



Planning for Energy Efficiency

May, 2009



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H. Allen Hight Learning Center Natomas Unified School District Sacramento

Energy Efficient Features:

- CHPS School
- Enhanced Building Commissioning
- Thermal Mass
- Reduced Building Footprint
- Vegetated and Cool roof systems
- Skylights
- Exterior Shading Devices
- High performance (low-e) glazing
- Daylighting and Occupancy Sensors
- High efficiency air conditioning and heating systems

Provided By: WCS/Ca

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CHAPTER 1

Introduction

The United States Department of Education reports that K-12 schools spend more than \$8 billion annually on energy, making energy the second-highest operating expenditure for schools after personnel costs.

One way to save money is to reduce energy costs through smart design of new construction and modernization projects, and changes in operations, maintenance and individual behavior in existing facilities.

Saving energy not only conserves precious local dollars but also conserves our finite resources and provides students with safe, healthy, educationally appropriate learning environments.

Planning and implementing energy conservation measures will also help prepare schools for compliance with the California Global Warming Solutions Act, AB 32.

AB 32 requires that by 2010 government buildings, utilities and major manufacturers must know how much their buildings contribute to carbon emissions and begin efforts to offset their carbon emissions. By 2020, those entities' buildings will be required to reduce their CO2 emissions by 30%, based on 1990 levels established by the California Air Resources Board. By 2050, that requirement increases to 80%. Although AB 32 does not specifically address school facilities at this time it is wise for school districts to plan ahead. This is why we need to determine how much energy our schools use and begin the process to improved energy performance- now.

How can my school district save energy, and how can it develop and implement an Energy Plan to meet our goals, once they are established?

Recognizing the importance and complexity of this task, C.A.S.H. established a High Performance Schools committee to answer the following questions:

- What is energy efficiency?
- What is an energy audit?
- What is retro-commissioning?
- How do we determine our baseline energy usage?
- How do we develop an Energy Master Plan?
- What professional help do we need, if any, and when do we need it?
- What funding options are available?
- Where do we go for additional information?

This manual provides the answers in a series of clear steps that can be applied to your existing facilities as well as modernization and/or new construction projects.

So assemble your team, measure your energy use, and set your performance goals. Make your existing facilities more energy efficient, and design your modernization and new construction projects utilizing CHPS or LEED design criteria, *at least 15% **better** than minimum compliance with Title 24 Energy Standards*. Capture additional cost benefits by implementing and maintaining your energy plan while monitoring your progress in meeting your overall energy conservation goals. Identify available funding mechanisms, free technical assistance, and consultant resources. The time to save energy **and** save cash is now!



Applied Technology Center Montebello Unified School District Montebello

Energy Efficient Features:

LEED, CHPS, Savings By Design, Daylighting, etc.
CHPS: 33.5 points

20% Energy savings above Title 24
Energy Efficient features: Maximum points for daylighting and energy efficient lighting; infrastructure for future photovoltaic panels.

Provided By: IBI Group

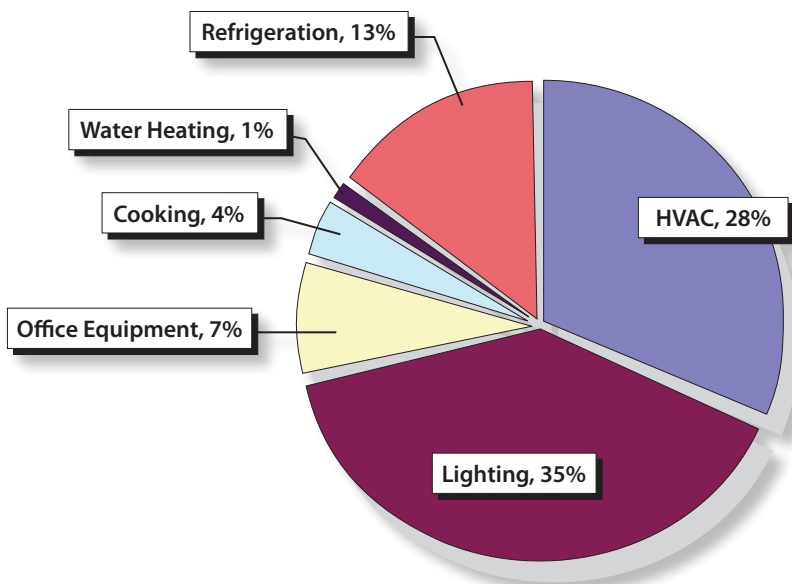
CHAPTER 2

Energy Efficiency

Energy efficiency is a cornerstone of a sustainable facility. In educational facilities energy efficiency should focus on four “systems” that tend to be the largest consumers of energy:

- Lighting
- Heating, Ventilation and Air Conditioning
- Service Hot Water
- Plug loads, small appliances and computers that “plug into the wall” and for those facilities that include large kitchens, the kitchen equipment.

Energy efficiency can be addressed in all aspects of school facilities operation and construction including; New Construction Projects, Modernization Projects, and ongoing operations and maintenance programs.



Data derived from “California Commercial End Use Survey”
CEC document # CEC-400-2006-005.

Refrigerant energy refers to equipment for food refrigeration AND vending machine refrigeration.

New Construction Projects:

Energy efficiency in new construction projects is regulated by Title 24, Section 6. This State regulation sets the minimum standard for energy efficiency. High performance / green schools have expectations of exceeding the Title 24 Standard. As an example, CHPS’s current expectation is to exceed Title 24-2005 by a minimum of 10%. Additional credit is given for performance increases up to and beyond 36%. The newly released California CHPS-2009 criteria require 15% above Title 24-2008 as a prerequisite for a high performance CHPS-rated school. Design teams familiar with sustainable design will be able to provide you with facilities that perform to these efficiency expectations. When developing a facility with above standard energy efficiency you and your design team will need to consider the following:

- **Building Orientation:** Minimize East/West facing windows and provide shading for South facing windows.
- **Modeling:** Analyze the “Performance vs. Price” trade offs.
- **Lighting:** Design maximum lighting efficiency with proper lighting controls that capture maximum natural daylight for indoor use.
- **Envelope:** Determine proper amounts and type of insulation, wood and metal framing types, and optimized windows.
- **Mechanical Systems:** Use low energy, passive strategies for heating, ventilating, and cooling to optimize or “right-size” mechanical system. When air conditioning is mandatory, high efficiency air conditioning units may be considered, but costs should be evaluated.
- **Variable Speed Fans:** Save energy and should be considered if and when fans are utilized. Payback can be as low as one year.
- **Heat/Energy Recovery Systems:** Consider both hydronic based as well as any mechanical, air- based HVAC.
- **Carbon Dioxide Sensors:** Save energy in classrooms while improving indoor air quality.
- **Gas Water Heaters:** Are usually more efficient than traditional tank electric; however, solar thermal systems for hot water may provide the best long-term investment and produce zero greenhouse gas emissions. See below for new ‘tankless’ technology.
- **Plug Load Reduction:** Can add up to significant savings since plug load ranks as the third largest energy user on school sites.



Thurston Middle School Gymnasium Laguna Beach Unified School District Laguna Beach, CA

Energy Efficient Features:

LEED Criteria
Natural Daylighting

Provided By: LPA, Inc.

Modernization Projects:

With budget constraints, spending “extra” on energy efficiency requires a long term vision. Energy efficiency is an investment in your district. The prudent approach is through a facilities assessment, part of which should be an energy benchmarking program (See Chapter 3, “Establishing a Baseline”) Benchmarking will determine and help establish energy efficiency opportunities within the wider scope of facility modernization. When armed with an energy audit of your poor performing buildings, a series of Energy Conservation Measures (ECMs) can be developed and implemented as part of your traditional modernization program. Depending on the extent of the modernization a variety of ECMs may be employed.

Limited Modernizations and Deferred Maintenance Program

- **Lighting Upgrades:** T12→T8→Super T8→T5 with low ballast factor ballasts. New lighting technology uses less electricity for equal amounts of light

produced and less heat, thus reducing air conditioning load.

- **Lighting Controls:** Utilize dual switching, occupancy sensors, and either tiered (by lamps) or continuous dimming controls utilizing photosensors to maximize natural daylighting.
- **HVAC Replacement:** If existing units are at least 10-15 years old, make sure the new units are 2-4 SEER points higher.
- **Boiler Upgrades:** Replace old boilers since current boiler design is in the 90% efficiency range.
- **Service Hot Water:** Replace traditional tank hot water heaters with demand hot water heaters. This eliminates the standby losses and greatly improves energy efficiency. Another possible strategy is to install solar thermal water heating using the old tank for storage, and the tankless as back-up if there is enough demand.
- **Roof Replacement:** Cool Roof products are available for both “Built Up” and “Single Ply” roofs as well as other types of roofs. See www.coolroofs.org. It also makes sense to consider installing additional insulation, if possible, when re-roofing.

“Down to the Stud” Modernizations:

- Incorporates some or all of the above.
- Envelope: increase insulation in walls and ceilings.
- Roof replacement with cool roof technologies.
- Window replacement: Low Energy and Dual pane.

Operations and Maintenance

Creating Energy Conservation Guidelines for the daily operation of your district is important. Most if not all of the following measures are zero cost items that can generate significant savings. Your guidelines should incorporate the following:

► Building Standards

- o Establish strict hours of operation for each type of facility (grade level, function, etc.) including lighting and HVAC allowing manual overrides. Only condition the spaces when needed. Utilize time clocks and energy management system to turn off energy consuming devices such as HVAC and lighting.
- o Lighting: Turn off all lights when not required or not being utilized, schedule interior and exterior lighting.
 - Use only the lighting necessary and one or two lamp switching when available. Encourage use of natural light.
- o Temperature Settings:
 - Cooling Season, 76 occupied, 85-95 unoccupied
 - Heating Season, 68 occupied 45-55 unoccupied.
- o HVAC filter replacement schedules need to be created and/or closely monitored.

- o Swimming pool covers should be utilized and their proper use required. Solar water heating should also be considered.
- o Require complete building and system shutdowns over extended breaks. This includes food service freezers and coolers, lighting, and HVAC systems.

► Plug Loads

- o Eliminate the use of small appliances (refrigerators, microwaves, toasters, coffee pots, etc.) in individual spaces or rooms.
- o Require the use of “common space” appliances (staff lounge, break rooms, etc.).
- o Require energy star rating on all purchased appliances.
- o Unplug all appliances during extended breaks and vacation.
- o Utilize power strips for office equipment where possible and turn off power strip at the end of each day.
- o Vending machines should have their operations automated with a vending MIZER device or mechanism similar, have lighting removed, or turned off each night and unplugged over breaks and vacation.

► Technology Loads

- o All computers, printers, monitors, speakers, and other equipment should be turned off every evening (fax machines excluded).
- o Deploy PC management software if possible (shuts off computers each night, local utility may pay for software).
- o Replace CRT displays with flat screen displays or utilize efficient projectors where applicable.
- o Network equipment including network printers should remain on.

► Program Consolidation

- o Summer school should be consolidated as much as possible to limit the number of sites, and also consolidated to specific parts of the campus so shutdowns can occur in complete buildings elsewhere on campus.
- o Consolidate facility use as much as possible particularly for summer months so most campuses can be completely shut down.
- o Single track year round calendars should account for energy consumption and costs over summer months.
- o Consider eliminating multi-track year round calendars when not needed for capacity reasons.

Return on Investment and Risk

Making your facility more energy efficient saves money that can be redistributed to other budget items, so energy efficiency is an investment. Like any investment there is a risk that the investment will not perform to expectations. When investing in energy efficiency have an idea for your **Return On Investment (ROI)** goal. Do these investments need to pay back in 3, 5 or 10 years? This will help your design team create a high performance building that fits your budget.

Energy education and awareness can be low cost, but does have a risk in that behavior modification typically is short lived without a program in place to provide continuous support and monitoring. Below is a list of typical Energy Conservation Measures. These measures have been “rated” via the Sixth Sigma process*. This rating is not only just energy savings but also factors in the risk of such measures.

These energy saving measures should be reviewed for applicability to your school project. The source of the following data is Trane.

Energy Conservation Measures Six Sigma Rating

The Six Sigma Rating is used to determine the relative general value of each ECM.

- 76% to 100% = Go - Green are generally best ECMs and should be recommended for most / all projects.
- 30% to 75% = Caution - Yellow ECMs are probably project specific (good for some but not good for others).
- 0% to 29% = Stop - Red are generally worst ECMs and probably not good for many / any projects.

Each ECM is scored on a percent scale from the standpoint of both the provider and the district when evaluated relative to the following:

- **Savings Potential:** Is there a good payback for the current project and a good life cycle cost for its future use?
- **Practicality:** Is it realistic and reasonable for proposing, implementing and supporting?
- **Commercial Viability:** Is it something that the district wants to buy and own?
- **Risk:** Does it have a high degree of certainty?

*Six Sigma™ is a rigorous and disciplined methodology developed by Motorola, uses data and statistical analysis to measure and improve an organization's operational performance by identifying and eliminating “defects” in manufacturing and service-related processes.

Architectural

Envelope

- Install Door Air Curtains (59%)
- Install Weather-Stripping (92%)
- Replace Windows (62%)
- Replace Doors (62%)
- Upgrade Roof (71%)
- Install/Increase Insulation (66%)
- Upgrade Walls (52%)

Envelope (continued)

- Install Window Films (61%)
- Over glaze with Acrylic (61%)

Other

- Cool Roof - Install/Paint with Reflective Coating (94%)
- New Construction - Green Roof (85%)

Controls

General/Special

- Install Direct Digital Control (to replace non-DDC) (98%)
- Upgrade Existing Direct Digital Control (79%)
- Retro-commission Controls (87%)

Resetting

- Reduce Outdoor Air (OA) (78%)
- Install CO2-Based Demand-Controlled Ventilation (78%)
- Install Variable Speed/Frequency Drive Control (82%)

Turning Off

- Install Chiller Optimization (66%)
- Install VFD on Fan & Cooling Tower Optimization Control (66%)
- Install Duty Cycling (16%)
- Install Time of Day Setback/Setup Set points (95%)
- Install Occupancy Sensor Controls (78%)
- Install Optimal Start/Stop & OA Delay (76%)
- Install Day lighting Controls (63%)
- Install Lighting Controls (67%)

Electrical

Electrical Generation (Non-Plant) Lighting

- Lighting as a General ECM (94%)
- Replace with LED Lighting (100%)
- Install LED Street Lighting (100%)
- Install Lighting Controls (67%)
- Replace T-8s for Hi Bays with T5s (92%)
- Install Encilium Lighting Controls (46%)
- Install Lighting Voltage Limiter (53%)
- Upgrade to Spectrally Enhanced Lamps (96%)
- Upgrade to T8 or T5 Lamps & Electronic Ballasts (92%)
- Retrofit Fluorescent Fixtures w/ Reflectors (92%)
- De lamp Fluorescent Fixtures (92%)
- Convert Multi-Lamp Fluorescent Fixtures to 2-level Lighting w/ Motion Sensor (92%)
- Redesign Lighting to Appropriate Level (92%)
- Replace HID Hi Bays with T5 or T8 (94%)
- Upgrade Hi Bay Fluorescents with Motion Sensors and Turn off (All or Partial) (92%)

Lighting (continued)

- Install Occupancy Sensor Controls (78%)
- Install Outlet Power Strip w/ Personal Occupancy Sensor (78%)
- Replace Incandescent with Compact Fluorescents (92%)
- Replace Incandescent with Fluorescents (92%)
- Replace Exit Signs w/ LED Exit Signs (92%)
- Add LED Night Lights in Halls (86%)

Power Factor

- Install Power Factor Correction (31%)

Power Quality

- Install Line Conditioning (31%)

Turning Off

- Install Occupancy Sensor Controls (53%)
- Install Power Strips w/ Occupancy Sensors (51%)

HVAC Building/Non-Plant

Heat Recovery

- Install Run-Around Loop Heat Recovery (49%)
- Install Heat Recovery Wheel (65%)

IAQ

- Install CO2-Based Demand-Controlled Ventilation (78%)
- Install Electronic Air Filters on HVAC (60%)

Maintenance

- Power Clean HVAC Coils (68%)

Unit Upgrade

- Install Head Pressure "Hy Save" (54%)
- Convert CV to VAV (82%)
- Convert CV Reheat to VAV (82%)
- Convert Dual Duct to VAV (82%)
- Convert Inlet Vane to VSD/VFD (95%)
- Install High Efficiency Motors (51%)

Plant

Boilers & Domestic Water Heaters

- Direct Contact Gas-Fired Water Heater (96%)
- Adjust Burner as Regular Maintenance (92%)
- Convert Boiler from Steam to Hot Water (58%)
- Install Automated Flue Gas & Make Up Air Control (42%)
- Install Trim Controls on Burners (40%)
- Install Dedicated or "Point-of-Use" Boilers (69%)
- Install Steam Generators (69%)
- Install Tankless / Instantaneous Water Heaters (92%)

Chillers

- Install New Chiller Technologies (100%)
- Install Thermal Energy Cooling Storage (63%)
- Install Free Cooling - Using HX on Tower Water and By-Pass Chiller (61%)
- Install Dedicated or "Point-of-Use" Chillers (69%)

Cooling Tower

- Install Tower Water Ozone Treatment to Replace Chemicals (51%)
- Install Flozone Water Treatment (76%)
- Install Tower Water Side Stream Filters to Clean CW (& CHW) for Greater HX Eff. (49%)
- Convert from Air Cooled to Water Cooled (69%)

Heat Recovery

- Install Waste Heat Recovery from Chiller or AC (51%)
- Install Exhaust Air Heat Recovery to Outside Air (51%)

Water Source Heat Pump Systems

- Install Geothermal Water Source Heat Pump System (65%)
- Install Water Source Heat Pump System (83%)



Placer High School Music and Science Building Placer Union High School District Auburn, CA

Energy Efficient Features:

Variable Air Volume Air Handling System
connected to Thermal Energy Storage System

Provided By: Trane

CHAPTER 3

Establishing a Baseline

Energy Benchmarking: How Does Your School Compare?

What are Benchmarks?

One of the best ways to determine whether a school is using energy efficiently is to compare its energy performance to that of similar school buildings – a process known as benchmarking. The intent of benchmarking is to help you make a quick assessment of your school's energy efficiency by comparing your energy costs and consumption levels. Benchmarks, also referred to as an energy utilization index (EUI), provide important information about a building's individual energy usage. Like the miles per gallon reference for vehicle fuel economy, the EUI reflects the rate of energy use of a building.

Energy benchmark reports can provide annualized energy data in a variety of forms. School administrators and business officials may find energy cost benchmarks useful. For example, energy cost per pupil or energy cost per square foot. Facility directors and energy managers may prefer energy units such as kWh or therms per square foot.

Why Energy Benchmarking Is Important.

Benchmarking can help your school district determine how well individual schools in the district are performing in

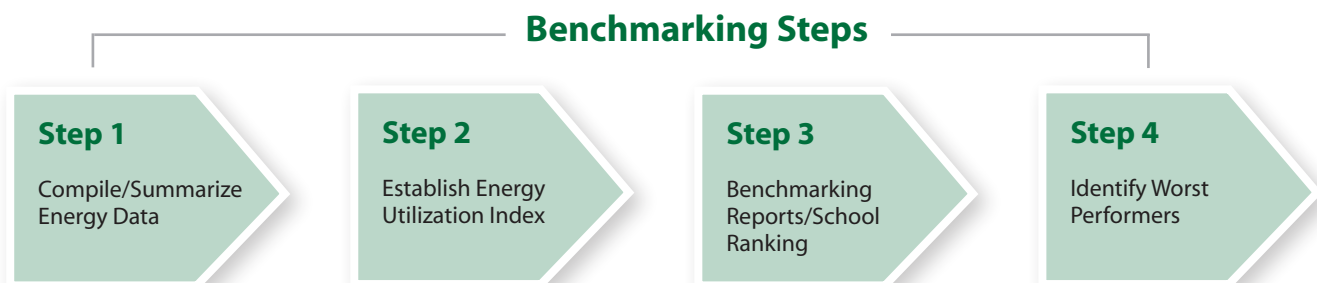
terms of energy efficiency. Benchmarks can quickly identify the best, and worst, energy using schools and reveal which have the greatest potential for energy savings. The benchmark guides a school district in assigning limited resources to buildings identified as 'energy-hogs,' thereby optimizing the investment in cost-effective energy efficiency projects in school buildings. An investment in energy efficiency can typically save a school 20% on annual utility costs¹.

Once benchmarks showing current energy consumption are established, they become a baseline for measuring future energy performance improvements. Routinely monitoring energy usage will assure that your schools stay on target and will identify energy operation and performance issues as they occur.

Additionally, Assembly Bill 1103, chaptered in 2007, mandates all owners or operators of nonresidential buildings, which includes schools, to disclose their buildings' benchmarking data from the USEPA's Portfolio Manager (and Energy Star rating) to prospective buyers and lessees of entire buildings². This mandate is effective on January 1, 2010. It would be a proactive step for California schools to benchmark their facilities' energy use based on this legislation.

What is the Benchmarking Process?

The benchmarking process begins with data-gathering and concludes with a prioritized plan for implementing energy-saving measures. The basic steps are as follows:



1. **Gather and summarize energy usage data** for all fuels including electricity, natural gas, and fuel oil. If you have difficulty gathering that information, just contact your local utility or energy provider.
2. **Establish an energy utilization index (EUI)** for your school. For example, tracking energy dollars per square foot might be appropriate for your energy assessment needs. By simply collecting 12 months of energy cost data and knowing the conditioned square footage of your school, you can produce your own energy benchmark report.

¹ California Energy Commission, Bright Schools Program.

² Inside ASHE Energy Disclosure of Buildings: An Emerging Trend. September-October 2008. Pp 11-13.

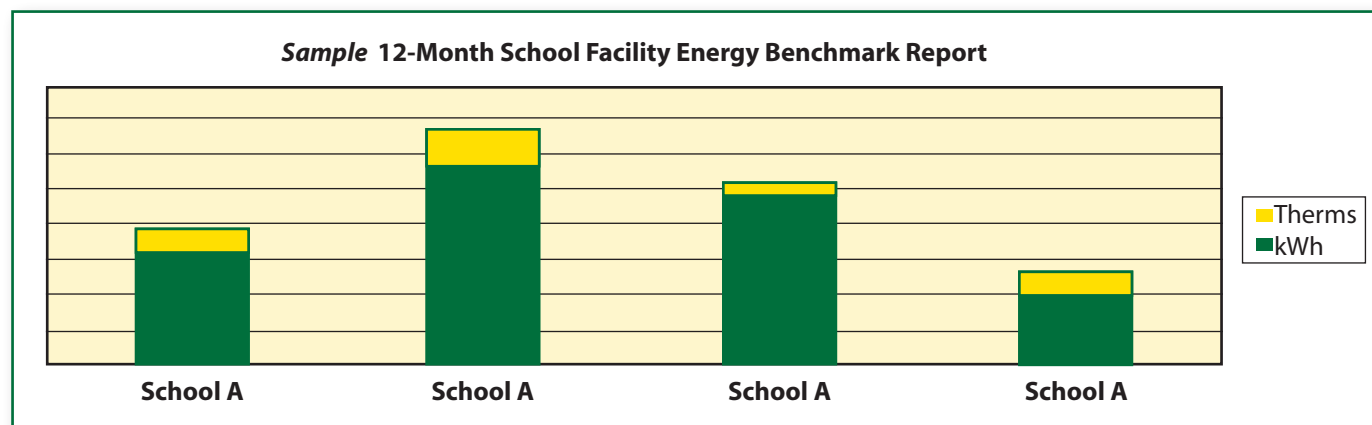
Planning for Energy Efficiency

For example, Victory Elementary School has 44,000 s.f. of conditioned building space³, 467 students and total annual energy cost of \$94,400. To calculate the EUI for energy cost per square foot, simply divide energy cost by conditioned square footage, and similarly, for energy cost per student, divide energy cost by the number of students.

Inputs			EUI Results	
Annual Energy Cost	Square feet	# of students	Energy Cost/sf	Energy Cost/student
\$94,000	44,000	467	\$2.12	\$2.00

Another very useful EUI is kWh/sf or therms/sf. To complete your own report, simply divide the annual electric usage and/or natural gas usage (or cost) by the conditioned square footage of each school. See Figure 1 to create your own benchmarking report.

Figure 1 To complete your own energy benchmark you will need:					
1) The conditioned square feet of each school					
2) The annual electric usage (kWh) of each school					
3) The annual natural gas usage (therms, or other heating fuel) of each facility					
Inputs				EUI Results	
Site	Conditioned Area	Annual kWh	Annual Therms	kWh/sf	therms/sf
School A	51,170	326,900	75,249	6.39	1.47
School B	40,150	450,400	88,000	11.22	2.19
School C	52,450	514,760	33,500	9.81	0.64
School D	53,200	216,520	61,000	4.07	1.15



3. **Benchmarking Reports/School Ranking.** The result of the benchmarking report is that school facilities are sorted into rank order based on the EUI. After the report is completed look for variations in usage. You can easily determine a specific school's performance relative to other schools in the district. This provides the direction for investigation into high energy use problems and cost effective energy efficiency solutions.

4. **Identify the worst performers.** The report ranking will present the schools that consume the most energy when compared to others in the district. But how does your school compare to other schools in the State of California? When comparing vehicle fuel economy, we all have a reference point. We all understand how an SUV averaging 15 mpg compares to a Prius averaging 45 mpg. However, when comparing school energy performance, what is the reference point?

³ Conditioned space is defined as building space that is heated or cooled with mechanical equipment. An example of non-conditioned space is a covered exterior walk way.

To help answer this question, Figure 2 presents four metric reference points: energy cost/sf, energy cost/student, kWh/sf and therms/sf. This table represents California averages to be used as a general guide. Please recognize that energy performance can differ greatly due to influences such as climate, occupancy level, hours of use, and size of school and additional facilities such as swimming pools and sports centers. Therefore, if you have a small school located in a hot inland area with high levels of extracurricular use, including a swimming pool, you are likely to have higher than “typical” energy costs.

Figure 2

Average K-12 School	
Energy Cost /sf	\$1.40
Energy cost / student	\$1.37
kWh/sf	7.65
Therms/sf	0.19
Data Source: California Energy Commission Bright Schools Program.	

Energy Benchmarking Resources and Tools

Beyond generating your own simple benchmarking metrics and reports, commercial benchmarking tools are also available. Typically, these tools are software programs that require information about your facility such as annual energy billing data. These programs are capable of more complex energy tracking, and produce benchmarking reports with illustrated graphs and charts.

Below is a list of benchmarking tools that you may want to review when considering a more sophisticated energy benchmarking methodology.

- 1) *EnergyStar® Portfolio Manager*:
<http://www.energystar.gov>
Available to everyone, the on-line *Energy Star® Portfolio Manager* tool provides a simple, free tool to continually track and record energy usage. After creating an account, the customer provides basic information regarding a building's performance criteria, including its energy usage. *Portfolio Manager* then compares that information against a national data-base of similar facilities and assigns a score of 0-100 points. Buildings scoring 75 or greater are considered “energy efficient.” Buildings with scores less than 75 become candidates for further energy performance or end-use systems evaluations.
- 2) *Energy Star® – California Energy Commission*:
<http://energyiq.lbl.gov/benchmark.html>
Currently in development, the *Energy IQ* prototype represents a major advancement beyond Lawrence Berkeley National Laboratory's (LBNL) widely-used *CalArch* tool, and provides a deeper (and complementary level of analysis)

compared to more generalized whole-buildings tools such as the *ENERGY STAR Portfolio Manager*. *EnergyIQ* benchmarks energy use, costs, and features for 62 building types and provides a carbon-emissions calculation for the energy consumed in the building, an important part of any businesses' overall “carbon footprint.”

Once an existing facility has been benchmarked, the lowest level performing buildings are good candidates for energy audits, and or full retro-commissioning if they have large HVAC or energy intensive systems.

New School Construction

During the design phase of a new construction or modernization project, engineers develop an allowable energy “budget” based on building codes: the California Energy Efficiency Standards for Residential and Nonresidential Buildings, Title 24, Part 6. Design improvements are determined by identifying systems which provide the necessary performance while reducing per square foot energy requirements of the project.

Target Finder is an energy performance rating tool for new school construction or major modernization. This is a companion product to *Portfolio Manager* offered through *Energy Star®*. *Target Finder* helps architects and building owners set energy targets and rate a building design's estimated energy use. Online information is found at: <http://www.energystar.gov>.

Case Study:

Fremont Unified School District is an example of a district that responded to increasing energy cost by benchmarking school energy performance. Using a commercial product, the district established energy usage and energy cost point baselines for 43 schools. Using this information, the district identified the best and worst performing schools and identified the most cost effective energy efficiency opportunities. This included not only no-cost and low-cost behavioral modifications, like turning computers off and establishing a “black-out” nighttime district lighting policy, but it also included investments in energy efficiency projects such as HVAC modifications and the installation of an energy management system. At the end of three years, the district showed a savings of \$5 million dollars. The district received the 2004 US EPA's Energy Star – Excellence in Energy Management Award.

Conclusion:

Knowing the energy use of your school is a first step to managing school energy cost. Energy benchmarking is a valuable tool to help schools establish an energy use baseline, to prioritize school buildings for energy efficiency improvements identifiable through energy audits and/or retro-commissioning and to provide a target for continued operation and energy performance monitoring.

CHAPTER 4

Goal Setting and Developing a Formal Energy Master Plan

Goal Setting

Goal setting is an effective and necessary tool for tracking progress in a District's efforts to be more energy efficient. Determine what you want at the end of the project. *If your work succeeds, what will the headline in the newspaper say?* Making that decision first will help you outline your energy goals and help in the goal setting process.

One effective and proven strategy for establishing energy efficiency goals is to conduct an Eco-Charrette. The District, key stakeholders and the design team work together in a one-day or multi-day work session to develop an agreed upon vision for the project and set the course for the development of the project in the months and years to come. One of the key outcomes of this initial meeting is the fostering of a positive attitude and commitment to the projects green building and energy goals among participants in the meeting.

Regardless of the approach taken, the following 7-step process has proven results and can help Districts identify and reach their energy efficiency goals.

Step 1: Identify Energy Goals

During the process of establishing energy efficiency goals, focus on setting "SMART" goals: **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, **T**imely.

It is often helpful to first determine areas of focus or categories. Examples may include renewable energy, site lighting, air conditioning, classroom lighting, equipment, building envelope, energy efficient lighting and energy metering and monitoring. Then list each SMART energy goal under each category.

Weak Example: "Use energy efficient lighting"

Strong Example: "Replace 25 percent of the incandescent lights with compact fluorescents every quarter until complete."

The simple rule is do not set a lot of goals at the same time. The key to goal setting is staying focused, and it is impossible to focus on many goals at the same time. Start with the most important ones.

Step 2: Chart A Path to Achievement

If your District has adopted a High Performance Resolution, use it for guidance and to support goal achievement. Building internal support can also come from a collaborative and open goal setting process.

Chart the blocks on attaining your goal and write how to deal with each issue. This part is important because often we do not think of the obstacles in achieving our goals. This step will also identify where additional information or research is needed.

Goal	Ease (1-5)	Cost (\$, \$\$...)	Needs
Replace 25%...	1	\$	Lamp count; funding; rebates

Step 3: Breakdown Goals to Mini-Goals

Breakdown your goals into specific actions, making sure they support the "roles" you define as being important to the District.

Step 4: Define Tasks and Responsibilities

Outline all the steps to achieve the goal. Each step needs to be broken down into small manageable tasks that are capable of accomplishment by an individual or a team of individuals. "Assign" these tasks to individuals or groups that will be held responsible for completing the tasks with specific goal deadlines.

Step 5: Report Back

Accountability comes with responsibility. Hold those individuals or teams accountable for completing their tasks by specified deadlines, and reward exemplary performance. If they were unable to meet goals find out why and work together to identify solutions to overcoming those barriers and implement them. Progress and lessons learned need to 'feed' back into the goal process. Goals and mini-goals should be re-evaluated on a regular basis and adjusted as necessary.

Actually achieving goals requires commitment and dedication from everyone involved. That kind of commitment is unlikely to emerge on projects in which the energy goals are justified on strictly first-cost financial grounds. In practice, that sort of commitment seems to emerge only when the participants feel a connection between the project goals and their own environmental values, and when they participate in the development of the goals themselves.

Placer High School Placer Union High School District Auburn, CA

Energy Efficient Features:

Thermal Energy Storage System – Central Plant

Provided By: Trane



Developing a Formal Energy Master Plan

For public school districts, a formal energy master plan creates an organizational framework which provides strategies to identify, plan, implement, achieve and measure energy use reductions. Energy saving opportunities may be found in all district facilities including classrooms, administrative offices, food service facilities, gyms and multi-purpose rooms.

The principle benefit of an active energy plan is **saving energy reduces operational expenses which may be directed to other district needs**. An energy plan supports the District's public commitment to sustainability by preserving limited resources through the reduction of energy waste while asserting its standing as a community environmental role model.

Energy efficiency at the school provides a positive learning example for students and improves the visual, environmental and acoustic qualities of the learning environment.

An Energy Plan May Contain These Key Elements:

- Governing Board and administrative support of the plan.
- Administrative regulations to implement the energy plan.
- Specific strategies to reduce energy usage.
- Energy use reduction goals.

- A methodology to quantify energy savings.
- A timetable for energy savings accomplishments.
- Specific vacation and holiday period operating practices for energy using equipment.
- A rewards system for individual or site participation.
- A statement of energy standards for new equipment.
- Energy guidelines for new construction, modernization or renovation projects.
- A cost covering fee schedule for facility use by outside groups.

Developing Your District's Energy Plan:

Review, update or adjust any existing plan with assigned district staff using concepts supporting the key elements listed above. Seek feedback and best practices from other districts, community colleges or universities with active energy management plans. Collaborative planning involving all affected stakeholders will improve the operational effectiveness of any energy plan.

Finalizing the Energy Plan:

Submit the energy plan to the Governing Board for approval then roll-out the energy plan to all groups of district employees. Each group can contribute to the District's overall energy efficiency goals.



Granite Bay High School Roseville Joint Unified High School District Granite Bay, California

Energy Efficient Features:

Energy Retrofit Project: New Air Cooled Chiller and Condensing Boiler Package, Replacing Absorption Heating and Cooling System.

Provided By: Trane

SAMPLE PLAN

Below is a comprehensive sample plan for a hypothetical school district. Some school districts may choose not to adopt all of the elements listed. Each district should select those components that best meet their local needs.

XYZ UNIFIED SCHOOL DISTRICT ENERGY PLAN

Overview of the Energy Plan

The guidelines contained in this Energy Plan are adopted by the XYZ Unified School District for implementation by District staff to reduce the use of energy and water in the operation of District facilities. This Plan is enacted for the purpose and intent of reducing District operational expenses associated with energy and water use.

The District has established a goal to reduce **overall energy use** by ____ percent (___ %) in the first year, ____ percent (___ %) in the second year, and ____ percent (___ %) the third year of this plan by implementing the practices, measures, and procedures outlined in this Energy Plan. The energy savings resulting from this plan will provide energy cost savings and reduce greenhouse gas emissions associated with the operation of district facilities.

At an annual interval, the District will measure the fiscal effect of the conservation efforts by comparing total annual energy billings to historical usage (adjusted for energy cost increases or inflation) and reallocate any savings as determined by the 'Retention of Savings and Rebates' section of the Performance Measure, Management and Reward sub-section of the Implementation Plan.

The Energy Plan is comprised of eight major areas and supports the Energy Policy adopted by the Governing Board: The major components are:

1. *Mission Statement, Goals and Performance Criteria*
2. *Guidelines for Implementation*
3. *Equipment Standards*
4. *Practices and Measures for Reducing Energy Costs*

The Energy Plan is not intended to cause discomfort to students or staff, and there is flexibility for individual situations where adjustments must be made for health and safety reasons.

It is important that each person in the District do their part to ensure that the guidelines and standards are implemented and followed throughout the course of each workday in order that the District may prevent energy costs from seriously affecting classroom instruction.

The XYZ Unified School District's Energy Plan moves toward managing energy costs by:

- **REDUCING ENERGY WASTE.**
- **IMPROVING EQUIPMENT PERFORMANCE.**
- **DEVELOPING ENERGY EFFICIENCY INTO RENOVATION, MODERNIZATION AND NEW CONSTRUCTION PROJECTS.**
- **INVOLVING DISTRICT EMPLOYEES IN ENERGY USE DECISIONS.**

Section One: Mission Statement, Goals, Performance Criteria

XYZ UNIFIED SCHOOL DISTRICT ENERGY PLAN **MISSION STATEMENT**

Our district commits to environmental protection through energy efficiency as a fundamental operational objective and integral to the strategy of fulfilling our educational mission.

We recognize that the efficient operation of our facilities reduces environmental impacts.

We recognize our position as responsible community citizens and the opportunity to create a positive role model for resource conservation in public educational assets.

Therefore, our operational and planning decisions will incorporate the prudent use of energy resources by:

- Preventing and minimizing energy related pollution and waste.
- Fostering a sense of personal responsibility for resource conservation among all District employees.
- Emphasizing a resource conservation and environmental protection ethic among all District employees.
- Continually improving our Energy Plan performance.
- Deploying resources to reflect the District's environmental protection commitment through energy efficiency and resource conservation.

GOALS of the ENERGY PLAN

The District commits to actively improving our energy practices in order to save taxpayer dollars and reduce emissions that contribute to environmental pollution, and to improve the quality of educational facilities and demonstrate community leadership in resource conservation.

Improve Energy Efficiency

- The District will institute an Energy Plan that reduces energy consumption through the application of cost effective efficiency measures and employee training.
- The Energy Plan will speed the introduction of cost-effective, energy-efficient technologies into our facilities.

Reduce Greenhouse Gases

- Through cost effective energy efficiency measures, the District will reduce the greenhouse gas emissions attributed to our facilities energy requirements.

Address Renewable Energy

- The District will evaluate renewable energy resources (passive solar, solar thermal, solar electric, wind, geothermal, biomass) within our facility operations on equal footing with conventional energy resources.
- The District will evaluate purchasing electricity from renewable energy sources (if available).
- The District will evaluate the implementation of 'Grid Neutral Schools' concepts as offered by the Division of the State Architect.
- The District will consider the CHPS version 2009 Climate Credits CL2.1 Grid Neutral or CL2.2 Zero Net Energy as a guideline where feasible in all new construction projects.

Improve Transportation Efficiency

- The District commits to reduce petroleum fuel consumption through improvements in fleet fuel efficiency and by the use of alternative fuel vehicles if practical.
- The District will promote the use of alternative modes of transportation including public transportation, carpooling, bicycling and walking.
- New school design will incorporate District, parental and student traffic mitigation design elements.

Water Conservation

- The District will reduce water consumption and its associated energy delivery use in our facilities by implementing cost effective efficiency measures.

ENERGY PLAN PERFORMANCE CRITERIA

- Maximize opportunities to reduce energy costs through energy efficient lighting and mechanical systems, improved lighting and mechanical equipment controls, natural lighting, maintenance and operations best practices (for example: as prescribed in CHPS Maintenance and Operations (M&O) Manual 4, and general equipment efficiency and maintenance.
- Specify sustainable building practices (based on CHPS or LEED guidelines) during new construction and renovation to increase energy performance to exceed the minimum level of energy efficiency prescribed by California State standard Title 24.
- Specify and ensure that fundamental building system components are constructed, installed, commissioned, and maintained to function as intended to achieve energy performance goals.
- Encourage energy conservation, energy efficiency, load management, customer owned generation, solar and renewable technologies and demand response to reduce environmental impacts associated with energy use.
- Require architects, vendors, and contractors to support the environmental standards of this plan and to work in partnership with the District to ensure that facilities and operations incorporate the highest level of environmental protection through energy efficiency.
- Ensure that personnel who work with energy equipment or are involved in energy-related decisions receive training for implementing this Plan.

Section Two: Guidelines for Implementation

XYZ UNIFIED SCHOOL DISTRICT ENERGY PLAN

The District will continually work to reduce its energy use and costs by:

- Purchasing and installing energy efficient and water efficient equipment that reduces energy costs and conserves natural resources.
- Promoting energy efficiency, water efficiency, material reuse, recycling, and renewable energy resources.

The District will seek to institutionalize energy efficiency as a public value by:

- Providing training and technical resources to assist the Maintenance and Operations Department in evaluating various energy-saving technologies.
- Enabling the Maintenance and Operations Department to implement energy efficiency projects using financing strategies such as energy cost savings reinvestment, participation in the California Energy Commission low-interest loan program, and participating in utility financial incentive programs for energy efficiency.
- Implementing outreach and communication strategies to increase awareness among all District employees, not only those involved in energy or facility management.
- Encouraging all District employees to practice energy efficient habits in the workplace.
- Serving as a positive example to the community by demonstrating the benefits of energy efficiency, water efficiency, and renewable energy resources.

IMPLEMENTING THE ENERGY PLAN

Leadership

- The District will designate an individual responsible for meeting the goals and requirements of this Plan, including the preparation of an annual Governing Board summary. The annual summary will address Plan performance and include a statement of the net annual energy and cost saving impacts of Plan activities.
- If there are multiple schools within a District, each school will designate an individual as responsible for submitting updates for inclusion in the annual summary.

Energy Team

- The District will form an energy team consisting of appropriate procurement, legal, budget, instructional, management, and technical representatives as well as a utility representative to expedite and encourage the goals and requirements of this Energy Plan.

Energy Management Technician

- If resources allow, the District will designate an Energy Management Technician to implement, coordinate and monitor energy utilization, energy efficiency, and energy cost savings at District properties.
- The District will consider creating Student Energy Patrols.

Life-Cycle (or Long Term) Cost Analysis for Efficiency Decisions

- The District will avoid using 'lowest first cost' criteria and instead use life cycle (or at least long term) cost analysis for decisions regarding investments in products, services, design, construction, and other projects to reduce energy and water consumption and lower energy and resource costs.
- Where appropriate, the District will consider the life-cycle costs of blended projects, particularly to encourage bundling of energy efficiency projects with renewable energy projects. This strategy supports the DSA Grid Neutral concept.
- The District will retire inefficient equipment on an accelerated basis where replacement results in lower life-cycle costs.

Energy and Water Audits at District Facilities

- The District shall conduct a walk-through energy and water efficiency survey of each of its facilities. The surveys shall be used to rank facilities for future comprehensive energy and water efficiency audits.

Comprehensive Energy and Water Facility Audits

- Based on the walk-through surveys, the District will develop and implement a plan to conduct or obtain comprehensive energy and water efficiency audits.
- The District will conduct these audits as soon as possible, either independently or through utility service offerings.
- Audits of facilities performed within the last three (3) years may be considered current for the purposes of implementation.
- "No-cost" audits will be utilized to the extent practicable.
- The District will conduct surveys and audits of any leased facilities to the extent that the recommendations of such surveys and audits could be implemented under the lease terms.

Implementation of New Audit Recommendations

- Based on preliminary data from the initial walk-through surveys, high priority energy/water audits will be completed first.
- Within six months of the completion of a comprehensive energy/water audit of each facility, the District will begin implementing cost-effective recommendations for the installation of energy and water efficiency recommendations and renewable energy technologies.

Implementation of Existing Audit Recommendations

- Within one month of the date of this Energy Plan, the District will begin implementing the cost-effective recommendations of any audit performed within the past three (3) years for the installation of energy and water efficiency and renewable energy technologies.

Retro-Commissioning Program

The District will utilize retro-commissioning to ensure that existing building systems, equipment, and controls are restored to optimal performance levels.

ENERGY MANAGEMENT FINANCING AND STRATEGIES

Utility Rebate Programs

- The District will participate in all appropriate utility rebate programs and equipment manufacturer rebates. Many utility companies provide cash rebates for qualifying low cost measures, financial incentives for investment grade measures based on calculated energy efficiency measures, and for efficient design and construction using the Savings by Design (SBD) program. Utility rebates and incentives may be viewed as 'after-the-fact' grants.

Use of Financing and Special Programs

- In addition to any available appropriations, the District will consider participating in programs such as the California Energy Commission low-interest loan program, utility financial incentive programs, and utility demand side management programs to meet the goals and requirements of the Energy Plan.
- The District will work with its purchasing department to identify and eliminate internal regulations, procedures, and barriers to the implementation of the energy efficiency goals of this Plan.

Deferred Maintenance

- Equipment scheduled for deferred maintenance, hardship grant, emergency repairs or special needs replacement or allocations should always contain elements of energy efficient performance.

Participate in Cooperative Purchasing Programs

- The District will activate membership in Government sponsored bulk purchasing opportunities for energy products, equipment, and services such as electricity, natural gas, water and others that would reduce costs, enhance energy efficiency and conserve natural resources.

Energy Star® and Energy Efficient Products

- The District will select Energy Star® or other resource efficient products when acquiring energy or water equipment. For product groups where Energy Star® ratings are not yet available, the District shall select products that are in the upper 25 percent of energy efficiency for their respective product categories.

- The District will include a preference for Energy Star® products in specification language developed for Basic Ordering Agreements, Blanket Purchasing Agreements, and all other purchasing procedures.

The Collaboration for High Performance School (CHPS)

- The District will require sustainable design principles based on current CHPS (Collaborative for High Performance Schools) standards for all new construction and modernization projects. The District will apply CHPS principles to the orientation, design, construction and operation of new facilities.
- The District may consider using LEED™ (Leadership in Energy & Environmental Design) voluntary standards in assessing individual projects.



Applied Technology Center Montebello Unified School District Montebello, CA

Energy Efficient Features:

LEED, CHPS, Savings By Design, Daylighting, etc.

CHPS: 33.5 points

20% Energy savings above Title 24

Energy Efficient features: Maximum points for daylighting and energy efficient lighting; infrastructure for future photovoltaic panels.

Provided By: IBI Group

- The District will optimize life-cycle costs, pollution reduction opportunities and other environmental and energy costs associated with the construction, operation and decommissioning of District facilities.
- The District will consider designing their facilities to meet the School Facility Program High Performance Schools standards, which will enable them to apply for High Performance Incentive Funds if the District has eligibility for the State New Construction Program.

Facility Efficiency Improvements

- The District will investigate efficiency opportunities for lighting and control registers for steam systems, boiler operation, air compressor systems, ventilation direct digital controls, and renewable energy technologies.

Highly Efficient Systems

- The District will require high performance energy systems in new construction or retrofit projects when the systems are determined to be life cycle cost-effective.

- The District will consider incremental efficiency specifications when upgrading existing equipment when the efficiency upgrades are life cycle cost effective.
- The District will survey local natural resources to optimize use of naturally occurring energy sources such as wind, solar, or geo-thermal (ground-source) combined with heat pumps.

Self Generation

- The District will consider alternative energy systems including solar hot water, solar electric and solar outdoor lighting where such systems are life-cycle cost-effective and offer additional benefits including pollution reduction, source energy reduction, reduced infrastructure cost, increased efficiency through distribution loss avoidance or expedited service, increased demand response capability, and possible future revenue generation.

Electricity, Natural Gas, and Water Resources

- To advance the greenhouse gas reduction and renewable energy goals of this Plan, and to defer source energy use, the District will strive to use electricity from clean, efficient, and renewable energy sources. Alternate solutions to the utilization of natural gas as a source of heat or hot water, in order to reduce greenhouse gas emissions is encouraged.

Competitive Power

- The District will evaluate competitive opportunities in electric, natural gas, water, and other resource markets to reduce costs and enhance services.

Reduced Greenhouse Gas Intensity of Electric Power

- When selecting electricity providers, the District will purchase electricity from sources that use high efficiency electric generating technologies when life cycle cost-effective. The District will consider the greenhouse gas intensity of the electric generator resource mix and select suppliers that minimize the greenhouse gas intensity of purchased electricity.

Renewable Energy Sources

- The District will review its current purchases of electricity (if any) from renewable energy sources and report this value in the annual Governing Board summary. Based on this review, the



Yuba City Unified School District Yuba City, CA

Energy Efficient Features:

LEED, CHPS, Savings By Design, Daylighting, etc.
Savings by Design

Provided By: Sundt Construction

District may adopt policies and pursue projects that increase the use of renewable energy resources. The District may include provisions for the purchase of electricity from renewable energy sources as a component of its electric procurement bids. The District may use savings from energy efficiency projects to pay additional incremental costs of electricity from renewable energy sources.

Fleet and Transportation Efficiency

- The District will work to reduce fleet operations petroleum fuel consumption by practicing energy efficient driving habits, minimizing individual trips, and eliminating the unnecessary idling of district pool vehicles. The District should consider the acquisition of alternative fuel vehicles or higher fuel economy vehicles when replacing District vehicles.

PERFORMANCE MEASUREMENT, MANAGEMENT AND REWARD

Annual Budget Submission

- The District's annual budget submission should specifically request funding to achieve the goals of this Energy Plan. Budget submissions should include the costs associated with:
 - Administering the Energy Plan.
 - Providing contractual capabilities to implement cost-effective efficiency measures.
 - Procuring cost-effective efficiency products.
 - Constructing sustainable new buildings.
 - Implementing energy efficiency in the modernization and renovation of District facilities.

Annual Implementation Plan

- The District will provide annual adjustments to the Energy Plan to fulfill the goals of the Plan. Adjustments should be noted in the annual Governing Board summary.

Annual Governing Board Summary Requirements

- The District will measure and include in the annual Governing Board summary its progress in meeting the goals and requirements of the Plan. An annual Governing Board summary is due at the end of each fiscal year.
- The Governing Board summary will describe how the District is using the strategies described in this Plan to help meet resource cost savings and environmental pollution reduction goals. The Governing Board summary explains which strategies saved energy costs, and which did not.

Incentive Awards

- The District should review employee and or site based incentive programs to ensure that such programs appropriately reward exceptional performance in implementing this Plan including all school users. Such awards may include monetary or non-monetary incentives, or honor awards.

Position Descriptions and Performance Evaluations

- The District will include provisions of the Energy Plan in the position descriptions and performance evaluations of district leadership, the energy committee, project managers, site administrators, facility managers, energy managers, facilities personnel, or other appropriate employees.

Retention of Savings and Rebates

- The District will retain savings generated from resource efficiency activities where the savings occur to provide greater incentive for that facility, faculty, or staff to undertake additional resource efficiency initiatives and training. Savings from Plan implementation may be used to:
 - Augment educational budgets at individual school sites.
 - Purchase new energy efficient equipment.
 - Finance additional energy efficiency retrofit projects.
 - Provide energy efficiency training for District employees.
 - Reward facilities department participation.

Training and Education

- The District will ensure that all appropriate personnel who work with energy equipment or are involved in energy related decisions receive training for implementing this Plan.
- The District will provide training or training materials for any programs made available relating to the resource efficiency strategies contained in this Plan.
- Each new employee working in facilities or with energy equipment will be given basic instruction on whole building energy systems, lighting, HVAC, energy management systems and resource efficiency.

- The District will incorporate training for the Purchasing Department that includes life-cycle cost analysis, utility rebate and incentive programs, energy savings performance contracts, Energy Star® purchasing options and resource conservation opportunities.
- The District is encouraged to develop outreach programs that include education, training and promotion of Energy Star® products for all its employees.
- The District will extend the above training and education to its site administrators, faculty, staff and at appropriate intervals to student groups where these measures have been implemented.
- The District should consider sending M&O staff to energy efficiency training provided by the statewide Building Operator Certification (BOC) sponsored by the utility energy centers. BOC offers technical training and a recognized credential in energy efficient building operation. See more information at www.theboc.info/CA.

Showcase Facilities

- The District will designate exemplary new and existing facilities (with significant public access and exposure) as showcase facilities to highlight energy, water efficiency, or renewable energy improvements, including grid neutral or Zero Net Energy.

New Building Showcases

- o When the District constructs a new building, it will designate the building, at the earliest stages of development, as a showcase highlighting best practices for resource efficiency.

Existing Building Showcases

- o The District may designate one major building as a showcase to highlight energy efficiency, water efficiency, renewable energy technologies, and indoor air quality improvements. Building selection will be based on considerations such as the level of community visitors / students, historic significance and the likelihood that visitors will learn from displays and implement similar projects.



San Ysidro High School, Classroom and Performing Arts Addition Sweetwater Union High School District San Diego, CA

Energy Efficient Features:

LEED, CHPS, Savings By Design, Daylighting, etc.
CHPS criteria elements and Savings by Design elements

Provided By: Sundt Construction

Section Three: Equipment Standards

XYZ UNIFIED SCHOOL DISTRICT ENERGY PLAN

Overview

Any non-district owned equipment must be approved by the site administrator and Facilities/ Maintenance manager before it is used at District facilities. The site administrator will complete an equipment approval form and forward it to the Facilities/Maintenance department for record keeping until the end of the academic year.

Equipment

Microwaves, ice makers and refrigerators shall be permitted only in staff break rooms, nurse's rooms, science prep areas, and athletic locker room areas. Appliances shall meet District standards for energy efficiency and shall remain unplugged during summer, winter, and spring breaks.

Coffee warmers/coffee makers are permitted in employee areas (*other than classrooms*) as long as timers or automatic shutoff devices are used to prevent overheating. It is understood that safe use is expected at all times and employees are expected to take all precautions necessary to protect the safety of students, other occupants, and property.

Computers, televisions, VCR's, overhead projectors, printers and other equipment needed for instruction are required to be plugged directly into wall outlets or approved surge protectors. Appliances shall be attached with approved anchoring devices to prevent theft and accidental falling in the event of an earthquake. If a power strip is available, it should be turned off at the

close of the day; CD players should be unplugged.

Only XYZ Unified School District approved (heavy grade with ground) extension cords are allowed. At no time are extension cords to permanently power any appliance. No ground plug adapters will be allowed. If permanent power is necessary, a work order is to be submitted to the Maintenance Department that will complete the necessary modifications.

Office equipment, such as copy machines, mimeograph and duplication equipment shall be installed as per manufacturer recommendation. Adequate ventilation will be established before use. The equipment is to be turned off at the close of business.

Electric space heaters are not permitted unless provided by the Maintenance Department, and then only as a temporary measure. A space heater or other means of heating may be used after the site administrator has submitted a work order or her/his designee and the repairs cannot be completed in time to ensure the comfort, health, or safety of students and staff. All heaters must be unplugged when the room is unoccupied and flammable material shall be kept away from the electric heaters at all times. Space heaters are a temporary measure and not intended for permanent use.

Used or New refrigerators or freezers offered by the public for use at district facilities shall not be accepted unless the refrigerator or freezer is certified as an Energy Star® unit.

Section Four: Summary of Energy Saving Tips to Reduce Energy Costs

XYZ UNIFIED SCHOOL DISTRICT ENERGY PLAN

Administrative Controls

- Promote energy awareness and encourage staff participation in energy conservation efforts.
- Develop a systematic and reasonable energy plan to reduce energy costs.
- If feasible, create an energy team composed of certificated, classified, union, and student representatives to develop and implement the energy plan.
- Designate leadership of energy management responsibilities to a specific employee.
- Establish a baseline energy index for each district site to identify facilities with energy intensive profiles with the greatest energy saving potential, and to document the future success of your energy saving activities.
- Request a complete, printed review of all rate schedule options from your utility company.
- Create a system which allows employees to report energy efficiency opportunities.

- Recognize and reward employees who submit practical and implemented energy saving ideas.
- Create and use an energy awareness logo to promote your District's commitment to saving energy.
- Create an energy awareness theme and publish it along with your logo and energy saving tips and success stories in the school newsletter.
- Conduct nighttime and weekend 'energy awareness' walk-through audits to identify unnecessary energy use.
- Include energy items in the employee performance process.
- Include energy conservation topics in staff training.
- Charge contractors for energy used during construction.
- Charge for energy used by outside groups during non-district events.
- Discourage or restrict the use of personal, non-Energy Star® appliances.
- Contact your mechanical, electrical and lighting contractors and vendors to solicit energy saving ideas.
- Develop expectations with vendors to recommend energy efficient equipment.
- Post "KEEP DOORS CLOSED" signs in service corridors, gyms, pools, kitchens and classrooms.
- Specify Energy Star® ratings for all new equipment and appliances.

Heating, Air Conditioning and Ventilation (HVAC)

- Set thermostats at 76 when occupied and between 85 and 95 when unoccupied for cooling, and at 68 when occupied and between 45 and 55 when unoccupied for heating.
- Report non-operational conditions to the Maintenance Department for correction.
- Allow heat-pumps (as found in portable classrooms) to slowly heat the room. Avoid operating the thermostat in a manner that causes the red or green emergency / auxiliary indicator lamp on the thermostat to activate.
- Do not block airflow around thermostats.
- Do not obstruct air supply or return registers.
- If adequate fresh air is available through ventilation systems, open windows or doors and ensure that all heating - air conditioning equipment is turned off.
- Avoid running large HVAC systems for small loads.
- Turn off HVAC systems when leaving the room at the end of the day.
- Use District approved portable fans to circulate air and create a 'wind chill' factor in warm seasons. Adjust the cooling temperature upward for full benefit.
- Verify setting of manually operated ventilation dampers in HVAC systems and clean all outside air filters.
- Calibrate economizer set points.
- Adjust ventilation and exhaust system operation to match building occupancy.
- Pre-cool buildings using outside air inducted through ventilation systems.
- Turn off exhaust fans in unoccupied spaces, particularly in student restrooms.
- Exhaust air volume should equal 85% of inducted air volume in kitchens.
- Annually, use a separate thermometer to calibrate thermostats and temperature sensors.
- Verify that thermostats are plumb.
- Adjust computer server room temperature to match the manufacturer's recommended temperature.
- Depending on the season, lock out heating or cooling capability.
- Perform annual boiler efficiency tests and tune as necessary.
- Check heat recovery devices annually for proper operation.
- Add boiler economizers where appropriate.
- Clean supply and return air duct registers.
- Clean HVAC blower compartments twice yearly.
- Assure HVAC condensate drains are free-flowing and unobstructed.
- Commission (calibrate) all replacement HVAC controls.
- Set timing devices so that HVAC operates only during building occupancy.
- Shut down HVAC systems 15 - 30 minutes before building vacancy.
- Install variable speed drives for fan and pump motors.
- Use correctly sized HVAC systems.
- Install narrow range adjustable thermostats with lockout and bypass capability in classrooms.
- Install programmable setback thermostats on portable classroom HVAC units.
- Insulate bare heating and cooling water distribution lines.
- Condition evaporative cooler and cooling tower water.
- Check HVAC refrigerant charges.
- Repair insulation weaknesses on forced air ductwork.
- Inspect the HVAC air distribution plenum connection for air leakage. Repair if leakage is found.

- Check belt tension, filters, controls and general operation of HVAC systems before each heating or cooling season.
- Add magnetic door switches to lock out HVAC operation when classroom door is left open for more than 15 minutes.
- Repair and straighten HVAC cooling fins damaged by vandalism.
- Perform routine preventative maintenance to improve HVAC performance.
- Replace HVAC filters on a regular schedule.
- Replace disposable filters with washable filters.
- Clean air conditioner condenser coils annually.

Energy Management Systems (EMS)

- Evaluate adding an EMS if such controls are not currently installed.
- Fine tune the programmed start and stop times.
- Confirm that all EMS 'points' are operating as designed.
- Pre-wire portables for EMS control capability.
- Program holiday, in-service, and special event hours into the EMS.
- Perform regular preventative maintenance on all EMS components.
- Upgrade EMS software upon release of new software.
- Replace outdated EMS with new PC driven EMS.
- Compare energy bills to EMS data.
- Assure EMS system times are correct for daylight savings time.

Interior and Exterior Lighting

- Replace stairway/hallway/garage fixtures with bi-level fixtures.
- Turn off fluorescent lighting if the room is unoccupied for more than five to ten minutes.
- Turn off lights during recess, lunch and assembly periods.
- Turn off lights when leaving any room or area that is not equipped with a motion sensor.
- Turn off metal halide lighting in gyms and multi-purpose rooms if the area will be unoccupied for more than 30 minutes.
- Do not turn on stadium lighting more than 15 minutes before light is actually needed for events, security or safety.
- If conditions allow, operate fluorescent lighting fixtures at reduced lighting levels.
- Turn off electric lighting fixtures near skylights.
- Turn off lighting rows nearest the windows.
- Turn off lights when leaving for evenings, nights, weekends and vacation or break periods.

- Repair any lighting that remains on during daylight hours due to mechanical malfunction.
- Limit use of windows surfaces to display student work as this reduces natural light.
- Turn off marquee, outdoor or pedestal signs at 10:00 PM or earlier.
- Turn off display case lighting at the end of the school day.
- Use only lighting in the immediate area for maintenance or custodial activities.
- Clean light fixture lenses and housings annually to improve light output.
- Install 'Please Turn Lights Off' stickers near light switches.
- Replace yellowed fluorescent lighting fixture diffusers to optimize light delivery.
- Document lamp and ballast installation dates. Early failures may qualify for supplier warranty adjustments.
- Reduce lighting to the lowest safe level in interior hallways and in hallways with adequate natural light.
- Turn off exterior lights at midnight excepting parking lot lights or others designated by the police or fire departments as necessary for safety and security.
- Replace spent lamps with energy efficient, long life lamps that are approved by the Maintenance Department.
- Program reasonable on - off schedules for decorative lighting.
- Perform routine preventative maintenance on all lighting system components.
- Inventory fluorescent ballasts (and transformers) containing PCB's.
- Smaller districts may qualify to use local Household Hazardous Waste facilities for the disposal of used fluorescent lamps. In certain areas, green tipped, ecology friendly fluorescent lamps are recycled without charge.
- Install spring wound or electronic timer switches to control lighting in intermittently used areas such as custodial closets, supply rooms and teacher workrooms.
- Install photocells on parking lot and building perimeter light fixtures.
- Install photocells on interior lighting if natural daylight is abundant.
- Design better lighting controls into new schools or modernization projects.
- Locate classroom lighting controls near the teaching station.

- Install (and commission) occupancy sensors to control lighting in staff areas, conference rooms, copy rooms and restrooms.
- Separate decorative lighting circuits from general lighting circuits.
- Use low watt halogen or compact fluorescent lamps instead of incandescent lamps.
- Provide zone control for parking lot lighting.
- Retrofit gym / MPR metal halide lighting with T-5 or T-8 fluorescent lighting.
- Replace exterior Mercury Vapor security lighting with High Pressure Sodium lighting.

Office Equipment and Appliances

- Use proper reducing strategies such as double sided printing, paper reuse and e-mail.
- Use plug load occupancy sensors to control plug loads including computer monitors, task lighting, copiers and vending machines.
- Use all Energy Star® features that switch equipment to a power-saving mode during non-use periods.
- Turn off trash compactors, computers, monitors, printers, copiers, unnecessary classroom, display and office lighting nightly, on weekends and during vacation periods.
- If unable to switch off a computer, turn off the

monitor using the control panel sleep function or connect the monitors to a server-based automatic-off control program.

- Use network printers and eliminate desktop printers.
- Unplug extra copiers and printers.
- Use flat-screen computer monitors.
- Use ink-jet printers instead of laser printers and laptop computers instead of desktop computers.
- Turn off laminating machines when not in use.

Food Service

- Do not preheat cooking equipment longer than necessary. Follow manufacturer equipment pre-heat recommendations.
- Do not operate steam tables at a higher temperature than necessary, or for longer than necessary.
- Use cooking equipment at capacity. Under or over loaded equipment wastes energy.
- Clean kitchen exhaust hood filters.
- Turn ovens down or off during low production periods.
- Consolidate refrigeration units.
- Keep low and medium temperature refrigeration cases full.
- Turn off plug loads.
- Make ice at night.
- Turn equipment temperatures down, turn equipment off, keep equipment clean.
- Replace electric cooking equipment with correctly sized gas-fired equipment.
- Purchase insulated cooking equipment whenever possible (e.g.: fryers, ovens, coffee makers).
- Replace broilers with grooved or smooth griddles to significantly reduce energy consumption.
- Make sure oven doors fit tightly and gaskets are in good condition.
- Replace incandescent lamps in the exhaust hood with correct wattage compact fluorescent lamps (CFL).
- Retrofit high temperature dishwashers with chemical rinse, low temperature dishwashers.
- Turn off doorframe heater on walk-in refrigerator box.
- Make sure energy management systems are working.
- Install low-flow pre-rinse spray valves.
- Repair all water leaks.
- Maximize the overhang on kitchen exhaust hoods.
- Maintain refrigeration systems.
- Evaluate the number of refrigeration units in the food service operation and consolidate to minimize the numbers.



Cesar Chavez Elementary School Long Beach Unified School District Long Beach, CA

Energy Efficient Features:

CHPS Certified
Savings by Design

Provided By: LPA, Inc.

Custodial Activities

- Reduce lighting levels during all custodial activities.
- Turn off trash compactors.
- Turn off vending machines at night.
- Turn off computer monitors when not in use and at night and weekends.
- Train custodians to identify and report energy wasting situations.
- Ask custodians to identify and suggest energy saving opportunities.
- Turn off coffee machines after lunch.
- Turn off unnecessary classroom, display and office lighting.
- Use a team custodial strategy to minimize power used during daily custodial activities.

Vacation Periods

- Turn off exterior lighting unless a school or community function is in progress, or lighting is required by local code or as necessary for safety and security.
- Turn off interior lighting when an area is unoccupied for more than five to ten minutes.
- Operate summer school sites and support facilities under the energy plan in effect during the academic school year.
- Empty, turn off and unplug all refrigerators and freezers. Only appliances or systems specifically designated by Food Services as necessary for summer operations may operate.
- Empty and unplug all refrigerated (and other) vending machines, except those at full summer school sites. An exception may be allowed if a vending machine is producing revenue during the summer and the site agrees to pay the cost of energy to run the machines.
- Turn off and unplug all coffee makers, water coolers, water dispensers, refrigerated drinking fountains, televisions, VCR / DVD players and miscellaneous plug loads.
- Remove personal aquariums, pets, terrariums, etc. from the school site unless they are used for instructional purposes.
- Turn off all water heaters at non-summer school sites on a date determined by the Superintendent.
- Use air conditioning at summer school sites only during regularly scheduled summer school hours and only if students and staff are present.
- Shut down heating and air ventilation systems at the end of the academic year on a date determined by the Superintendent.

Critical Peak Energy Shortages Before the Event:

- Subscribe to your electric service provider's interval meter data service if available.
- Understand which individual electric accounts are subject to Critical Peak pricing criteria.
- Become familiar with the functions and information available from interval metering.
- Educate district personnel of the effects of Critical Peak energy shortage events.
- Identify non-essential usage that may be curtailed without effecting safety or security.
- Reprogram the energy management system with Critical Peak load reduction strategies.
- Color code or mark light switches (or circuit breakers) that can be switched off when not needed, or in response to critical peak signals.

Upon receiving high energy cost notification during times of critical energy shortages:

- Activate the Critical Peak option in the energy management system
- Adjust fresh air intake settings to match building occupancy.
- Turn off all unnecessary appliances.
- Unplug vending machines.
- Raise air conditioning temperature settings.
- Operate lighting at reduced levels.
- Turn off electric water-heaters in the food service operation.
- Defer use of commercial dishwashers.
- Shift custodial and other activities to non-Critical Peak periods.
- Activate color coded switches (or circuit breakers).

Building Improvements

- Perform routine preventative maintenance on doors, walls, roofs and windows.
- Keep windows and skylights clean.
- Repair any water penetration into the building.
- Add or adjust exterior door automatic door closers.
- Weather-strip doors.
- Seal building cracks with caulking.
- Re-roof with cool-roof reflective materials.
- Increase insulation where appropriate, particularly during re-roofing.
- Modernize windows and skylights with high-performance, low-E glazing.
- Install reflective window film in select locations.
- Create west side shading using deciduous, water-efficient plantings.

- Construct exterior shading devices and shade air-conditioning condensers.

Refrigeration

- Clean evaporator coils and inspect for ice build-up and bent fins monthly
- Calibrate refrigeration temperatures using an accurate thermometer. Adjust to maintain 40 degrees.
- Replace incandescent lamps in walk-in refrigerator boxes with correct wattage compact fluorescent lamps (CFL). (Sub-zero temperatures prevent use of CFL's in freezers).
- Keep refrigerators fully loaded to reduce energy costs.
- Install and use plastic strip curtains and automatic door closers for walk-in refrigerators and freezers.
- If cafeteria milk coolers or similar equipment is to remain empty, turn them off and restart them using appropriate procedures.
- Remove classroom compact refrigerators and provide a new Energy Star® rated refrigerator in the staff lounge.
- Move outdoor machines inside.
- Remove older, inefficient 'donated' refrigerators from the site.
- Perform preventative maintenance on refrigeration units.
- Disconnect door gasket heaters on medium temperature refrigeration units.
- Replace worn door gaskets.
- Adjust door latches for positive closing.
- Set defrost time clocks to nighttime hours.
- Insulate bare refrigerant suction lines.
- Fit evaporator fan motors in walk-in boxes with 'electrically commutated motors' and speed controllers.
- When purchasing new refrigeration systems, select equipment with the highest, affordable energy efficiency rating.
- Evaluate the number of refrigeration units in the food service operation. Consolidate units wherever possible to minimize the number of individual refrigeration units.

Vending Machines

- Understand annual energy costs for vending machines and determine if vending revenue meets annual energy costs.
- Place machines in a shaded environment.
- Turn machines off at night and in summer if vendor removes product.
- Reduce the number of machines available during summer vacation.

- Permanently turn off door / signage lighting.
- Activate built-in controls to turn machine off at night and on weekends. Require vendor to set these controls to the District's specification.
- Add occupancy sensor controls to reduce night, weekend and holiday period usage.
- Require vending service vendor to perform regular preventative maintenance on vending machines including a quarterly cleaning of condenser coils.

Water Systems

- Clean refrigerated drinking fountain cooling coils.
- Turn off drinking fountain refrigeration.
- Adjust heated water temperature to less than 110 degrees in classrooms and restrooms.
- Report leaking faucets, valves, spigots and restroom fixtures.
- Check water meters to determine nighttime water use.
- Turn off water heater during vacation and break periods.
- Identify sites that use abnormal amounts of water and work to reduce usage.
- Interact with local water companies to identify and implement strategies that reduce water consumption.



Yuba City Unified School District Yuba City, CA

Energy Efficient Features:

LEED, CHPS, Savings By Design, Daylighting, etc.
Savings by Design

Provided By: Sundt Construction

CHAPTER 5

Funding Options

Funding for projects to improve schools' energy efficiency can be difficult to locate. A number of cost-effective opportunities exist and the intent of this section, while not exhaustive, is to identify some of those opportunities. While not all options can be presented in detail, the following options are a sampling of what is available to help you with your financing decisions.

Savings by Design

The Savings by Design program is offered by Pacific Gas and Electric, San Diego Gas and Electric, Southern Cal Edison, and Sacramento Municipal Utility District, and targets building owners and design teams, providing cash incentives to both in order to encourage the use of high-efficiency energy design. There are two approaches for calculating the incentive rebates; the "Whole Building" approach and the "Systems" approach. The "Whole Building" approach is the preferred method for estimating energy savings, as it encourages the integration of the most energy efficient and cost-effective systems into the building.

The "Systems" approach is a simple and straightforward method to saving energy. The design team may find it more appropriate for their project. This methodology makes it easier to estimate potential energy savings on your project.

The components of Savings by Design include design assistance, owner incentive rebates, and design team incentive rebates. Design assistance is available to both building owners and design teams, and is matched to the specific needs of the project. For new construction, a representative coordinates the scope and makes recommendations on energy-efficient equipment, consults on design strategies, assists with building energy simulation model development, and provides training on new tools and techniques. This is a free service to the district.

In order to receive owner incentive rebates, the design must exceed Title 24 energy standards by 10%. The incentive amount depends on the approach and efficiency actually achieved. In the "Systems" approach the program pays up to \$75,000 per building. The utility representative will calculate energy savings and incentives on a system-by-system basis. Savings of 3 to 12 cents per kilowatt-hour can be realized, depending on the technology used.

In the "Whole Building" approach owner incentive rebates can add up to \$150,000 per building. This approach uses a computer simulation analysis to determine energy savings, and based upon the outcome could yield rebates of 6 to 18 cents per kilowatt-hour and 34 to 80 cents per therm saved annually. For the design team incentive the Whole Building approach and computer simulation model must be used. This is available when the design saves at least 15% beyond Title 24. The incentives range from 4 to 6 cents per kilowatt-hour annually saved. This incentive pays the design team up to \$50,000 and is paid directly to the design team by the utility.



Beverly Hills High School Science & Technology Building Beverly Hills USD Beverly Hills, CA

Energy Efficient Features:

CHPS Designed
Savings by Design

Provided By: LPA, Inc.

The program provides funding on a first come, first served basis. To be eligible for the incentive, construction must be completed within 3 years of the date of the pre-approval letter issued by the utility. Some benefits of this program include defraying cost of energy efficient components, reduced operating costs for building owners, and increased property values. Additional benefits include increased occupancy comfort and creation of environmentally friendly buildings.

CEC Low-interest loan program

The California Energy Commission (CEC) offers low interest loans (currently at 3.95%) to public agencies including school districts. Over \$20 million is available through the program. Loans can finance up to 100 percent of the cost of energy efficiency projects. The maximum loan amount is \$3 million per application. There is no minimum loan amount. The loans (not to exceed 10 times the annual energy savings) are intended for the following types of energy efficiency projects:

- Lighting
- Motors or variable frequency drives and pumps
- Building insulation
- Heating and air conditioning modifications
- Automated energy management systems/controls
- Energy generation including renewable energy projects and cogeneration

A tax certificate, a promissory note, and a loan agreement between the applicant and the Energy Commission secure all loans. The funds are available on a reimbursement basis. The final 10 percent of the funds are retained until the project is completed. Interest is charged on the unpaid principal computed from the date of each disbursement to the borrower. The repayment schedule is negotiable up to 15 years and is based on the annual projected energy cost savings from the aggregated projects. Applicants are billed twice a year in June and December beginning 6 to 18 months after all projects are completed.

CEC Bright Schools Program

The Bright Schools Program is not a funding avenue for energy saving projects, but rather a free service offered to school districts to help them evaluate potential energy saving measures on both new construction and renovation projects. The services provided through Bright Schools are energy audits, review of existing proposals and designs, and the development of equipment performance specifications.

The CEC will provide technical assistance services up to \$20,000 of their consultant's costs. The cost of a study depends on the facility size, type and scope of the project. The CEC contracts with experienced engineering and architectural consultants who provide the technical assistance to the district.

The CEC works with the Office of Public School Construction, the Division of the State Architect, and the California Department of Education to ensure that recommended projects meet program eligibility requirements.

All publicly funded California K-12 school districts and non-profit K-12 schools are eligible for assistance from the Bright Schools Program. The CEC claims that savings typically reduce annual utility costs by an average of 20 percent.

State High Performance Schools Grant Program

In 2006 the State Legislature passed Assembly Bill 127 which made changes to the School Facilities Program (SFP) and placed Proposition 1D on the ballot. One of the changes made to the program was the establishment of the High Performance Schools Grant (HPSG) program. Proposition 1D authorized \$100 million to be used for High Performance elements in schools. The program is based on the 2002 and 2006 Collaborative for High Performance Schools (CHPS) Criteria, and increases the amount of the basic SFP per pupil grant by a sliding scale percentage ranging from 2% to 10.25% for new construction and to 10.37% for modernization based on the number of CHPS points included in the project. Some modifications were made to the CHPS Criteria to meet the provisions of the law. The primary changes were the elimination of the points for schools as teaching tools and for school district resolutions. These points were viewed by the OPSC as not directly being part of the construction process, therefore not eligible for State construction funding.

The State also provided additional points for alternative energy provisions. The CHPS standards allow for 1 point for every 5% of total energy produced on site up to 3 points. The HPSG allows up to 7 points for this section. With the noted exceptions, all prerequisites must be met to qualify for funding.

The requirements for New Construction projects on new sites differ from those of Modernization projects. Additions to existing sites have the same requirements as Modernization projects. New Construction projects must have a minimum of 27 points, 4 of which must be in the categories of energy efficiency or alternative energy. At the 27 point threshold a project will receive a 2% increase to the basic SFP per pupil grant. The maximum increase that is allowed for new construction projects is 10.25% at 75 points. The regulations and the funding formulas can be found in the OPSC regulations, Section 1859.71.6.

Modernization and addition projects must attain a minimum of 20 points and will receive a 2% increase in grants at that level. At least 4 points must be from energy efficiency or alternative energy. Alternative energy elements can receive from 3% increase to 9% increase. A modernization project can receive a maximum of 10.37% increase in the basic grant at 77 points. The regulations for the modernization funding can be found in OPSC regulation Section 1859.77.4.

To qualify for funding each project must be submitted to the Division of the State Architect. The DSA has developed a scorecard similar to the CHPS scorecard for use with this program. The scorecard indicates the documentation required to receive each point. The HPSG points are verified by the DSA and a compliance letter is sent to the OPSC with the number of verified points indicated. The OPSC then calculates the grant amount based on the verified increase.

The OPSC has indicated that, as a part of the audit process, they will verify that all High Performance elements are included in the final project as submitted to the DSA.

Revolving Fund

Establishing a Revolving Fund may be one of the simplest ways for schools to finance energy efficiency improvements. The Revolving Fund is designed to pay for itself overtime, and may even become a permanent source of environmental improvements and resource savings for California schools. The program can be self-sustaining as energy and water savings from projects implemented under the Revolving Fund Program reduce costs to the schools. The money saved through the implementation of these projects can then be fed back into the Revolving Fund to finance other energy and water projects.

Power Purchase Agreements

Power Purchase Agreements (PPAs) are a mechanism through which a public school district can select a vender to install energy efficiency devices on school district property at limited cost to the district. The vender retains ownership of the system and sells power back to the district at a defined rate. Government Code Section 4217.10 et. seq. governs energy service or efficiency contracts. PPA's have typically been used for the installation of solar photovoltaic generation systems on school sites.



Paramount High School Addition Paramount Unified School District Paramount, CA

Energy Efficient Features:

Solar Panels

Provided By: LPA, Inc.

Power Purchase Agreements have advantages and risks to both the provider and the district. One of the advantages to the district is predictable energy expenditures for the site. The costs of electrical power for the life of the PPA are established in the contract and known to the district. These rates are typically based on assumptions of power rate increases over the life of the agreement. There is a potential that the District could see significant savings in energy costs if these assumptions prove to be accurate. There is also the risk that the District would not realize the projected savings if the projections are not accurate.

With a PPA, ownership of the system remains with the provider. Maintenance and repair for the system can be the responsibility of the provider, not the District, if the contract so states. If the system fails, replacement is the responsibility of the provider.

Significant State and federal tax incentives are available for the installation of solar photovoltaic systems. 30 percent federal investment tax credits have recently been extended through 2016 for the installation of solar systems. However,

school districts are not eligible for these credits. By installing and retaining ownership of the system, the vender can take advantage of the incentives. Power companies such as PG&E also offer incentives in the form of rebates to both private and public entities for solar systems.

Joint Occupancy

Ed Code 17524 provides school districts with an option to use property assets creatively. It provides broad authority to the local Board of Education to meet both facility and income needs. It requires that a district continue to own a property asset, but the District can lease that property to a public or private sector partner, while maintaining or planning for a use of some fraction of the property or project to be built on the subject property.

The district may enter into a joint occupancy agreement with any entity the local Board of Education chooses. A process of selection is assumed to be used, but none is prescribed in the law. The State Board of Education is required by statute to review and approve the joint occupancy agreement prior to the local Board of Education taking action to commit the district to the agreement.

As related to district needs, the joint occupancy statute may be used in a variety of ways. The joint occupancy agreement may be written to include the following, each of which may provide for energy production, energy conservation, and green technology:

1. A project that will generate energy to reduce the school district's annual consumption calculated in dollars that reflect an annual savings equal to 5% of the total expenditures as determined by the districts independent audit in the fiscal year immediately prior to the fiscal year of the approval by the State Board of Education of the Joint Occupancy project.
2. A project that will be jointly occupied by a partner or partners that build a new, or reconstructs an existing, facility dedicated to use of at least 25% that provides and operates career technical education services not funded by or under the direction of the school district owning the real property upon which the project is constructed.
3. A project that will be jointly occupied by a partner or partners that build a new, or reconstructs an existing, facility dedicated to use as a child care development center or a facility offering rehabilitation services not funded and operated by the school district.
4. A project that will be jointly occupied by a partner or partners that build a new, or reconstructs an existing, facility that offers community services provided by local, state, or federal agencies or not-for-profit entities.



Thurston Middle School Modernization Laguna Beach Unified School District Laguna Beach, CA

Energy Efficient Features:

LEED Criteria
Natural Daylighting
Building Reuse

Provided By: LPA, Inc.

APPENDIX A

Sample Board Resolution

When a District is planning Energy Efficiency for all facilities, a Board Resolution is the best way to express their commitment and establish policy. Then a Master plan can be established for staff to follow and implement step-by-step.

Here is an example of a Board Resolution for Energy Efficiency.

Resolution on Energy Efficiency for Existing Facilities and New Construction

_____ School District
Board of Education

Adopted _____
Date

WHEREAS, Climate change and global warming are eminent dangers to our environment;

WHEREAS, Crisis of escalating energy price is an immediate threat to a school operation expense;

WHEREAS, Schools employ design, construction and operation strategies that minimize operating costs, in particular for energy and water use as studies show that facility energy costs, for example, can be reduced by 25 percent or more;

WHEREAS, The District's program to build new schools and renovate existing ones provides a unique opportunity to apply Energy Efficiency measures and follow the relevant criteria described by Collaborative for High Performance Schools (CHPS) or Leadership in Energy and Environmental Design (LEED);

RESOLVED, That the District should have an Energy Efficiency Master Plan

RESOLVED, That the _____ School District Board of Education recognizes the progress already made by the District's staff and design teams to incorporate energy efficiency design criteria into the District's school construction program; and

RESOLVED further, That the Board directs staff to expand this effort to ensure that every new school, new building and modernization project, from the beginning of the design process, incorporate Energy Efficiency Master Plan or CHPS or/ and LEED criteria and best practices to the extent feasible; that the next round of construction projects minimally meet the qualifying criteria and preferably achieve at least _____; and that the focus be on criteria in the following priority areas:

1) life cycle analysis; 2) operating cost minimization through resource efficiency; 3) minimizing the impact of District operations on the environment; and 4) taking advantage of financial incentive programs such as the High Performance Schools Grant Program; and

RESOLVED further, That the Board of Education directs staff to follow the Energy Efficiency Master Plan to ensure complete implementation, including a performance tracking system throughout design, construction and operation; and

RESOLVED further, That the Board of Education endorses District participation in and directs staff to pursue partnerships that further the goal of energy efficient schools, including Federal, State and utility programs that provide sustainable design financial incentives, and;

RESOLVED further, That the Board of Education directs staff during the design phase of the remaining projects in the current construction and modernization program and all such future projects, to require architects and staff to verify that their District project(s) have met or exceeded the minimum Energy Efficiency requirements, and report the energy savings; and

RESOLVED further, That the Board of Education directs staff to report to the Board, within _____ days of the passage of this resolution, on the District's plan to comply with this Resolution; and

RESOLVED, That the Board of Education directs staff to report to the Board annually on the progress of this program, and provide quarterly summary statistics on the number of new schools and modernization projects designed and the percentage which have incorporated Energy Efficiency design criteria, and other statistics useful in assessing the progress of this effort.

APPENDIX B

Useful Websites and Resources

Energy Efficiency Resources

Alliance to Save Energy – Green Schools Campaign

A comprehensive program designed for K-12 schools that creates energy awareness, enhances experiential learning, and saves schools money on energy costs.

<http://ase.org/section/program/greenschl>

ASHRAE Advanced Energy Design Guide for K-12 School Buildings

The Advanced Energy Design Guide series provides a sensible approach to easily achieve advanced levels of energy savings without having to resort to detailed calculations or analysis. Available for download: www.ashrae.org/publications/page/1604

Bright Schools Program (California Energy Commission)

The California Energy Commission program helps schools identify cost-effective energy efficient assistance as well as energy efficiency financing. This website can also be used to find school districts in your area that have utilized this program.

<http://www.energy.ca.gov/efficiency/brightschoools/>

California Energy Commission's PIER program

Reference specifications for energy and resource efficiency

<http://www.archenergy.com/library/pier/>

California School Boards Association, Financial Services

This site provides a list of financial services available through CSBA.

<http://www.csba.org/services/services/financialservices.aspx>

California Solar Initiative

A program adopted by the California Public Utilities Commission (CPUC) offering incentives for solar-energy projects.

<http://www.cpuc.ca.gov/PUC/energy/solar>

California State Energy Code – Title 24

Training for California's Title 24 Energy Efficiency Standard.

www.energy.ca.gov/title24/training/index.html

Coalition for Adequate School Housing

Provides school facilities related information, resources, and links.

www.cashnet.org

Collaborative for High Performance Schools (CHPS) Best Practices Manual, Design

Much of Design, the second volume in the CHPS Best Practices Manual, is dedicated to energy efficient design strategies including the chapters on Daylighting, Electric Lighting, HVAC, and Building Envelope. CHPS can also direct you to school districts that have successfully implemented energy efficient programs.

www.chps.net

Commercial Building Performance, by the Consortium for Energy Efficiency (CEE)

Information about existing programs and resources for building energy-efficient K-12 schools.

<http://www.cee1.org/com/bldgs/schools.php3>

Database of State Incentives for Renewables & Efficiency (DSIRE)

Provides a comprehensive list of federal, State and local incentives for renewables and energy efficiency.

<http://www.dsireusa.org/library/includes/map2.cfm?State=CA&CurrentPagelD=1&EE=1&RE=1>

Division of the State Architect (DSA) Commissioning Process Guide

Information about the commissioning process for school facility stakeholders.

http://www.dsa.dgs.ca.gov/Pubs/comm_process_guide.htm

Division of the State Architect (DSA) High Performance Schools

Information about the verification of plans for High Performance Incentive (HPI) Grants

<http://www.dsa.dgs.ca.gov/otherprog/hps.htm>

Energetics Benchmarking Tool - One-2-Five®Energy

<http://www.one-2-five.com/framesets/benchmarkingFS.htm>

Energy and Technical Services e-Bench

e-Bench™ is a world leading Internet based computer tool for measuring energy and environmental efficiency.

<http://www.e-bench.com/>

Energy Efficiency Financing Program

The California Energy Commission provides low interest loans for the installation of energy-saving measures or for energy audits and studies.

<http://www.energy.ca.gov/efficiency/financing/>

Energy IQ – California Energy Commission

Provides a deeper, complimentary level of analysis to ENERGY STAR Portfolio Manager.

<http://energyiq.lbl.gov/benchmark.html>

EnergySmart Schools (DOE)

A campaign of the Department of Energy and its Rebuild America program providing tools to help plan, finance, design, build, operate and maintain energy efficient schools.

<http://www1.eere.energy.gov/buildings/energysmartschools/index.html>

ENERGY STAR for K-12 School Districts

Offers resources and tools to improve energy efficiency including the energy performance evaluation tool: Portfolio Manager

http://www.energystar.gov/index.cfm?c=k12_schools.bus_schoolsk12

Flex Your Power – Solutions for Schools

Includes energy saving tips and funding options for California schools.

<http://www.fypower.com/inst/edu.html>

Greening Schools

This site provides a comprehensive list of funding options for energy-efficient school projects.
http://www.greeningschools.org/resources/funding_opportunities.cfm

LBL labs for the 21st Century

A Web-based database tool that contains energy use information from more than 170 laboratory facilities.
<http://www.epa.gov/lab21gov/toolkit/benchmarking.htm>

Minnesota B3 Benchmarking System:

<http://www.mnbenchmarking.com>

Oakridge National Laboratory

<http://eber.ed.ornl.gov/benchmark/homepage.htm>

PG&E – Automated Benchmarking Service

Automated Benchmarking Service (ABS) provides the ENERGY STAR® Portfolio Manager with your monthly energy usage data.
<http://www.pge.com/mybusiness/energysavingsrebates/analyzer/benchmarking/>

San Diego Gas and Electric – Energy Challenger

An online survey designed to help find ways to improve energy management.
http://www.sdge.com/business/esc/promo_audit.shtml

Savings by Design - Energy Design Resources

A guide to energy efficient design practices and financial incentives including the Savings by Design program to encourage high-performance nonresidential building design and construction, sponsored by the Public Utilities Commission.
www.energydesignresources.com

School Facility Program – High Performance Incentive Grant

The School Facility Program provides incentive grants through the High Performance Grant Program.
<http://www.opsc.dgs.ca.gov/programs/sfprograms/high+performance+incentive+grant.htm>

School Facility Program – Modernization Grants

The School Facility Program provides funding assistance to school districts for the modernization of school facilities.
<http://www.opsc.dgs.ca.gov/Programs/SFPrograms/Mod.htm>

Southern California Edison – SCE EnergyManager® Tool Suite

<http://www.sce.com/business/energy-solutions/sce-energy-manager.htm>

- SCE EnergyManager® Basic – provides basic energy information in 15-minute intervals and analytical tools to help you effectively manage your energy usage.
- SCE Cost Manager® - provides powerful analysis tools to help you better understand how your energy use translates into costs.
- SCE Bill Manager® - evaluates energy use trends and benchmark costs, as well as usage.

Statewide California Building Operator Certification (BOC) Program

The Building Operator Certification (BOC) Program is a nationally recognized training and certification program for building operators offering improved job skills and more comfortable, energy-efficient facilities. BOC is sponsored statewide in California by the utility energy centers under the auspices of the CPUC.
<http://www.theboc.info/>

U.S. Green Building Council –Green Schools Resource Library

Provides links to presentations, publications and other green school resources.
<http://www.buildgreenschools.org/resources/>



Brea High School Brea Olinda Unified School District Brea, CA

Energy Efficient Features:

CHPS Certified
Savings by Design

Provided By: LPA, Inc.

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CALIFORNIA'S
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