

california state university at long beach

Largest California State University Campus Saves Millions with Energy Management

CAMPUS REDUCES ENERGY USE DESPITE GROWTH

Controlling Energy Costs Campus-Wide

California State University at Long Beach (CSULB) is home to more than 35,000 students. The largest campus within the 23-campus California State University system, it is composed of 87 buildings, totaling almost 4.3 million sq. ft. of building space — 3.8 million sq. ft. of which is conditioned and occupied space. The university has its own electrical distribution system which receives 66 kV transmission service from local utility Southern California Edison. Interestingly enough, CSULB can take advantage of California direct access regulations to purchase its electric supply directly from an energy service provider. CSULB has combined electric and gas expenditures of nearly \$5.2 million. Electric cost is \$1.06 per sq. ft., with total energy usage of 77,000 BTUs per sq. ft. each year. CSULB receives funding from the State of California General Fund; however, it does not receive additional funding unless campus square footage increases. As a result, energy crisis market conditions, rising electric rates and increased student enrollment all work against CSULB's facilities department operating budget.

"EEM Suite provided a means for us to utilize the existing technology and not re-invent the wheel... Easy integration and quick implementation meant we didn't have to wait several months before seeing its benefits or the benefits of the investments we've made in efficient equipment upgrades."

- *Tim Ball
Associate Director
Facility Management
California State
University at Long
Beach*

The energy shortage in California, rising rates and the desire to operate more efficiently prompted the campus to review its energy management strategy. Aware of market conditions, the campus saw the opportunity to decrease energy consumption and improve its operations using real-time data. The university had already invested in energy- saving operational improvements and now wanted to track how these changes impacted usage and costs. Furthermore, CSULB had been participating in and benefiting from energy contracts that required demand reduction activities. For 10 years prior to the California energy crisis, these curtailment events had been initiated about two times. However, during the winter of 2000-2001, curtailment events were enacted 31 times. As California's energy crisis began, CSULB quickly recognized that the use and enforcement of demand reduction programs was about to begin. The campus was tasked with developing a plan that enabled CSULB to avoid substantial penalties by complying with contractual demand-reduction commitments. With total electric expenditures in 2002-2003 of nearly \$5.2 million, CSULB definitely needed an effective way to manage its financial and energy operations.

Since the university did not have a centralized energy reporting and analysis system in place, it became critical for CSULB to have real- time information so it could make decisions about energy consumption with only a moment's notice. CSULB's common building controls system, present in 95 percent of its facilities, was collecting over 99,000 data points. The university could gather data about each building's infrastructure but did not have the analytical tools to view energy information at any level. What was needed was a method to integrate an existing building automation system into a new electric distribution system strategy. Simply

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put, the university needed a way to capture interval energy data gathered through its digital building controls system and effectively use it to manage financial and operational needs.

It also required real-time data to participate in and monitor demand-reduction program compliance. Although metering had been installed on all transformers, no campus-wide Ethernet existed in the meters for linking meter points together. As a result, information was multiplexed through the building automation system. CSULB needed an energy management application that could interface to existing capital investments and capture real-time interval data — one that could apply energy consumption information, operational monitoring and verification, benchmarking and procurement analyses to effectively manage its own energy use.

Enterprise Energy Management from McKinstry

After careful consideration, an enterprise energy management (EEM) solution from McKinstry was implemented at CSULB prior to California's energy crisis and demand reduction events. As part of the system, McKinstry designed and implemented a standard Modbus gateway to capture the energy information from the existing control systems. This system interfaced to the existing building automation system and the new distributed electric metering scheme so the university could accurately monitor, verify, analyze, and benchmark its energy and procurement operations. To make the deadline, CSULB had to gather load profiles for all facilities; develop forecasts and demand reduction strategies; manage the usage demand for disparate sites across campus from remote locations and devices; and be ready within two months of installation for actual demand reduction events. The EEM system also had to allow bill comparison and demonstrate event participation so CSULB could verify it was appropriately compensated for its compliance during reduction events.

After installation was complete in August 2000, Tim Ball, the university's associate director of facility management, engaged in load profiling and benchmarking activities for all 87 campus buildings. The strategy involved developing a campus load reduction plan that would meet demand reduction contract commitments. The winter of 2000–2001 brought 31 California Independent System Operator Stage 2 Alerts requiring CSULB to employ curtailment and peak demand management actions. Using the real-time energy information and predetermined rapid-response plans for the campus, Ball was able to comply with the demand reduction alerts and avoid more than \$1.5 million in penalties. Through pre-planning, baselining, benchmarking and verifying demand reduction activities for each building and the total campus, CSULB had a three-stage operational plan in place for responding to demand reduction events. At the height of some Stage 3 Alerts, CSULB was able to drop its load 9 MW and achieve its 3 MW service level commitment. Using EEM system tools, operators could initiate campus reduction plans, monitor their demand reduction performance, and verify and audit their actions with service providers.

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More Than \$2.5 Million In Savings

“Real-time monitoring with EEM has resulted in a well-informed community and immediate participation in all energy initiatives and programs,” says Tim Ball. For example, he holds regular meetings with campus occupants in various areas to build a greater awareness of energy use, show results of their energy performance, and promote new initiatives. These activities have resulted in good-spirited competition between campus buildings. Campus-wide access to Web reporting allows users to view bar charts comparing each building’s usage and demand performance.

CSULB realizes that general funding to pay for electricity is static. The university must meet energy performance measures and conservation efforts because overrunning electric budgets would result in tapping academic budgets to cover utility bills. This raised campus awareness of best practices.

Behavior changes resulted in saving energy consumption equivalent to \$446,000 in cost avoidance during 2001-2002. In fact, by using building load profiles, baselines and cost per sq. ft. analyses, CSULB can even calculate and charge for activities that are non-general fund uses of campus facilities to ensure proper reimbursement to the general fund for these uses. Department and building managers now consult with the Facilities Management group to calculate appropriate rents and charges for use of their space.

CSULB uses McKinstry’s EEM solution to benchmark before and after performance for all energy programs. Over the past seven years, CSULB has invested approximately \$15 million in energy conservation programs and efficiency improvements such as variable speed frequency drives, lighting retrofits, and high efficiency motors. McKinstry’s EEM solution was used as proof for measurement and verification purposes to obtain incentives on a lighting retrofit project and to demonstrate the required project savings. With EEM, CSULB’s Facility Management department has achieved more stringent energy efficiency standards in its new buildings than California’s Title 24 Energy Efficiency Occupancy Ratings.

Total electric consumption at California State University Long Beach has remained at a constant average of approximately 50,000,000 kWh, even with 28 percent growth in campus population and an additional 200,000 sq. ft. of conditioned and occupied space. This reflects the increased awareness and success of the energy conservation programs, retro-commissioning of buildings with efficiency projects, and improved efficiency standards on new construction. This has been especially important because CSULB’s electric rates have escalated from 5.9 cents per kWh to 10.9 cents per kWh since California’s energy crisis. Using EEM’s demand management and monitoring tools, CSULB has avoided \$2.2 million in energy expenses and penalty charges.

The university continues to partake in demand management programs and negotiate rates based upon its demonstrated load reduction capabilities. CSULB is now able to curtail use and reduce costs during peak demand, prevent billing errors, and measure the performance of equipment upgrades. The university’s total energy usage is 77,000 BTUs per sq. ft. each year. In contrast, the national average for

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similar institutions is 175,000 BTUs per sq. ft. each year. CSULB also ranks lower than the California and Pacific region averages of 105,000 and 144,000 respectively.

CSULB's on-going procurement activity has greatly benefited from implementing an McKinstry energy management system because the university can now manage its overall risks. It can also manage its demand components resulting in preferential contracts for energy supply. CSULB's ability to further participate in utility demand reduction programs provides the campus with monthly capacity rebates. Rising costs are now being mitigated with the use of real-time energy management information. In addition, CSULB can contract for energy supplies with very tight load profile band-widths that improve its pricing. The university can also use EEM to demonstrate capability and past performance results to take advantage of demand management programs and tariffs.

Demand-Based Pricing, Cogeneration, And More

Eventually, CSULB plans to add infrastructure to accommodate demand-based pricing for electricity and gas. CSULB will be able to use McKinstry's EEM technology to effectively manage energy usage at a new cogeneration facility it is considering building. The university plans to continue investing in additional energy-efficient equipment upgrades and using McKinstry's EEM reporting features to verify the effectiveness of these operational improvements.

ABOUT MCKINSTRY

McKinstry is a full-service, design-build-operate-and-maintain (DBOM) firm specializing in consulting, construction, energy and facility services. Our innovative, integrated delivery methodology provides clients with a single point of accountability that drives waste, cost, time, and redundancy out of the design/build process. We employ over 1,600 professional staff and trades people throughout the Pacific Northwest, Rocky Mountains, West, Midwest, and Southwest regions of the United States with operations in more than 15 states. McKinstry advocates collaborative and sustainable solutions designed to ensure occupant comfort, improve systems efficiency, reduce facility operational costs, and ultimately optimize profitability for "The Life of Your Building."

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