Schools Programs

Exemplary Programs

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Exemplary Program

Collaborative for High Performance Schools
California Energy Commission
California Integrated Waste Management Board
California Department of Education
Division of State Architect
Office of Public School Construction
Pacific Gas & Electric
Sacramento Municipal Utility District
San Diego Gas & Electric
Southern California Edison
Southern California Gas

PROGRAM OVERVIEW

The Collaborative for High Performance Schools (CHPS, often referred to as "chips") brings together a broad range of government, private industry, and nonprofit organizations to facilitate and inspire change in the K-12 educational system. The stated mission of CHPS is:

- To facilitate the design, construction and operation of high performance schools: environments that are not only energy and resource efficient, but also healthy, comfortable, well lit, and containing the amenities for a quality education.

The specific goals to fulfill the CHPS mission are:

- Increase student performance with better-designed and healthier facilities,
- Raise awareness of the impact and advantages of high performance schools,
- Provide professionals with better tools to facilitate effective design, construction and maintenance of high performance schools,
- Increase school energy and resource efficiency, and
- Reduce peak electric loads.

CHPS offers services through four principal programs:

- *CHPS Recognition Programs*: CHPS oversees the nation's first green building rating program especially designed for K-12 schools. The CHPS Criteria is a comprehensive system of environmentally responsible benchmarks designed by the CHPS technical committee, which is made up of over fifty school facilities experts including state agency officials, designers, school district officials, contractors, product manufacturers and energy and water utility officials. A CHPS school is a school that has strived to achieve excellence in environmental efficiency and healthy building practices. CHPS recognizes superior design teams and school districts through award ceremonies, case studies and media outreach. Schools can self-certify their school through the free CHPS Designed

program, or seek third-party verification of their high performance school through the CHPS Verified program.

- *CHPS Trainings:* CHPS, as an American Institute of Architects registered provider of Continuing Education Services, offers accredited high performance school technical seminars to design professionals. A leader in the field of green school development, CHPS also offers workshops to school districts and other stakeholders on the green school development process, including assisting school districts in creating district-wide resolutions on green school construction. CHPS also offers an annual conference on high performance schools called "Greentools for Healthy Schools."
- *CHPS Best Practices Manual:* CHPS has developed and maintains a six-volume technical best practices manual for high performance schools. The manual covers planning, design, high performance benchmarks, maintenance and operations, commissioning and relocatable classrooms in high performance schools. The manual was developed through a consensus process with the assistance of school officials, state agencies, industry representatives and design professionals. CHPS periodically updates each volume of the manual.
- *CHPS High Performance Resources:* CHPS manages a member directory of green school building services and a directory of certified low emitting materials for green school construction.

Twenty-six school districts, including those serving San Francisco, Oakland, San Diego and Los Angeles, have become CHPS Districts by passing school board level resolutions to build all new construction and major modernization projects to the minimum qualifying point and prerequisite thresholds of the CHPS Criteria. These school districts also commit to using CHPS Best Practices for all operations, maintenance and minor modernization projects where feasible.

The success of CHPS in California has led other states to join CHPS. While the CHPS Criteria were originally develop for the California school market, these criteria are readily applicable to other states and regions. As a result, the CHPS building Criteria have been adapted for Washington, Massachusetts, New York, Connecticut, Maine, New Hampshire, and Rhode Island. This kind of rapid program emulation is a testament to the principles and practices that CHPS promotes for school environments. "High performance schools" make sense in any location for the numerous benefits of such schools cited earlier.

PROGRAM PERFORMANCE

In California, twenty-five schools have been designated CHPS-Designed. In the other seven states that have adapted the CHPS program, seventeen schools have been built to the CHPS standard. One hundred and fifty schools are underway using the CHPS program. Twenty-six school districts have mandated the CHPS Criteria in all new construction and modernizations, and three more have recommended its use where feasible. Of the completed CHPS schools in California, estimated energy savings are between 10 to 35% better than California's already stringent Title-24 standards.

A high performance school is:

- Healthy,

- Comfortable,
- Energy and material efficient
- Easy to maintain and operate,
- Commissioned,
- On an environmentally responsive site,
- A building that teaches,
- Safe and secure,
- A community resource,
- Designed to be stimulating architecture, and
- Adaptable to changing needs.

Creating a school with these characteristics is not difficult, but it does require an integrated, "whole building" approach to the design process. Key systems and technologies must be considered together, from the beginning of the design process, and optimized based on their combined impact on the comfort and productivity of students and teachers. At the end of the process the entire facility will be optimized for long-term performance. The result will be a finished school that is an enduring asset to its community: one that enhances teaching and learning, reduces operating costs, and protects the environment.

LESSONS LEARNED

CHPS demonstrates some guiding principles for successful energy efficiency programs serving a diverse constituency, such as school districts.

- *Collaboration works.* CHPS has engaged a broad set of stakeholders in the design, construction and operation of K-12 schools, including school administrators, architects, contractors, utilities, regulators, and facilities managers. CHPS has successfully addressed a wide range of interest – finding the common ground of high performance schools to bring these stakeholders together working for a common goal.
- *Customers are interested in multiple benefits.* For school districts saving energy and associated costs is only one of many considerations for construction and operation of their facilities. CHPS has successfully demonstrated the full range of benefits that can be realized through high performance schools, not just energy cost savings, but also enhanced student performance, improved health of all building occupants, and reduced resource use.
- *Schools can drive the market.* The purchasing power of school districts is driving market transformation. With a membership of over 200 companies, organizations, school districts and government agencies, CHPS proves that the robustness of the school construction market can transform school construction practices to become more environmentally responsible.*Regional, state-specific building standards are necessary.* CHPS has been firmly committed to the idea that every state builds schools differently, and that high performance building standards need to be adapted to reflect the varying climates, school systems and constraints and opportunities of each region. With the adaptation of the CHPS standard for eight states, and interest from several other states,

CHPS is well-positioned to respond to the need for state/regional-specific building standards.

PROGRAM AT A GLANCE

Program Name: Collaborative for High Performance Schools

Targeted Customer Segments: School districts, including their architects and engineers, superintendents, parents, teachers, school board members, administrators, and those persons in the school district that are responsible for facilities

Program Start Date: FY 2000

Program Participants: A total of 25 CHPS Schools have been built in California, with another 17 in the rest of the US. Twenty-six school districts in California have committed to building all new construction and major modernizations to the CHPS high performance school standard. The program model and resources have also been adapted and applied in seven other states – Washington, Massachusetts, New York, Connecticut, Maine, New Hampshire, and Rhode Island. Many of the program resources, such as the CHPS Best Practices Manual, are provided free for download on the CHPS website, www.chps.net.

Annual Energy Savings Achieved: Although individual CHPS schools typically have measurable kWh savings in the range of 30% below Title 24 minimum-efficiency requirements for similar building designs, the full impact of the program cannot be measured in kWh. Since the primary focus is on education, training, and information dissemination and transfer, a measurement and verification component is not required.

Budget: FY2007: Approximately $600,000.

Funding Source: California public goods charge, membership, grants

For more Information about the Program:

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Energy Smart Schools Program
New York State Energy Research and Development Authority

PROGRAM OVERVIEW

Energy costs are typically the largest controllable budget item for school districts. Unfortunately, facilities managers and business officials do not always realize the magnitude of the impact that good energy management can have on their district's budget. Additionally, their time is often fully consumed by the day-to-day needs of their buildings and districts, leaving no one in charge of energy management. Even for districts that are already actively pursing energy efficiency and sustainability, it can be difficult to find resources and stay knowledgeable about this new and ever-changing field.

The New York State Energy Research and Development Authority (NYSERDA) created the Energy Smart Schools (ESS) Program in the late 1990s to address these difficulties. The ESS Program was developed by experts in the field of energy management. Core elements of the program are benchmarking, technical assistance and training.

Through various outreach efforts, the first step of the program is to raise awareness of energy efficiency and sustainability issues among school managers and maintenance personnel. The next step—education—has taken on two forms: benchmarking and training.

Benchmarking is the backbone of the ESS program, providing free reports for school districts that submit building and utility data. With minimal effort required by the district to collect the data, the reports provide energy consumption and cost analyses that incorporate district, state, and national data. National data analysis is made possible by the U.S. Environmental Protection Agency's (EPA) Building Performance Rating System, *Portfolio Manager,* an on-line energy benchmarking tool. An added benefit of using the EPA's *Portfolio Manager* is the possibility for national recognition through the well-known ENERGY STAR® Program.

The Benchmarking Reports are invaluable, but direct training brings the knowledge of the district staff to an even higher level. The ESS Program has delivered the following training and education opportunities across New York State:

- 9 Building Operator Certification (BOC) courses,
- 7 Lighting & Building Controls one-day seminars,
- 5 Boiler Efficiency one-day seminars, and
- A free 18 module on-line training program for architects and engineers – the High Performance School Design On-line Training.

The Energy Smart Schools Program has also hosted and sponsored several statewide conferences, with over 1,000 attendees. Finally, the program has developed numerous tools and

resources, such as the High Performance School Design Guidelines (NY-CHPS), a Comprehensive Maintenance Plan Excel Tool, a plug load energy use estimator, a T-stat set back model, and a fuel switching estimator.

In addition to specific courses and seminars, the program also provides direct one-on-one technical assistance to help school districts initiate energy efficiency projects and take next steps. With the education, experience and resources that school personnel gain through this program, they are prepared to improve the energy efficiency and sustainability of their buildings. They are also knowledgeable of other NYSERDA programs and financial incentives that can facilitate the process.

The NY-CHPS Design Guideline was developed in collaboration with the New York State Education Department (NYSED), the United States Green Building Council, the New Buildings Institute, Inc, Massachusetts-CHPS, Washington-CHPS, the Massachusetts Technology Collaborative, the Massachusetts School Building Authority, as well as 9 additional New York State associations. NY-CHPS is a state-of-the-art design guide incorporating many new enhancements with regard to indoor environmental quality, materials durability and operations and maintenance, and it was customized to apply specifically to New York State schools and NYSED priorities. The NY-CHPS Guidelines created by NYSERDA have been issued by NYSED for use by the state in February of 2007. Additional support was provided by the ESS Program to the City of New York, who developed their own design guideline, but included information from NY-CHPS.

PROGRAM PERFORMANCE

Some key program accomplishments include:

- Energy benchmarked 132 districts with 643 school buildings, including 60 million square feet and nearly 350,000 students.
- Six districts have received seven U.S. Environmental Protection Agency's ENERGY STAR Leader Awards, which is 12.5% of all Leader Awards in the nation; 23 individual schools have earned the ENERGY STAR Building Label.
- Developed four free Excel-based estimator and support tools that facilitate low-cost/no-cost improvements and best practices operations and maintenance.
- Developed a high performance design guideline, which has the potential to affect 4,400 school buildings and $4.5 billion in annual construction, titled *NY-CHPS*.
- Developed a free *High Performance School Design On-line Training* program, which has served almost 2,000 users.
- Implemented several training programs, which have served almost 700 people.

The program has produced significant, documented energy use reductions across the state of New York. Data analysis from the year 2000 to the present shows:

- Since 2000, K-12 schools in New York have improved their efficiency on average by 13%, without this improvement, statewide utility costs could have been as much as $75 million higher during 2006.
- A 100% improvement of EPA *Portfolio Manager* Score - from 21 to 42;
- A 19% decrease in heating fuel use;
- No increase in electricity use despite:
  - A 100% increase in average percent air conditioning, and
  - A 24% increase in number of PCs per student.
- An increase of only 28% in cost per square foot and 34% in cost per student despite:
  - An 82% increase in the price of natural gas,
  - A 60% increase in the price of fuel oil, and
  - A 7% increase in the price of electricity.

Comparing the average total energy consumed by schools during the first year of the benchmarking program with the average total energy consumed by schools during the most recent year, New York State schools have saved 564 million kBtu per year. Many individual districts in the database have reported savings on the scale of hundreds of thousands of dollars. Statewide, public K-12 schools energy costs are estimated to be over $700 million, with almost 20% of the state's population spending their days in a school as a student, faculty, or staff person. As the ESS Program continues to grow, there is no doubt that energy reductions will continue to improve.

LESSONS LEARNED

Through frequent and open communication between program managers, contractors, and school district customers, the Energy Smart Schools Program was able to grow flexibly to meet the ever-changing needs of the K-12 schools market sector. Over the years, the services of the program have been expanded and enhanced, and the operation of the program itself has been adjusted for maximum efficiency.

The knowledge of energy tracking and energy efficiency that the Energy Smart Schools training programs, tools, resources, and Benchmarking Reports provide will stay with the district officials and school personnel for years to come. Furthermore, permanent upgrades and adjustments to the operation and maintenance of school buildings have been performed as a result of the ESS Program.

In addition to the ESS Benchmarking Reports, the BOC courses have become well-known by K-12 schools building managers across the state. A number of facilities managers are now requesting more BOC courses and other trainings before they have even been scheduled. The 95% certification rate of BOC students demonstrates this training program's success.

Over the course of the program, many process improvements have been developed to make the benchmarking and student tracking process as efficient as possible. In the next several years, NYSERDA is exploring the possibility of working with the EPA to create a direct on-line connection between the ESS Benchmarking Program and the *Portfolio Manager* On-line

Benchmarking Tool. Although the benchmarking process is automated in many respects, it has maintained a flexibility that allows for personalized data collection and reporting to meet each district's specific needs. For example, one district submitted 13 years of data to the program. This district was given a more detailed set of reports and new graphs were created to allow for all years of data to be compared at once.

NY-CHPS and the High Performance School Design On-line Training are also incredibly successful, with the potential to affect approximately $4.5 billion in annual construction costs for public schools statewide. The free on-line training program has already been utilized by thousands of professionals in the fields of architecture and engineering, which expands each month. With the start of the new Energy Smart Schools Program, updates and expansions to the existing course modules will be made and more outreach will be done to promote the on-line training program. Based on the success of the NY-CHPS Guidelines, NYSERDA is also going to expand this material to include guidelines for existing buildings. NY-CHPS for existing buildings, or NY-CHPS EB, will be a focus of the new program. This planned guideline has the potential to affect over 3.1 million students, teachers and staff in over 4,400 public schools.

The success of the Energy Smart Schools Program has led NYSERDA to expand this sector based approach with the re-authorization of the System Benefits Charge Program in 2006 with the creation of the Energy Smart Focus Program. The Energy Smart Focus program is a sector-based service-delivery approach that will target five sectors: institutions (K-12 schools and state facilities), water and waste water, hospitality, commercial real estate, and industrial. Each sector will tailor its services for the specific needs of that sector, but general services will include: benchmarking, training, development of tools and resources, and technical assistance, which were all pioneered under the Energy Smart Schools Program.

PROGRAM AT A GLANCE

Program Name: Energy Smart Schools Program

Targeted Customer Segment: Public and private K-12 schools: administrators, facilities managers, energy managers, contractors and other stakeholders involved in design, construction and operation of school buildings and facilities.

Program Start Date: Late 1990s

Program Participants: Multiple services offered: 132 school districts with 643 buildings total have been benchmarked; on-line training program has reached almost 2000 users; in-person training programs have served almost 700 professionals.

Annual Energy Savings Achieved: 564 million kBtu per year

Peak Demand (Summer) Savings Achieved: Not available.

Other Measures of Program Results to Date: 226 students received Building Operator Certification training through ESS; projected savings from improvements they will enact are over 61 GWh of electricity and 65 million MMBtu of heating fuel lifetime savings.

Budget: $800,000 for 2006

Funding Sources: New York State systems benefits charge

Best Person to Contact for Information about the Program

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Higher Education Energy Efficiency Partnership
Pacific Gas & Electric
Southern California Edison
San Diego Gas & Electric
Southern California Gas Company
University of California, Office of the President
California State University Office of the Chancellor
California Community Colleges System Office

PROGRAM OVERVIEW

The University of California (UC) (10 campuses) and the California State University (CSU) (23 campuses) partnered with the four investor-owned utilities, Pacific Gas & Electric, Southern California Edison, Southern California Gas and San Diego Gas & Electric to create an innovative program in the 2004-2005 Energy Efficiency Program Cycle administered under the auspices of the California Public Utilities Commission (CPUC). This groundbreaking effort, renewed for 2006-2008 and extended to the California Community Colleges (CCC) (70 districts with 112 campuses) following a successful 2004-2005 Program Cycle, includes the following elements:

- Training and education;
- Energy efficiency retrofits, including:
  - lighting and controls,
  - HVAC systems, and
  - energy management controls;
- Monitoring-based commissioning (MBCx);
- New construction; and
- Engineering assistance for project identification and development.

Investor-owned utilities and campuses contribute personnel, resources, infrastructure, and technical, administrative and financial skills towards achieving the project goals, which for the 2006-2008 program cycle total 45 MW, 186 million kWh/yr, and 6.2 million therms/yr across the UC, CSU and CCC systems. Combined with the results from the 2004-05 program cycle, the program represents savings of approximately 50 MW, 226 million kWh/yr and 7.6 million therms/yr.

The program uses four key strategies: energy efficiency retrofits; emerging technology demonstrations; monitoring-based commissioning (MBCx); and training and education. Together, this multifaceted approach combines innovative technology, processes, and program management to deliver a comprehensive program with far-ranging impacts for California and beyond. The MBCx strategy is particularly innovative, and introduces the use of new and permanent metering and trending capabilities, combined with operator training, to identify

immediate energy use reduction opportunities and ensure long-term savings through the ongoing optimization of building operations. As a critical component of the program, hundreds of engineers, consultants, and campus facility staff have received hands-on training in both retro-commissioning and continuous commissioning using advanced metering and data visualization tools. The program is effectively transforming the California commissioning marketplace as many of these professionals have carried their knowledge and experience into other market sectors.

The roles and responsibilities of the collaborating organizations, along with the contractor for the program—Newcomb, Anderson, McCormick—are summarized below:

Investor Owned Utilities (PG&E, SCE, SCG, SDG&E):

- Administer Partnership program;
- Integrate Partnership into overall energy efficiency initiatives and ongoing programs;
- Contribute technical, financial and program expertise;
- Provide outreach to campuses with program information and monitor project implementation; and
- Ensure overall program energy savings goals are met.

University and College Staff (UC, CSU, CCC):

- Develop and implement projects,
- Provide project co-funding,
- Contribute technical, financial and program expertise,
- Integrate with internal sustainability and energy efficiency policy, and
- Demonstrate project success to enable additional funding both this cycle and beyond 2008.

Newcomb, Anderson, McCormick

- Provide overall program management, technical support and administration;
- Coordinate activities among the four IOUs and university partners;
- Create and facilitate program processes and documentation;
- Track projects and report results; and
- Lead partnership teams and committees.

PROGRAM PERFORMANCE

During the first cycle of 2004-2005, the partners exceeded their electric and gas savings goals for kW, kWh/year and therms/year by achieving 123%, 129% and 146% of the goals, respectively. This translates to achieved program savings of over 4.5 MW, 30 GWh/yr, and 1.4 million therms/yr. These results were verified on a campus level, rechecked through a technical due-diligence process by each utility, and will ultimately be confirmed by an independent measurement and verification process. Final independent measurement and evaluation reports for the 2004-05 program cycle are expected late 2007 (not available at publication time).

The partners also achieved significant additional savings from the training and education program. Among other impacts, the green building and new construction-related training courses improved the design of 98 UC buildings and saved an estimated $4.1 million in annual operating costs. The Partnership also reached thousands of students via the Alliance to Save Energy's very successful Green Campus Program, leading the way toward campus sustainability by bridging the divide between students and campus energy costs.

The overall program, including utility administrative costs, was held to a cost effectiveness threshold test as defined by the CPUC, which is based on acceptable total resource cost ratios applicable to programs funded with public-good dollars. As additional evidence of the program's cost effectiveness and energy savings, the CPUC approved the Higher Education Partnership programs for the current three-year program cycle. The overall program's funding levels have increased by more than a factor of seven, and energy savings goals have increased nearly ten-fold.

LESSONS LEARNED

The Energy Efficiency Partnership Program is an ambitious statewide endeavor, unprecedented in both scope and scale. It represents the first time that California's four IOUs—Pacific Gas and Electric Company, San Diego Gas & Electric, Southern California Edison, and Southern California Gas Company—have worked collaboratively with specific statewide partners, namely the UC, CSU and CCC systems, collectively representing 145 campuses. The program, which began with an initial two-year phase, has become the nation's most comprehensive energy efficiency program serving the higher education sector, designed and implemented to achieve sustained energy savings and to influence energy policy in the education sector nationwide.

One of the challenges met successfully by the program was merging participants from very different corporate cultures and backgrounds into working groups. Another key challenge met was equipping facility energy managers with the tools and expertise required to understand and utilize the controls and systems put in place in campus facilities.

In an extraordinary commitment to commissioning, half of the program's incentive money was dedicated to improving the operation of existing building and plant equipment in 2004-05. Over $5 million in public purpose funding and campus resources was invested in over 30 building commissioning projects and several plant commissioning projects on 25 campuses. An MBCx approach was employed, utilizing permanent metering and trending capability to identify energy use reduction opportunities and ensure persistence of savings.

The MBCx program includes installation of whole building metering, with sub-system metering in selected buildings, establishing baseline building energy use, installing permanent energy information systems to collect trend profiles on energy use and key HVAC points, using the trend data to identify energy saving opportunities, implementing the low/no cost measures immediately, and verifying the energy savings through the monitoring capability.

The Partnership has successfully publicized the success of the program through the development of case studies, papers, presentations and university-wide best-practice awards. Results of the Partnership's MBCx program have been reported in papers submitted to the 2006 and 2007 National Conference on Building Commissioning (NCBC), the 2006 American Council for Energy Efficient Economy (ACEEE) Summer Study, ACEEE's 2006 Market Transformation symposium and will also be presented at the 2007 USGBC Greenbuild conference. Case studies of successful MBCx projects have been developed for Partnership training and education classes, as well as statewide sustainability conferences, to directly disseminate lessons learned to the appropriate audience of facility managers and building engineers.

Just as the success of the 2004-05 program translated into a more ambitious program for 2006-08, the program partners expect the 2006-08 program to translate into an ongoing, high impact program for California's colleges and universities. The Higher Education Energy Efficiency Partnership is a proven and effective channel through which utilities can deliver energy savings.

PROGRAM AT A GLANCE

Program Name: Higher Education Energy Efficiency Partnership

Targeted Customer Segment: Non-residential education institutions

Program Start Date: 2004

Program Participants: 145 university, college (4-year) and community college campuses are involved.

Annual Energy Savings Achieved: 30 GWh/year and 1.4 million therms/year for 2004-5 program year.

Peak Demand (Summer) Savings Achieved: 4.5 MW

Other Measures of Program Results to Date: Accomplishments include 98 UC new building designs influenced by the program and 55 commissioning projects implemented.

Budget: $30 million in 2006

Funding Sources: The majority of program funding is provided by ratepayer public goods charges as administered by IOUs under the auspices of the CPUC**.** The campuses also provide additional project co-funding and in-kind labor contributions.

Best Persons to Contact for Information about the Program

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Universities and Colleges

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