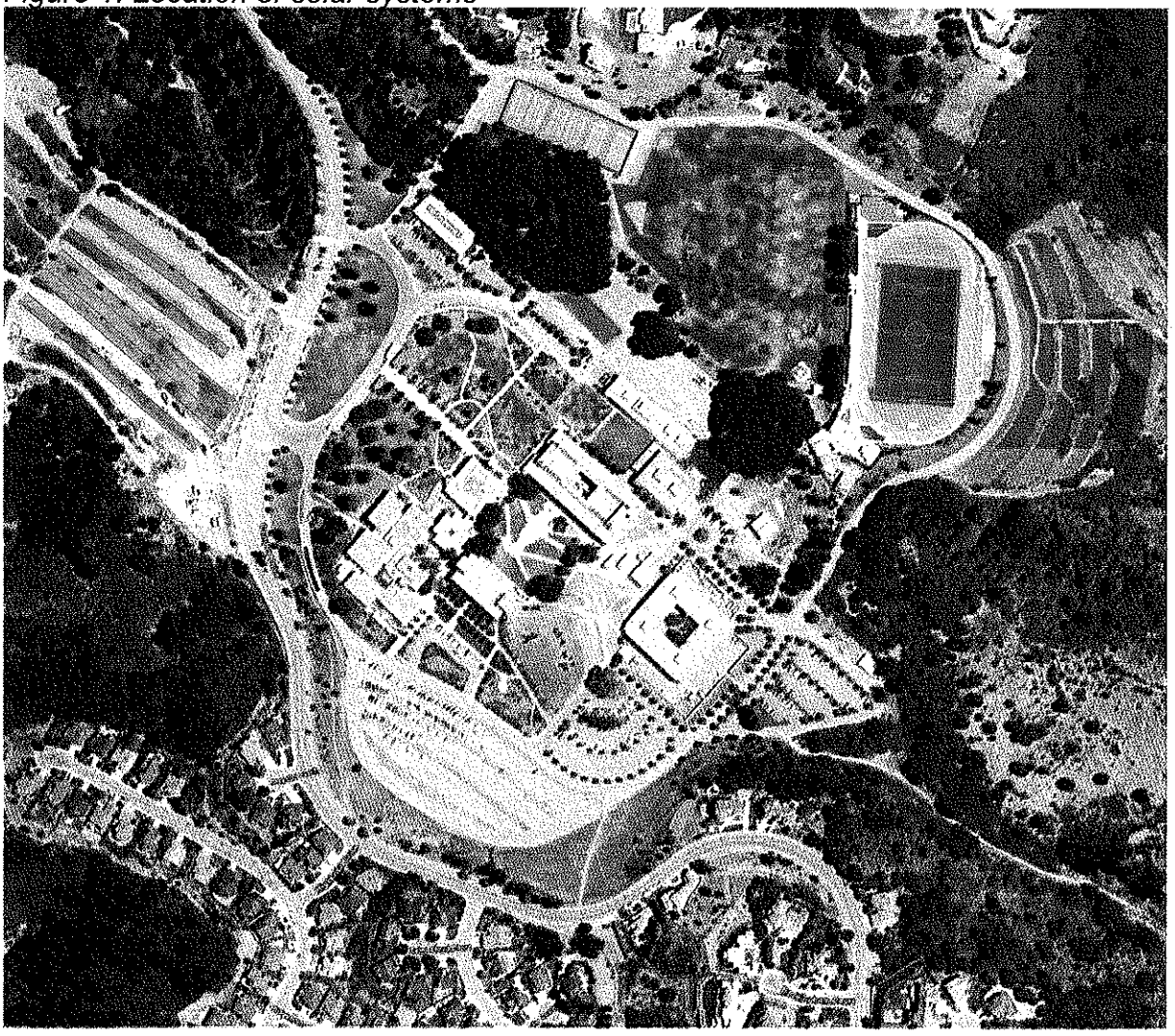
Photovoltaic System for Merritt College Campus

Chevron ES recommends installing ground-mounted and parking canopies solar photovoltaic (PV) systems at the Merritt College campus to offset a percentage of the District's electric demand with clean, renewable onsite-generation. PV systems produce the most electricity during peak hours of the day when electric rates are the highest. By installing PV at the Merritt campus, the Peralta Community College District will reduce its energy bills by displacing power purchased at peak rates.

The solar systems will enable the District to hedge against increasing electricity rates. PG&E rates have historically increased at 6% a year and are projected to escalate between 6-8% in the future. Chevron ES will secure incentives through the California Solar Initiative (CSI) authorized by the California Public Utility Commission and administered by PG&E. If the Peralta Community College District takes action soon (as the incentives are dropping over time), it can secure up to $2.1 million of incentive money.

The total size of the PV systems will be approximately 2 MW in size and will provide approximately 75% of the total energy usage by the college The hillside PV system will be approximately 800-1000 kW-DC in size. Chevron ES also recommends installing a parking cover structure with 1200 kW PV panels at Merritt College parking lot "B". . Figure 1 shows the location of both PV systems.

Figure 1. Location of solar systems



The solar panel array will be mounted at a 10 degree tilt on steel structure framed racks. The racks will be supported by galvanized steel posts set in concrete supports. A suitable inverter, cabling and switches will be provided as required for a fully functional system.

The Chevron ES proposal includes a weather station and a "kiosk" or display panel, which presents real-time operational data; it can be used to illustrate solar generation to District's employees and to the general public. The weather station can monitor temperature, wind speed, wind direction, and solar irradiance. Its output, together with kWh readings from the PV generation meter, will be supplied to the kiosk. The District may determine the appropriate location to install the kiosk; the information displayed can be used by the District to educate the public about its solar program and environmental benefits.

Chevron ES maintenance program includes O&M manuals consisting of site-specific operation, maintenance and parts manuals for the PV system and modifications to any existing facility. The manuals cover components, options and accessories supplied. They

may also include maintenance, troubleshooting, and safety precautions specific to the supplied equipment. Maintenance schedules are also provided. Depending on the structure of the agreement and the nature of the District's needs, Chevron ES could be the point of contact for O&M.

Stakeholder groups on each of the campuses have been and are continuing to be consulted regularly in the process to ensure consideration of all possible concerns and contingencies, including allocation of program savings into educational programs and operational needs.

An hour-by-hour output was generated for the solar systems at the Merritt College campus to calculate the new usage profile of the site. The complete model recreates a whole year of consumption, solar production and billing, the net results are illustrated on figure 2. The utility rate at this location is a time-of-use (E19P); no rate changed is recommended at this site.

Figure 2a. Merritt College – Existing Load Profile No PV

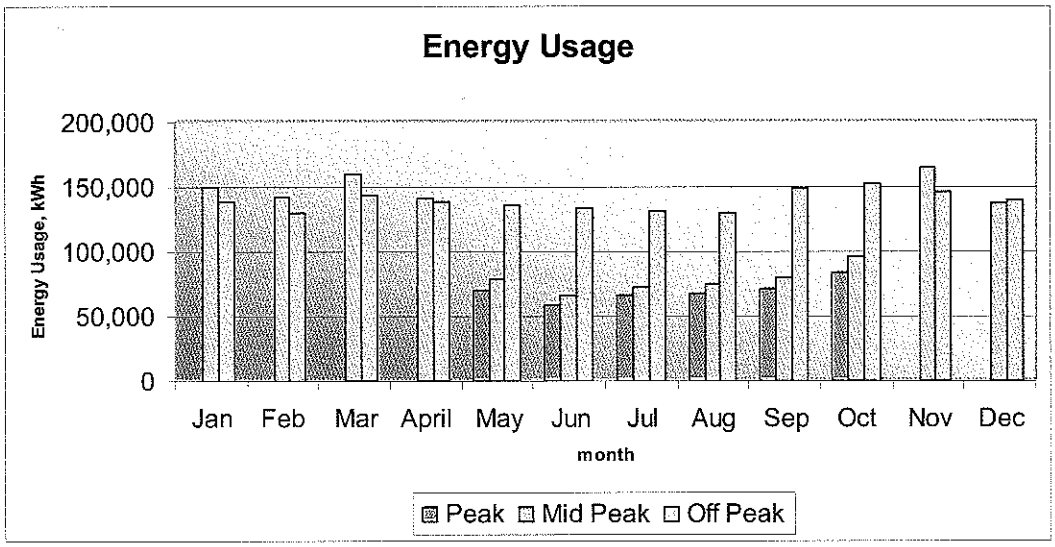
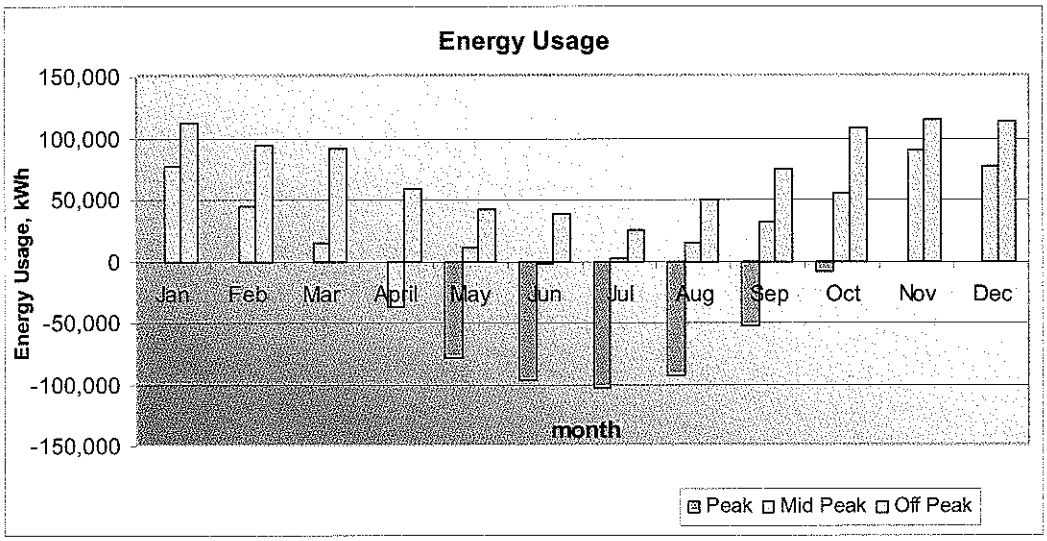


Figure 2b. Merritt College – Load Profile with a 2000 kW PV Array



Reduce Equipment Run-time

Operating schedules for the main building systems (HVAC and lighting) were reviewed by Chevron ES engineers utilizing the existing Delta Controls energy management system and verified by the 15-min utility interval data. Figures 3a and 3b illustrate the results for Laney and Merritt College campuses (no interval data available for College of Alameda and Berkeley City College). Many of the building systems start as early as 3:30 AM when there no students or staff in the campus creating unnecessary use of electric and natural gas.

Chevron ES recommends creating a schedule based on current class requirement for each campus, schedules should be reviewed by maintenance staff semiannually. By implementing this recommendation, as an example, the Laney College campus can reduce the run-time of many large air handling units up to 18 hrs/week creating significant energy savings. And additional benefit is the reduction on wear-and-tear of the equipment.

Figure 3a: Laney College Utility Profile

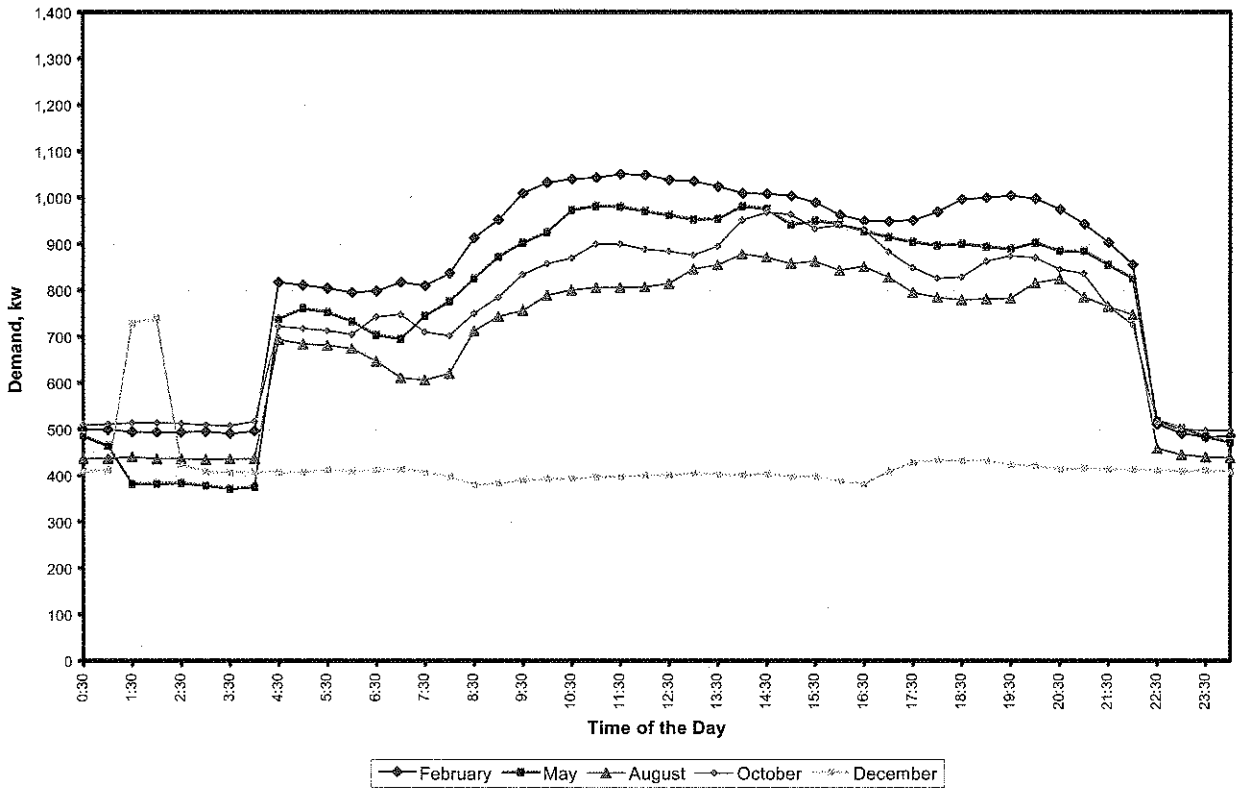
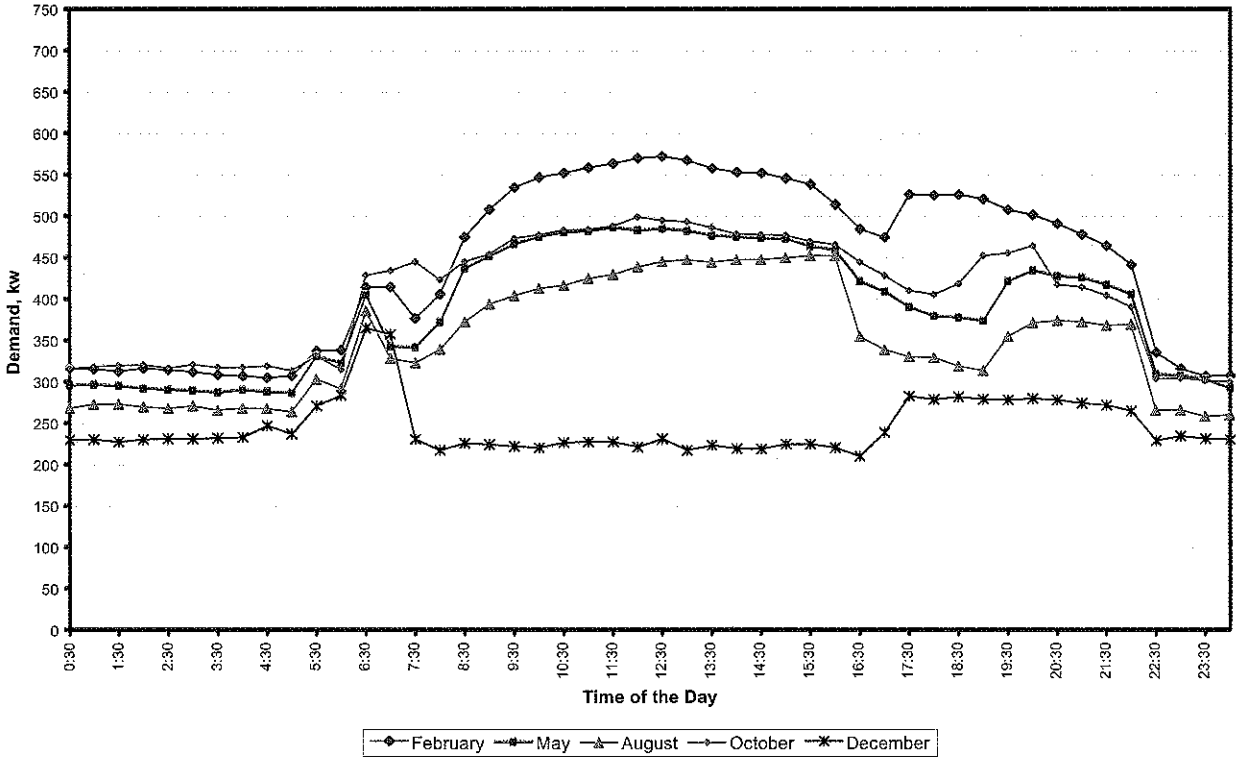


Figure 3b: Merritt College Utility Profile



Retrocommissioning

Retrocommissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction, or address problems that have developed throughout the building's life. In all, retro-commissioning improves a building's operations and maintenance procedures to enhance overall building performance.

For the Peralta Community College District, Chevron ES recommends retrocommissioning the following facilities:

- Laney College: Art Building
- Laney College: Central Plant
- Merritt College: Central Plant
- Berkeley City College: HVAC and EMS

These facilities were selected based on the information collected by Chevron ES engineers and the information provided by the District's maintenance staff. The commissioning goals for these facilities include: to produce a building that meets the unique needs of the District, improve operation and system reliability, and reduce energy consumption.

Building Submetering

"Energy usage cannot be managed unless it is measured"

Three of the four college facilities that constitute the Peralta Community College Districts are large campuses with a single utility meter (additional meters exist for selected buildings at Laney and Merritt colleges), thus, the only information available to the facilities team is total campus energy usage. Building electric submeters exist at the Laney College facility, however, during Chevron ES site visit it was determined that most of the submeters do not function properly. Chevron ES recommends implementing a building level sub-meter plan to measure individual building performance.

Installing individual meters at each building can help the District to,

- Separate energy use in facilities that receive funds from different sources.
- Facilitate charging-back to departments or other campus units as a way to encourage energy efficiency measures.
- Utility cost allocation
- Maximize indirect cost recovery
- Identify small problems before they become big problems
- Identify, analyze, and validate energy conservation efforts
- "Right-sizing" utility service to buildings
- Educational tool
- Identify performance improvements and guides preventive maintenance: trends in monthly and annual use of each form of energy help to identify the benefits received from system upgrades and also the energy systems (e.g., boilers or chillers) that may need attention if they show unexpected increases in use.
- Enables quick response to failures of system components.
- Help compile baseline energy for benchmarking purposes
- Assist in making decisions about energy upgrades in buildings by comparing energy use in similar facilities.
- Submetering and monitoring energy usage may contribute LEED credits for future certification.

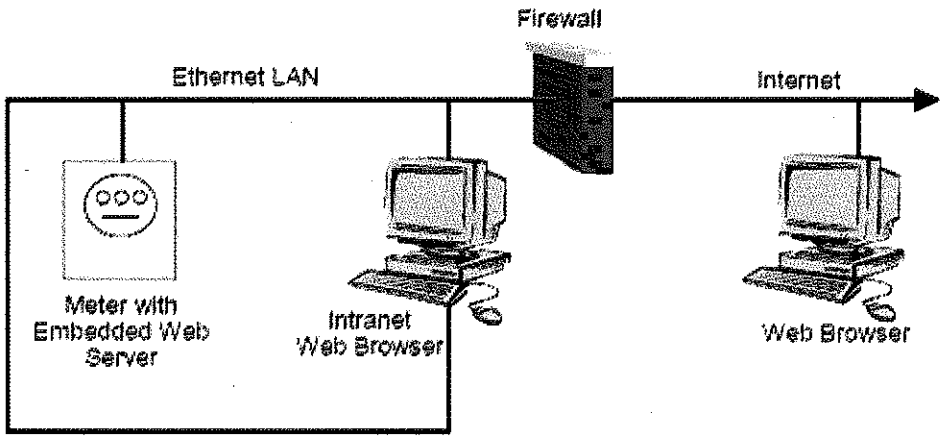
Metering System Components

A typical metering system includes,

1. Meters
2. Data-collection system
3. Data storage
4. Data analysis and presentation.

Most modern metering systems are web-base and can be integrated into the existing energy management system, for the Peralta District, a possible configuration is shown in figure 4.

Figure 4: Metering system configuration



A summary of Chevron ES sub-meter plans is illustrated on Table 3. A list of metrics recommended to evaluate the individual building energy performance is shown on Table 4.

Table 3: Sub-metering Plan

DESCRIPTION	Electricity	Natural Gas	Water	Outside Air Temperature	Supply Temperature	Return Temperature	GPM
Campus Level:							
Main Meter	X	X	X	X			
Chilled Water Loop					X	X	X
Hot Water Loop					X	X	X
Central Plant	X	X	X		X	X	X
Building Level:							
HVAC	X	X		X	X	X	
Indoor Lighting	X						
Plug Load	X						
Indoor Plumbing			X				X
Domestic Hot Water		X	X				X
Chiller Water					X	X	X
Hot Water					X	X	X

Table 4: Performance Metrics

Performance Metric	Units	Description
Building Energy Use	kWh, Btu, J	Energy consumed in a building for heating, ventilating, and air conditioning (HVAC), indoor lighting, facade lighting, service hot water (SHW), plug loads, people movers, and other building energy use, excluding Process Energy Use and Cogeneration Losses.
Building Energy Use Intensity	kWh/ft^2, Btu/ft^2	Building Energy Use divided by the Functional Area.
Building Lighting Energy Use	kWh, Btu, J	Installed Lighting Energy Use plus Plug-in Lighting Energy Use plus Facade Lighting Energy Use
Building Purchased Energy Cost	US$	Portion of the Net Facility Purchased Energy Cost corresponding to the Building Energy Use
Building Purchased Energy Cost Intensity	US$/ft^2	Building Purchased Energy Cost divided by the Functional Area
Renewable Electrical Energy Production	kWh, Btu, J	Electrical energy produced by cogeneration equipment that is either (a) utilized at the facility in a way that offsets the consumption of purchased energy or other energy generated at the facility, or (b) exported from the facility and utilized elsewhere (e.g., electrical energy fed to the utility grid).
Cooling Energy Use	kWh, Btu, J	Energy used by air conditioners, chillers, heat pumps (when in the cooling mode), or other devices used to cool a building, such as absorption or evaporative coolers.
Facility Energy Production	kWh, Btu, J	Total of all energy produced at the facility and either used at the facility or sold for use elsewhere, excluding losses within the energy production system.
Fan Energy Use	kWh, Btu, J	Fan energy used to move air through a building, whether or not the air is heated or cooled.
Heating Energy Use	kWh, Btu, J	Energy used by furnaces, boilers, heat pumps (when in the heating mode), electrical resistance coils, or other devices used to heat a building.
HVAC Energy Use	kWh, Btu, J	Heaters, chillers, pumps, fans, and any other loads that constitute the HVAC system. Heating Energy Use + Cooling Energy Use + Fan Energy Use
Installed Lighting Energy Use	kWh, Btu, J	Electrical energy measured in all circuits that are dedicated to indoor lighting fixtures, adjusted for any non-lighting appliances on these circuits.
Net Facility Electrical Demand	kW, kVA	Peak demand on the electric utility during the month, as defined in the applicable electric utility rate structure, or the annual maximum of the monthly values.
Net Facility Energy Use	kWh, Btu, J	Total Facility Energy Use – Facility Energy Production
Net Facility Purchased Energy Cost	US$	Monetary cost of all energy purchased for use at the facility, minus any credits or receipts for energy produced at the facility and sold for use elsewhere.
Other Building Energy Use	kWh, Btu, J	Indoor energy consumption that is not included in another category under Building Energy Use, excluding Process Energy Use.
Other Facility Electrical Energy Production	kWh, Btu, J	Electrical energy produced at the facility by any means, to be specified, not included in one of the other categories under Facility Energy Production.
Outdoor Ambient Temperature	°F or °C	Average ambient air temperature at the facility, corresponding to the energy measurements.
Outdoor Energy Use	kWh, Btu, J	The sum of all energy consumed at the facility away from the building, including parking lot lights, walkway lighting, detached sign lighting, snow melting, or other outdoor energy uses.
Plug-in Lighting Energy Use	kWh, Btu, J	Energy consumed in all indoor lighting fixtures that are not connected to a dedicated lighting circuit.
Plug Loads Energy Use	kWh, Btu, J	Electrical energy measured in all circuits that are dedicated to plug loads, less energy that is included in another category.
Process Energy Use	kWh, Btu, J	Energy consumed within a building or elsewhere at a facility in support of a manufacturing, industrial, or commercial process other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.
PV Energy Production	kWh, Btu, J	Electrical energy produced by PV modules, less losses in any components that are integral with the PV system.
Service Hot Water (SHW) Energy Use	kWh, Btu, J	Energy used to heat water for any use other than HVAC or process loads.
Thermal Energy Production	kWh, Btu, J	Thermal energy generated at the facility by means such as solar thermal or geothermal, to the extent that the energy is used at the facility in a way that offsets the consumption of purchased energy or other energy generated at the facility.
Thermostat Setpoints	°F or °C	Actual setpoints of all space heating and cooling thermostats (or building automation system [BAS] setpoints) corresponding to the energy measurements.
Total Facility Energy Use	kWh, Btu, J	Total of all energy consumed at the facility. If fuel is stored at the facility, in a fuel oil or LPG tank for example, the fuel usage must be metered as it is dispensed from storage.

New Hot Water Boilers for College of Alameda

Hot water for space heating and domestic use is provided by a central plant at the College of Alameda. Three boilers fueled by natural gas, approximately 35 years old, provide the hot water. During Chevron ES site visit, only one boiler was operational and it seemed to be at the end of its useful life, the other two boilers do not operate at all. A constant flow primary loop supplies hot water to individual building thru a reverse-flow one-pipe system.

Chevron ES recommends replacing the existing boilers with new high efficiency units and converting the existing constant flow to primary/secondary variable flow to optimize energy performance. Thus saving significant amounts of energy to the District and reducing the risk of losing the boilers during the next heating season.

ALTERNATIVES/OPTIONS:
Not applicable.

EVALUATION AND RECOMMENDED ACTION:
Approval is recommended for the Chancellor's approval to negotiate with Chevron Energy Solutions for the design, finance and installation of Solar Power Energy Systems, District-wide and new hot water boilers for College of Alameda.

SOURCE OF FUNDS (AND FISCAL/BUDGETARY IMPACT):
Either third party financing or Measure A, as approved by the voters in Peralta's constituency and authorized under Resolution 05/06-45, Exhibit A-1, District-Wide "Solar energy systems installation the retrofitting of existing energy systems".

OTHER DEPARTMENTS IMPACTED BY THIS ACTION (E.G. INFORMATION TECHNOLOGY):
YES _____ NO __X__

COMMENTS:
No additional comments.

WHO WILL BE PRESENTING THIS ITEM AT THE BOARD MEETING?
Vice Chancellor Ikharo

DID A BOARD STANDING COMMITTEE APPROVE THE ITEM? YES _____ NO __X__

IF "YES", PLEASE INCLUDE THAT INFORMATION IN YOUR SUMMARY.

PLEASE ACQUIRE SIGNATURES IN THIS ORDER:

DOCUMENT PREPARED BY:

Prepared by: Sadiq B. Ikharo **Date:** May 20, 2008

Dr. Sadiq B. Ikharo
Vice Chancellor of General Services

DOCUMENT PRESENTED BY:

Sadiq B. Ikharo **Date:** May 20, 2008

Dr. Sadiq B. Ikharo
Vice Chancellor of General Services

FINANCE DEPARTMENT REVIEW

__X__ Finance review required _____ Finance review *not* required

If Finance review is required, determination is: __✓__ Approved ____ Not Approved

If not approved, please give reason: _____

_____

Signature: Thomas Smith **Date:** 5.12.08

Thomas Smith
Vice Chancellor for Finance and Administration

GENERAL COUNSEL (Legality and Format/adherence to Education Codes):

__X__ Legal review required _____ Legal review *not* required

If Legal review is required, determination is: ____ Approved ____ Not Approved

Signature: _____ **Date:** _____

Thuy T. Nguyen, General Counsel

CHANCELLOR'S OFFICE APPROVAL

____ Approved, and Place on Agenda ____ Not Approved, but Place on Agenda

Signature: [signature] **Date:** 5/13/08

Elihu Harris, Chancellor