

## **Enterprise Energy Management Solution**

### **Opportunity**

#### *Controlling Energy Costs Campuswide*

University of California, Santa Barbara, is home to more than 22,000 students. The UCSB campus is composed of 300 buildings, totaling 5 million sq. ft. of building space—3.2 million sq. ft. of which are core, state-funded facilities. The university has its own electrical distribution system which receives 66 kV transmission service from local utility Southern California Edison. Interestingly enough, UCSB can take advantage of California direct access regulations to purchase its electric commodity supply. UCSB had a total electric spend of \$5.87 million for its core facilities in 2002-2003. Electric cost is \$1.84 per sq. ft., with electric consumption totaling 62 million kWh.

The UCSB campus is divided into four zones. Each zone has a manager responsible for the operational status of that specific area. Initially, the UCSB energy management system consisted of a centralized building controls system from Johnson Controls. This building controls system had workstations at the energy facility central office and in several buildings throughout campus. It offers real-time data and time-series reports for monitored points, and control system operational settings. However, its building control system does not have a Web interface or the capability to provide energy analytics, profiling, baselines, and trend reporting.

UCSB Energy Manager, Jim Dewey, became the university's new energy manager in 2000 just prior to the

California energy crisis. Jim is responsible for the university's energy program. Since UCSB did not have a centralized energy reporting and analysis system in place, it quickly became critical to develop an aggressive energy strategy for the university. Jim's primary goal was to purchase an enterprise energy management system so he could monitor and analyze the entire campus, and then develop an overall energy management plan. There was also a need to participate in the Independent System Operator's (ISO) Demand Response Programs.

To offset some of UCSB's investment in an enterprise energy management system, Jim seized an opportunity to use state funding. To qualify for CEC Senate Bill 5X (public) funding, the university had to demonstrate its ability to reduce electric demand and verify its performance. While the university had a building controls system in place, it required additional energy information to develop demand reduction strategies and monitoring for compliance. In truth, the university needed a Web-based energy analysis solution to monitor whole building and total campus energy usage so it could successfully participate in contracted energy demand reduction programs and conservation initiatives.

### **Solution**

#### *Solution*

#### *An Enterprise Energy Management Solution from Itron*

Without a centralized energy reporting and analysis system in place, UCSB did not have the tools it needed to properly view energy information campuswide.



Knowledge to Shape Your Future

“The ability to view an entire campus’ energy usage sounds fundamental in a time when there is an energy crisis and you see your gas rates skyrocketing from \$0.30/therm to \$1.60/therm. Unfortunately, we didn’t have the right tools to manage our utilities. My immediate goal was to capture real-time interval data and interface with our building controls system.”

– Jim Dewey  
Energy Manager  
University of California,  
Santa Barbara

The university needed real-time energy data to participate in and monitor its demand-reduction program compliance. After careful consideration, UCSB installed a Web-based, enterprise energy management (EEM) system from Itron in June 2001 to efficiently monitor and analyze the university’s energy use, and to participate in an energy conservation project.

EEM Suite was installed on a central server within the Facilities Management group, and interfaced to the university’s centralized building controls system, Johnson Controls Metasys. UCSB also invested approximately \$50,000 in an additional 30 electric and 20 gas metering points which are integrated into both the campus building controls and EEM systems. EEM Suite has the ability to send control signals via the Internet to the building controls system to initiate various demand reduction strategies when the CA-ISO or a local utility calls for demand reduction events. By successfully demonstrating response and reduction capability, UCSB received \$226,000 in public funding to help offset the investment in EEM Suite, along with additional metering, installation, and maintenance requirements.

#### *UCSB Reduces Average Peak Demand by 20 Percent*

UCSB uses EEM Suite to benchmark, index, trend, and conduct performance baseline reporting to analyze its energy activities and cost data. For procurement purposes, Facilities Management uses

EEM Suite energy cost analytics to evaluate results of specific actions and to review contracted utility and energy supplier programs such as Demand Reduction Programs. For example, Facility Manager Ken Hermann can monitor buildings, campus zones and total campus energy activities daily, and then compare the data to information benchmarks and expected performance measures. Energy Manager Jim Dewey uses the energy management software to create baselines and investigate reduction activities for all campus facilities. Quantifying the various activities and actions that reduced demand for each building gave Jim the ability to develop demand reduction response scenarios that ensured the campus would achieve its 1 MW load reduction commitment. By fully participating in demand reduction programs, UCSB received \$77,000 for its involvement in California’s ISO Summer 2001 Demand Relief Program. UCSB has benefited in subsequent years by continued participation in demand management programs with electric utilities and suppliers. Better information and insight into the campus’ total peak summer demand enabled UCSB to make permanent operating changes. As a result, UCSB has reduced the university’s average peak demand 20 percent from 14,800 kW in 2001 to 11,731 kW in 2003.

“Operational changes and potential energy-saving projects are continually being investigated because of the daily routines of the energy and facility manager,” Jim explained. “Ownership of EEM Suite is key. Someone has to

use the information daily and become intimately familiar with the primary energy users, and instinctively know when and where there is an aberration.” The university’s energy and facility managers use the energy management analytics, reports, alarms, and graphs daily. For example, Ken Hermann communicates with campus zone managers who are responsible for system operations and troubleshooting buildings in their respective zone. Zone managers have access to the building controls system but they don’t see a building’s actual load profile compared to its benchmark. Energy and facility managers, on the other hand, can spot irregular activities using interval energy patterns and reports.

#### *EEM Suite Drives Energy-Saving Practices*

In a recent budget meeting, Jim Dewey was given a utility reduction goal. Because of EEM Suite, and the total campus energy profiling and baseline studies that have been captured for two years, Jim was able to present a plan that achieved the budget reduction goal in just one hour. Jim’s plan showed exactly what steps the buildings and departments would require, and most importantly, he could advise the university on the expected outcome by following the outlined cost-saving measures.

According to UCSB energy and facility managers, Itron’s EEM Suite has become invaluable for current energy projects and monitoring energy policy

results. Energy managers use EEM Suite’s indexing and benchmarking reports to identify energy-intensive buildings. They also use scatter plots to see the correlation between outside air temperatures, and natural gas and chilled water consumption. Knowing the building patterns and expected behavior helps energy managers forecast energy use and develop action plans to meet contractual obligations. In brief, EEM Suite use has grown from occasional load shedding activities to daily energy management practices, including planning and monitoring larger conservation initiatives and building retro-commissioning projects.

## benefits

### Benefits

#### *EEM Key Benefits*

- Decreased total campus energy consumption by 1 million kWh (2002-2003)
- Saved \$590,000 in electric costs during first year of use
- Lowered total annual electric usage by 24 percent (1998 to 2002)
- Reduced natural gas usage by 27 percent since 1999
- 2001 total Energy Use Intensity (EUI) at 111,000 Btus per sq. ft. (electric & gas)
- Average summer peak demand reduced 20 percent from 14,800 kW to 11,730 kW



Knowledge to Shape Your Future

“Ownership of EEM Suite is key. Someone has to use the information daily and become intimately familiar with the primary energy users, and instinctively know when and where there is an aberration.”

– Jim Dewey  
Energy Manager  
University of California,  
Santa Barbara

### *UCSB Saves \$590,000 in Electric Costs during First Year*

From 1998 to 2002 the university added 112,400 sq. ft. of conditioned space. During this period the university has managed to lower its total annual electric usage by 24 percent. UCSB has also reduced its natural gas usage by 27 percent since 1999 despite rates tripling during that period. In the past year, a new, highly energy-intensive 80,000 sq. ft. research building was completed yet UCSB still managed to reduce its total campus energy consumption by 1 million kWh. During the first year of implementation, the university saved a total of \$590,000 in electric cost, half of which Jim attributes to optimizing energy operations. In fact, system payback was less than one year.

EEM Suite has allowed UCSB to evaluate several demand relief scenarios and develop demand reduction strategies to comply with California-ISO curtailment events. For example, the university had a two-stage approach for achieving any requested level of demand curtailment participation. The first scenario involved building occupant and behavior activities such as turning off lighting and unused equipment, and enabling energy-saving modes on electronic office equipment and computers. This effort alone achieved a 730 kW load reduction. The second stage involved actions the facility operation staff could initiate such as load shedding on the virtual chilled water loop, curtailing chiller loads and boilers, and limiting air volumes

on VAV air handlers resulting in another 1090 kW load reduction. Because UCSB preplanned these activities, they were ready when the CA-ISO called a demand curtailment event July 3, 2001—successfully participating in and achieving a 629 kW demand reduction.

Facility, zone and total campus baseline reporting and daily monitoring activities are essential in preparing demand reduction strategies. This same knowledge and information is especially important when the university is preparing budgets or reacting to cost issues. With EEM Suite, UCSB has the necessary tools and energy information to manage consumption, improve building efficiencies and perform contract risk management.

### **UCSB Uses EEM Suite to Improve Energy Operations in Major Campus Buildings**

#### *Chemistry Building Changes Policy and Occupant Behaviors*

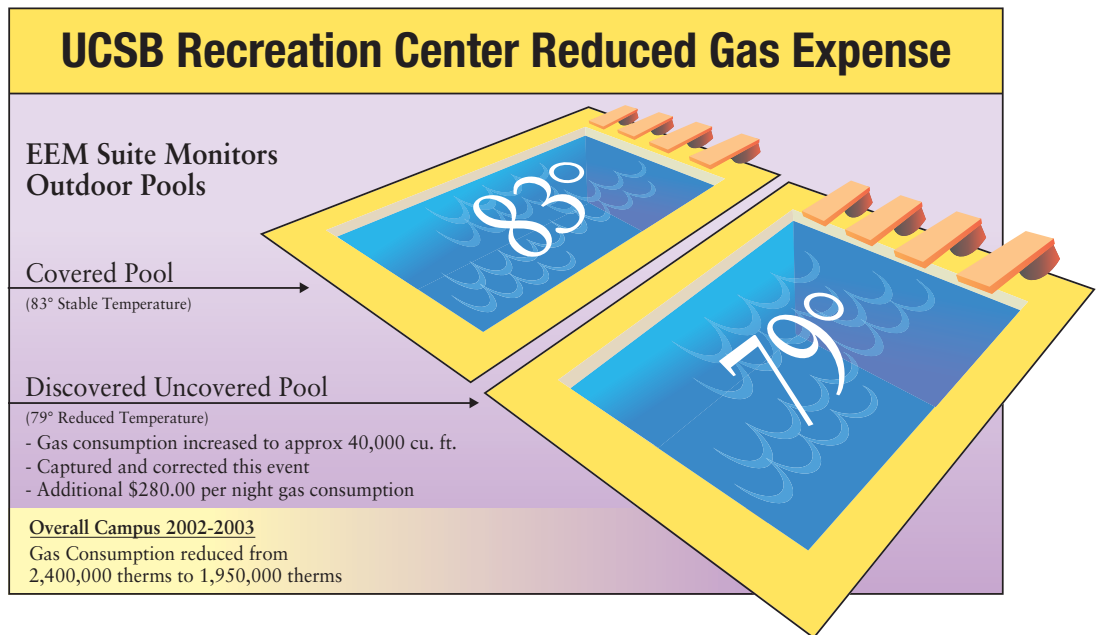
Ken Hermann, Facility Manager, reviews campus energy use everyday. He recognized consistently high electric use and demand in the Chemistry Building after normal classroom hours and continuing throughout the night. After investigating, Ken found that fume hood sashes were left open at night when not in use. Using EEM Suite's monitoring and load profiling features, a series of tests were performed with all the fume hoods in different positions from 100 percent open to 100 percent closed. Tests determined the average fume hood position was

30 percent open at night when students were not in the labs and no experiments were being conducted. As a result of these findings, the university initiated new practices and posted signs reminding users to close the fume hood sashes. The ability to show cause-and-effect relationships in building load profiles helped Jim Dewey, Energy Manager, to engage department leaders to change behaviors and policy in their building.

*Physical Science Building Achieves \$33,500 in Annual Energy Cost Savings*

When the Physical Science Building was interfaced to EEM Suite in 2001, the energy manager and facility manager noticed the building's electricity load profile was consistently flat. They

knew the Physical Science Building was equipped with a control system capable of running multiple schedules and strategies for optimal equipment operation and maintaining building conditions. This particular building requires 100 percent outside air flow, which translates to a high energy-intensity index. However, this building is not occupied 24-hours-a-day. The facility manager discovered that the nighttime setback strategy had been disabled. After consulting with the building operations staff, the fan operation speed was reduced to 50 percent between midnight and 7 a.m. This change resulted in dropping the building's energy profile from 465 kW to 235 kW for eight hours each day. The 230 kW reduction equates to a savings of 1840 kWh per day—approximately \$92 per day,



Knowledge to Shape Your Future

\$33,500 annualized. This is especially important now that the university's electric rate has increased 50 percent to 9.6¢ per kWh in 2002-2003.

*Recreation Center Reduces Gas Consumption; Expenses Dropped By \$487,000*

The UCSB Recreation Center has two outdoor pools that can be monitored using EEM Suite. Energy staff trend correlations between the outside air and water temperatures. One day in March, the facility manager noticed unusually high gas consumption while the outside air temperature remained constant the previous few days. On the same day, the water temperature in one of the pools also dropped from 83°F to 79°F. These events triggered an investigation that found one of the pools had gone uncovered. Because of excessive heat loss, gas consumption increased to approximately 40,000 cu. ft., costing

about \$280 per night. By monitoring, capturing and correcting events like this campuswide, UCSB has been able to reduce its gas consumption from 2,400,000 therms in 2002 to 1,950,000 therms in 2003. The university has also seen its gas expenses reduced by \$487,000.

## future applications

### Future Applications

The University of California, Santa Barbara, continues to add new building and operating data into its EEM system while incorporating more comprehensive metering into its old buildings. The university also plans to generate billing information for each of its campus buildings. Looking forward, UCSB remains firm in its commitment to use Itron technology to properly manage its campuswide energy usage.

## University of California, Santa Barbara, Saves \$590,000 in Electric Costs in First Year of EEM System Implementation

### executive summary

#### Executive Summary

University of California, Santa Barbara, selected an Enterprise Energy Management (EEM) solution from Itron as the California energy crisis highlighted the inability in current practices to proactively manage energy. There was no centralized energy reporting and analysis system in place and no analytical tools to view energy information at any level. By implementing EEM Suite, UCSB was able to deploy effective operational and analytical management solutions for 300 buildings through real-time energy consumption information, profiling, performance monitoring, baseline and trend reporting, benchmarking, operational monitoring and verification, demand management, and procurement analyses processes.

EEM Suite enabled UCSB to save \$590,000 in electric cost alone during the first year of system implementation. In addition, the university has reduced its total energy consumption by 1 million kWh. The university's ability to manage its operations efficiently demonstrates the advantage of using a single enterprise energy management solution to effectively link together disparate business processes. With Itron's EEM Suite, UCSB now has the necessary tools and

energy information to manage consumption, improve building efficiencies and perform contract risk management.

#### University of California, Santa Barbara Profile

- 5 million sq. ft. total space; including non-state funded space
- 3.2 million sq. ft. of core, state-funded facilities
- 300 buildings (50 large)
- 22,000 students
- 66 kV main campus electric supply
- \$5.87 million total electric spend for core facilities in 2002-2003
- \$1.87 million total gas spend 2002-2003
- \$1.84 electric cost per sq. ft. for core facilities
- 62 million kWh total electric consumption 2002-2003

#### Achievements

- Reduced total energy consumption by 1 million kWh
- Saved 9.9% of total electric spend during the first year



Knowledge to Shape Your Future

Publication 100469CS-01  
04/05