2009 SACUBO BEST PRACTICES ENTRY: PEOPLE-ORIENTED ENERGY CONSERVATION

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Abstract

The Oklahoma State University System (OSU) is committed to a land-grant mission of research, instruction and extension. Each year brings new budget challenges. In particular, state appropriations continue to shrink year after year, resulting in a corresponding rise in tuition rates. Another challenge faced is an increase in utility demand, resulting from campus growth and reliance on technology. This has put a strain on existing utility systems which are reaching near capacity. Planned growth has already necessitated a $4 million project to double the chilled water plant capacity, placing further strain on the institution's budget. Additionally, utility rates for OSU's main and branch campuses as a whole have increased.

In an era of ever-increasing budget needs and concern for preservation of natural resources, OSU determined to take a leadership position in higher education energy conservation by opting to initiate a behaviorally-based energy conservation program for all campuses in the OSU System. Several K-12 school districts have had success with this type of program, but OSU is the first higher education institution to adapt the program to address the challenging and complex university environment. This people-oriented initiative requires no capital investment, and is not only self-funding from the start, but preserves funds for educational purposes. OSU strives to be a model of thoughtful stewardship through energy management and conservation, not only for the benefit of taxpayer and student's tuition dollars, but also for preservation of natural resources and the environment.

Following system-wide implementation, the program is achieving up to 25% savings and is on target to reach an expected $22 million net savings over seven years. OSU is currently outpacing projected net savings by 45%, with results from January to June, 2008, achieving $2.26 million gross savings and $1.28 million net savings. The savings generated from this program will eliminate the need for additional monetary resources to provide utilities to over $180 million in academic construction projects currently underway.

Introduction of the Organization

Oklahoma State University is a public land-grant institution established in 1890 as a result of the Morrill Act. OSU has more than 32,000 students across its System and more than 19,000 on the Stillwater campus, with students from all 50 states and 120 nations.

A large comprehensive university and Oklahoma's first Truman Honor Institution, OSU has more than 350 undergraduate and graduate degrees and options within nine different colleges as well as professional degree programs in medicine and veterinary medicine. The OSU System has five campuses across the state and a presence in all 77 Oklahoma counties through the OSU Cooperative Extension Service.

The main campus is located in Stillwater, located in north-central Oklahoma with a population of more than 47,000. Stillwater is located approximately 60 miles from both Oklahoma City and Tulsa, the state's two largest metropolitan areas. The Stillwater campus includes the general university, the Agriculture Extension Service, the Agriculture Research Division and the College of Veterinary Medicine.

OSU has four branch campuses, two of which are located in Tulsa, OSU-Tulsa and the OSU Center for Health Sciences and College of Osteopathic Medicine, OSU-Oklahoma City located in Oklahoma City and the OSU Institute of Technology is located in Okmulgee.

OSU has a bold vision of enhancing its reputation as a modern land-grant institution, one that remains true to its land-grant mission of research, instruction and extension, while cutting across disciplines to form a structure that better prepares students for a new world.

Statement (restatement) of the Problem/Initiative

The state's appropriation for the university budget has decreased over the last 8 years. In FY02 state appropriations made up 58% of OSU's budget, tuition and fees comprised 28%, and the remaining 14% came from other sources. Compare that to FY09, when state appropriations shrank to 40.6%, tuition and fees contributed 47.9% and 11.5% came from other sources. The decrease in state appropriations resulted in a corresponding increase in tuition and fees.

Another challenge was an increase in utility demand resulting from campus growth. This has put a strain on OSU's existing utility systems, which are near capacity. OSU currently has $180 million in construction projects underway, with another $150 million planned over the next five years. Planned growth has already necessitated a $4 million project to double the capacity of our west chilled water plant, placing additional strain on our budget. Utility rates for OSU's main and branch campuses as a whole have steadily increased, which necessitated a reduction in use to keep costs under control.

Additionally, OSU embarked on a journey to develop a sustainable campus in order to minimize the environmental impact of day-to-day operations. The principles of sustainability integrate three closely interlinked elements—the environment, the economy, and the social system—into a program that can be maintained in a healthy state indefinitely. Our students, faculty and staff were eager to see OSU progress as a leader in this area since our land grant mission requires good environmental stewardship. Energy savings could be directly linked to reductions in our carbon footprint, thereby lessening our impact on the environment.

To address these financial and sustainability issues, OSU decided to target significant financial and environmental savings in utility expenses, one of the single largest line items in the budget.

With limited budget for equipment upgrades and rising utility demands and rates, university officials recognized the only way to rein in the utilities budget line was to control energy consumption.

With the firm belief that “buildings don’t use energy people do,” university leadership opted to implement a customized version of a people-oriented, non capital investment, behavioral-based energy conservation program that would involve participation and buy-in from every person at every OSU campus.

“We want to always do whatever we can to wisely use our financial and natural resources throughout the OSU System. Energy is, of course, a major cost item. We believe this initiative could help contain energy costs and, at the same time, create a greater awareness of the importance of conservation,” said Joe Hall, Chairman of the OSU Board of Regents when the program was proposed.

Design

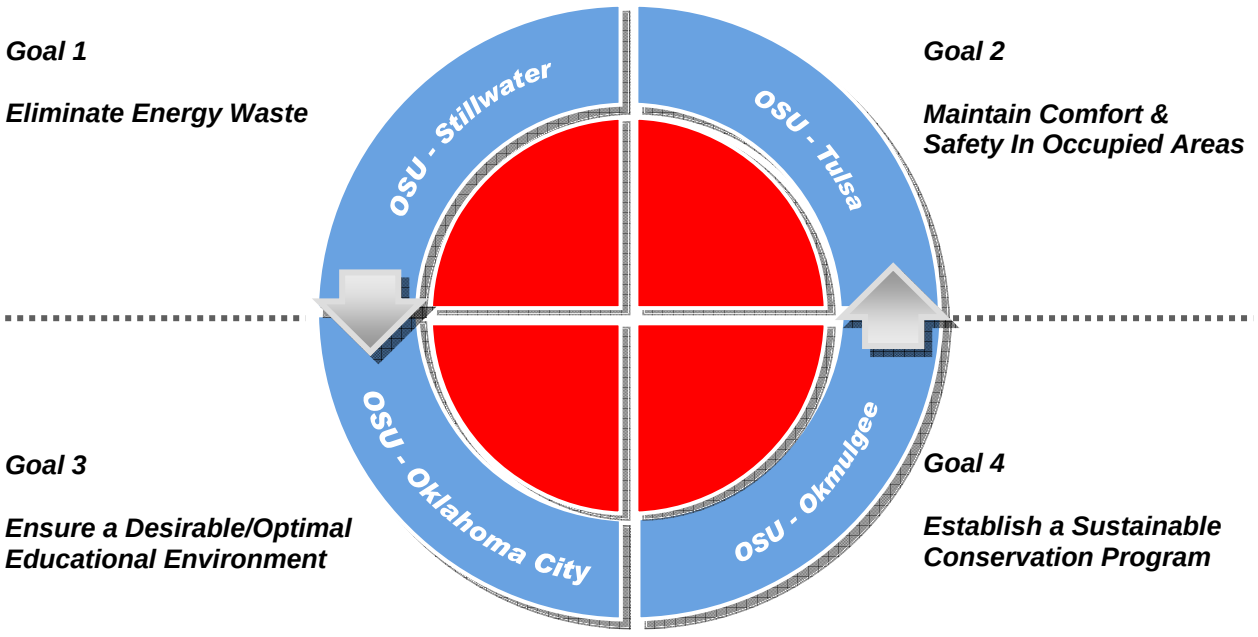
Recognizing the need to conserve energy and address the OSU community’s desire for a more sustainable campus, the OSU administration launched an innovative energy conservation program that would require no capital investment. This program would focus on changing human behavior to reduce energy consumption across the University System.

Up to now, most energy-savings efforts at colleges have focused on making capital investment mechanical changes, such as installing more efficient windows, light fixtures or HVAC systems. According to Dr. David Bosserman, OSU Vice President of Administration and Finance, “OSU's

new efforts focus on people's behaviors—where you can really save. If we don't do it, we're going to put more of a burden on students through tuition."

The first step was due diligence to find a partner to help develop and implement the program. After extensive research, Oklahoma State University Regents partnered with Energy Education, a national firm that had success with providing people-oriented energy conservation services to public school districts and large churches across the nation. Administration was confident the Energy Education program could be adapted to the university environment. The University President strongly communicated his support for the program and its mission to all campus groups.

OSU's conservation program was designed with four primary goals for all campuses:



1. Eliminate energy waste and significantly reduce the university's carbon footprint, which will result in net savings to the OSU System of $22 million over seven years.
2. Maintain comfort and safety in occupied areas with customized and dynamic building operational plans for each campus.
3. Ensure a desirable/optimal educational and research environment, developing a partnership with the campus community.
4. Establish a sustainable conservation program, to maximize the economic, environmental and social benefits of energy conservation.

The goals for the program were the same for each campus, and each campus followed the same process for implementation. This enabled the Energy Educator/Managers (EEMs) to tailor programs to meet the specific demands of each campus.

Primary leadership for the conservation program rested squarely with Physical Plant administration. The initial planning involved obtaining input on usage and occupancy patterns of each building from a variety of campus groups, including researchers whose projects must, in many cases, be maintained under climate-controlled conditions. Many hours of strategic planning and cooperation were invested to develop a solid foundation for the conservation program.

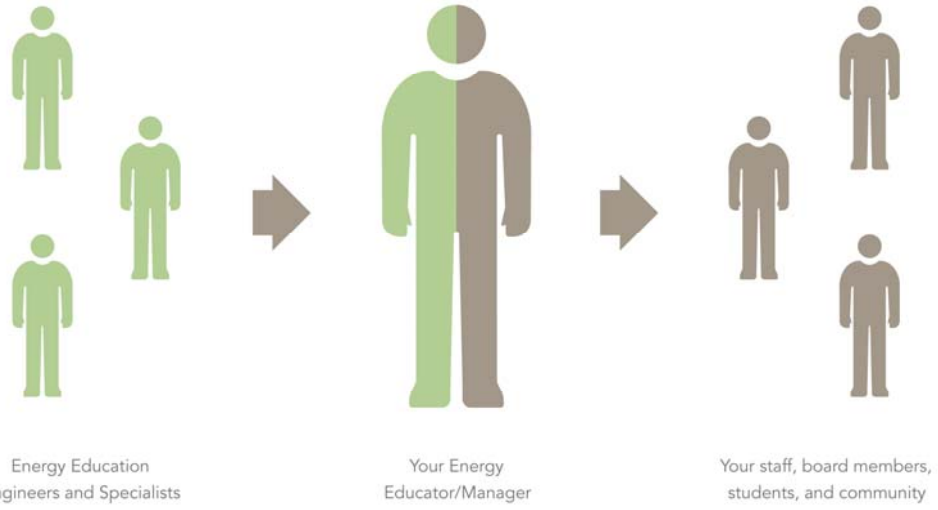
Physical Plant staff and Energy Education energy specialists reviewed university infrastructure, jointly auditing the largest cost centers (athletics, student union, library, research facilities and classrooms), building use patterns and analyzing energy use throughout the System. The team identified savings potential and noted specific opportunities for comprehensive energy consumption reduction. They reviewed existing and ongoing energy initiatives on all campuses

to look for synergies in other complementary projects. Together they created a process map of energy flows throughout the System to ensure consumption patterns were fully illustrated.

The Board of Regents and campus Presidents prepared and passed Energy Management Policy and Guidelines, the detailed guideposts for program implementation. The guidelines created a consistent definition of environmental conditions for occupied and unoccupied building spaces.

Through an aggressive public relations campaign, the program was systematically introduced to the OSU community, especially students, faculty, staff and research leaders. Administrators for the university's research facilities were specifically targeted to protect ongoing research projects. A variety of communications methods were used to publicize the effort to include press releases, student newspaper articles and presentations to specific group meetings (Student Government Association, Residence Hall Association, Faculty Council, etc). Additionally, an energy management page was created on the OSU System Website.

The cornerstones of the program are the EEMs who are part of the Physical Plant team. The EEMs worked closely with Energy Education's energy specialists to create strategic site plans for each building to preserve and maintain comfort for the educational environment as well as to ensure protection of research projects. The EEMs were responsible for implementing the site plans, and communicating, educating and motivating each person in the OSU community to do his or her part in conserving energy when possible.



EEMs conduct period audits of buildings to check occupancy patterns and operation of HVAC equipment. Once the occupancy patterns were documented, the building systems were adjusted accordingly to provide heat or cooling only during occupied times. During unoccupied times, building systems were either adjusted to let building temperatures rise in the summer months (and fall in the winter months) outside of normal personal comfort ranges, or the systems would be shut down. Special attention was paid to keeping appropriate temperature and humidity levels in each building to prevent damage to the building systems and to prevent mold growth. Research areas that required specific environmental conditions were also considered and building systems were adjusted accordingly. Additionally, all occupants were asked to turn off all electricity consuming equipment: computers, printers, speakers, etc.

Implementation

Energy Education's program is based on two very significant elements. The first element includes savings recommendations specific to the university environment and organizational

behavior, which are based on the results of a survey conducted by Energy Education personnel. During the survey, Energy Education looks at the complex and unique university environment and documents potential savings areas for process implementation.

The second element, Energy Education's Transformational Energy Management Process™, is a powerful, complex implementation method involving four very specific and incredibly involved components.

Assessment + Planning:

The EEMs continually perform audits, assessing building heating, ventilation and air conditioning (HVAC) Systems, water and sewer use, and building use patterns. They develop Strategic Site Plans identifying priorities, savings opportunities, points of responsibility, optimized building scheduling profiles, implementation strategies, and other elements critical to successful implementation and changing energy conservation behavior. The EEMs place data loggers strategically to record building temperatures, humidity levels and HVAC performance and then analyze the data collected to build an operation plan to match the occupancy pattern of the building.

Coordination + Communication:

Implementing a people-based energy savings program involves more than just sending out announcements. In a decentralized and complex campus environment that supports people with very different backgrounds, areas of focus, personal concerns, levels of education, personalities, preferences, and so forth, coordination and communication efforts are exponentially more difficult. Coordination efforts must positively engage people providing constant reinforcement, generating customized messages on broad and individual levels,

employing printed, digital, and face-to-face communications, facilitating effective meetings, and much more. Maximizing savings requires that everyone who consumes energy be engaged in understanding how to save it.

OSU's President included information about the conservation program in his periodic messages to the OSU community. EEMs scheduled meetings with campus groups and met with the editorial board of the student newspaper, The O'Collegian. A monthly public relations' conference call was held with all campuses to maintain communication and coordinate efforts. Additionally, periodic meetings with appropriate Physical Plant personnel were also conducted to address repairs, adjustments and coordinate activities.

Leadership + Focus:

Executing an effective energy savings program that transforms organizational behavior requires daily focused effort and personnel who can make energy management a priority. OSU hired eight EEMs, energy conservation leaders who provide onsite leadership and education for the energy program. Energy Education energy specialists train the EEMs to be successful. This includes multiple onsite visits and hundreds of hours in on-the-job training over the entire contract period. Five EEMs are assigned to the Stillwater campus, and one each for the Oklahoma City, Okmulgee and Tulsa campuses.

Measurement + Verification:

One of the distinctions of the Energy Education program lies in the fact that the clients are responsible for measuring and verifying the program results. OSU uses EnergyCAP, a third-party software product that calculates energy savings using Department of Energy standards

and international protocols. EEMs input monthly usage data into the software and it adjusts for load changes, facility changes, differences in billing periods, and weather differences to ensure all reported savings are attributable to OSU's energy program. This approach to measurement and verification ensures full accountability and integrity.

OSU's EEMs employ data loggers to measure building temperatures and humidity, determining whether systems are operating as set, how long each building takes to recover from setbacks, and how various settings affect humidity.

Because OSU's central plant lacked the ability to measure energy use for all of its buildings individually, an extensive project was launched to install measuring equipment for the key high

cost centers. The Interval Data project provided the ability to quickly assess the affects of changes made by the EEMs and Physical Plant Personnel.

Benefits

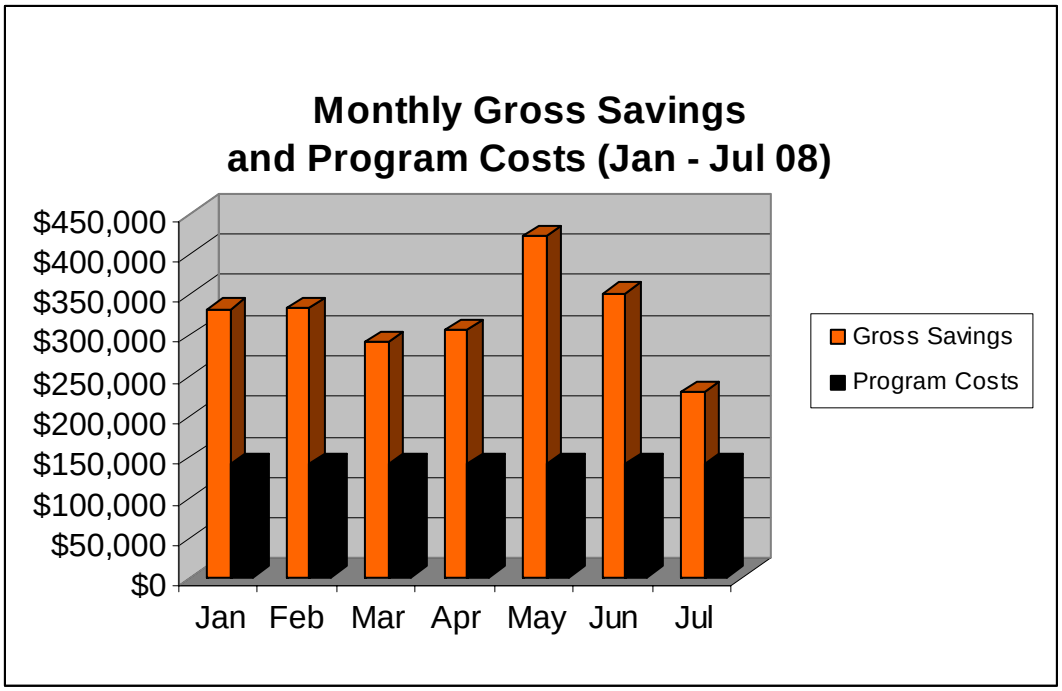
In the first contract savings year, OSU's people-oriented energy conservation program has returned financial and sustainability benefits to the university and the community it serves. Additionally, the program has had positive unintended results for the Physical Plant.

Financial: The program has already exceeded expectations. Actual gross savings was $2.26M over the first seven months compared to an anticipated gross savings of $1.86M. The savings were determined by comparing current energy consumption to the CY2006 baseline year consumption. The chart below shows the gross savings breakout for each campus as well as savings for the OSU System.

System Wide Savings (January 08 through July 08)

Campus	Dollar Savings	% Savings
OSU—Stillwater (Main Campus)	$1,774,633	16.9%
OSU—Oklahoma City (Branch)	123,434	22.5%
OSU—Tulsa (Branch)	144,295	22.8%
OSU—Center for Health Sciences	113,145	25.8%
OSUIT—Okmulgee (Branch)	104,262	12.8%
Total Savings (7 Months)	$2,259,769	17.3%

This is significant in light of the fact that the entire investment came from dollars already being spent on utility services. No new funds were dedicated to implementing the program. Net savings are also significant. Even after accounting for all program costs, OSU achieved a net savings of $1,276,502. The chart below shows monthly gross savings and program costs for the first seven months of the savings year.



Gross Savings:	$2,259,769
Program Costs:	$983,267
Net Savings:	$1,276,502

Sustainability Benefits: Environmental benefits are often stated in cars removed from the highway and trees planted. EnergyCAP uses calculations from the U.S. Department of Energy Environmental Protection Agency, with greenhouse gas factors for utility sources regionalized for accuracy. In seven months, the program had reduced energy consumption by 318,100 MMBTUs. This equates to a reduction in our carbon footprint by 23,731 metric tons of CO_2. To put this in simple terms, it is equivalent to removing 4,259 cars from the highways or planting and growing 606,982 pine trees for 10 years. Additionally, the program has built an increased spirit of cooperation, communication and a sense of doing something good for our environment by everyone on campus. Finally, individuals have reported that they have taken what they have learned on campus and implemented conservation ideas at home. Tasks as simple as turning off

lights and computers when not needed and correctly programming home thermostats are now saving dollars on home utility bills for students, faculty and staff.

Physical Plant Benefits: The EEMs are constantly on campus conducting audits, checking building systems and communicating with building occupants. They have become the "ambassadors of the Physical Plant." Customers relay concerns and potential maintenance issues directly to the EEMs who, in the case of critical maintenance issues, report them directly to the Action Desk for response. For non–critical issues, the EEMs educate the occupants on the procedure for contacting the Action Desk to submit a work request. Additionally, since the EEMs are checking buildings systems' operations, they are able to identify equipment malfunctions or errors that ultimately would result in excessive use of energy. Examples include valves stuck in the open position, thermostats that were not properly calibrated and building control systems that were set to provide cooling 24 hours a day to unoccupied buildings. All of these incidents are typically transparent to the customer and therefore would not have been readily identified if it weren't for the watchful eye of the EEMs.

Retrospect

In retrospect, after more than a year of preparation, training and program implementation, OSU realized that the team underestimated the amount of effort involved in changing the behavioral culture of an organization. Trust, especially, was essential to the program's successful implementation.

Winning the trust of special-interest groups among the university community—researchers who need controlled climates for laboratory projects, librarians who need to protect important documents, 24/7 operations such as the Veterinary Medicine Teaching Hospital, police facilities,

residential life and dining facilities, and information technology facilities that house the mainframe and component clusters—was important for program success. The team had to build relationships, spending enough time to convey their knowledge of implementing energy conservation in these critical areas without adversely impacting the individual missions.

At the same time, Physical Plant personnel needed guidance to adapt long-held operational practices to focus more closely on energy conservation. The energy specialists from Energy Education had to demonstrate expertise with implementing the conservation ideas while reassuring all constituencies of the campus that existing systems and environments would be protected.

OSU has blazed the higher education energy conservation trail for others to follow and stands ready to provide lessons-learned and implementation guidelines to any institution who decides to participate in this most worthwhile endeavor.