

# University of Central Missouri Undertakes Radical Energy-Efficiency Improvements

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When University of Central Missouri (UCM) president Aaron Podolefsky first revealed his vision for the physical future of the university during his State of the University address in August 2008, he likely did not know how much the university would be able to reduce its energy consumption and carbon footprint.

Now, advanced computer modeling indicates that proposed energy conservation measures will generate a 32 percent reduction in utility costs and greenhouse gas emissions. And to sweeten the deal even more, the university will be able to pay for the upgrades that will deliver the cost savings directly from those future savings.

Founded in 1871 as a teacher's college, UCM, in Warrensburg, Missouri, has more than 11,000 undergraduate and graduate students. The school is embarking on an unprecedented 24-month, \$36.1 million project that will radically reduce energy consumption and the university's carbon footprint, while making a significant improvement to the learning environment.

The improvements reflect the university's commitment to the sustainability of the environment and available resources.

UCM took a comprehensive approach to the process of improving its infrastructure—the heating, ventilation, and air conditioning, as well as other basic underlying systems that optimize the school's buildings—and to generating campuswide support for the improvement efforts.

At the start, UCM was looking for new ideas to address aging and outdated systems and to help meet commitments to reducing energy consumption and greenhouse gas emissions on campus.

UCM was not alone in its need to address aging infrastructure. One out of every two schools is updating its campus master plan to cope with issues such as increasing enrollment and aging facilities, according to *Capital Budgeting Practices in Public Higher Education* (APPA, 2006).

Going green is also becoming increasingly important for schools to attract students. Sixty-three percent of college applicants are looking for a green campus, according to the *Princeton Review* (2008).

“The energy service company (ESCO) agreement comes as a breath of fresh air to those wanting UCM to make monumental changes to its carbon footprint,” says Manny Abarca, a senior UCM political science major from Kansas City. He adds, “We need to change the way we have been living, as students, staff, and faculty, and make sustainability part of this new lifestyle where we no longer accept waste, no longer accept un-recyclable products, and most important no longer let others ruin our planet. It's time for a change, and I am proud to say that my university is a champion in sustainability.”

UCM followed best practices in its improvement approach, building a business case for the improvements, carefully researching the need and the best potential solutions, securing funding, and then creating support for the entire effort.

## University Leadership Plays Crucial Role

At UCM, the commitment to improvement was led from the highest levels of the administration. As a charter signatory of the American College and University Presidents Climate Commitment in 2007, Podolefsky had already agreed to creating a more sustainable campus environment.

## Tips for Success

Here are some tips to ensure success for a green initiative such as that undertaken by UCM.

- Identify your key stakeholder groups and keep them updated every step of the way. Make “no surprises” your motto when it comes to keeping stakeholders up-to-date.
- A strong leader is key to a successful infrastructure improvement process. Find someone at the administrative level who can build a team to see the project through while remaining involved start to finish.
- Make sure that team members in charge of scheduling do their homework before any improvements begin so that you can minimize interruptions on campus for students, staff, and faculty. Provide a very clear timeline for improvements for subcontractors and vendors, and insist that they meet the dates.

As a result, the university took the key step of aligning its green initiative with its vision and mission as a learning institution.

The second key leader was Dr. Betty Roberts, vice president for administration and finance. By staying in close communication with Podolefsky, Roberts and her staff led the university’s concentrated team effort to develop a comprehensive approach toward more efficient energy usage and a much improved learning and working environment.

### Audit Helps Build a Business Case

Roberts and her team started by conducting an in-depth audit to identify potential

infrastructure improvements and related savings and, ultimately, to implement the designated solutions. An audit uses historical utility data to evaluate operational savings for proposed energy conservation measures (ECMs).

The team collected and averaged three years of utility expenses to create a snapshot of annual utility use and to reflect seasonal changes and annual variance. They also conducted an operations and maintenance analysis, reviewing 12 months of repair and replacement work orders (including 30,000 line items) for the school’s classrooms.

The audit also included:

- An in-depth analysis of current operations and maintenance practices
- Feedback on classroom and building conditions from students, faculty, and staff
- A three-month on-site survey of existing buildings that identified additional energy and operational efficiency challenges and potential solutions

Once the available data were entered, the team used energy-modeling software approved by the U.S. Department of Energy to evaluate the benefits of potential improvements. The software re-created campus buildings in a simulated computer environment and identified the best potential systems to meet the school’s needs. This process resulted in 265 separate ECMs that the university could take to deliver significant energy cost savings.

Because modeling allows users to enter the utility rate structure information into the simulation, during the ECM selection process, the team was able to evaluate energy consumption costs for various ECMs and see how they interact as a whole to create energy, operations, and maintenance savings.

Based on the audit, the team created a business case showing that proposed ECMs would generate a 32 percent reduction in

utility costs and greenhouse gas emissions. The business case demonstrated that a 24-month, \$36.1 million performance contract, reallocating funds from three existing budgets (utility, operations and maintenance, and capital repair and replacement) would enable UCM to pay for the improvements. A performance contract is a package of products and services customized to deliver significant energy and operating cost reductions.

### Improvements Create a Better Learning and Working Environment

The proposed improvements will provide a vastly improved learning and working environment throughout the campus. According to the “Greening America’s Schools” report, sponsored in part by the nonprofit U.S. Green Building Council, green buildings provide a better study and learning environment for students. The study, which evaluated K–12 school environments, found that improved lighting, air quality, and acoustics are estimated to improve learning abilities and test scores by as much as 5 percent.

Key elements of the selected upgrades will include the installation of renewable energy-efficient heating, ventilation, and air-conditioning systems, new hot water distribution systems, more energy-efficient lighting, and installation of campuswide building automation.

These elements will also include life safety measures, laboratory air systems and controls, green technologies for curriculum utilization and campus green awareness, replacement of roofs and windows on various buildings, improved air handling systems, and acoustical improvements for classrooms and office spaces. The audit clearly outlined the benefits of the selected improvements.

With funding and targeted improvements identified, UCM is well on its way to success.

### Top Leaders Stay Involved

Roberts and her team remained at the helm, taking a best-practices approach. They understood that a campuswide effort needs campuswide support.

Because the school developed a financial business case for the improvements, as the school's CFO and top finance person, Roberts was also the natural fit to lead the project.

"Improvement efforts such as ours affect every department, every student, and all 2.5 million square feet of building space," Roberts said. "We wanted to take a systemwide approach to the improvements because we wanted them to reflect the needs of the campus as a whole—not merely the needs of a single department."

"Campuswide comprehensive efforts also require a strong leader to champion

them. We were very fortunate to have Dr. Roberts at the helm," said Podolefsky, who acknowledges the level of change that would be involved. "Dr. Roberts and I realized that these improvements would change the very culture of the school."

### Team Builds Stakeholder Support

With this understanding and ongoing support and communication with Podolefsky, Roberts set about building stakeholder support for an effort that will alter how the campus looks, feels, and operates. She created a plan to gain support from the administration, board of governors, faculty, staff, and students.

The team used a collaborative approach to get all stakeholders on board. Roberts and her team met with each group of constituents to educate them about the proposed improvements and how they and the campus as a whole would benefit.

Each presentation outlined the business case for the improvements by describing the need, the selected ECMs, and the benefits they would provide. The presentations also described how performance contracting would provide the school with self-funding solutions from existing budgets. Each workshop allowed time for a question-and-answer session. "Convincing any skeptics of the benefits, the workshops created a groundswell of support for the improvements," Roberts said.

"The Board of Governors appreciated that there was a solid business case demonstrating the need for the improvements and the benefits to each group of stakeholders," said Richard Phillips, president of the UCM Board of Governors. "We especially liked that the school will use existing funds to pay for the improvements—and will even generate cost savings."

## HP ProCurve Networking

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HP switches enable significant energy cost savings compared to the industry average—up to 45 percent savings on HP modular switches and up to 38 percent on fixed-port switches. (Source: Miercom)

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## Microsemi's PowerDsine

Microsemi's PowerDsine® family of enterprise-class Power-over-Ethernet (PoE) midspans is used on campuses nationwide to improve cost and energy efficiency while enhancing productivity. The company is one of the first to offer the latest high-power, IEEE802.3at-draft4.2-compliant midspans, including 1-, 6-, 12-, and 24-port 1U configurations and a virtual 48-port 2U version.

Microsemi's PD-9000G midspans reduce heat concentration, deliver power as needed as a green alternative to PoE-capable switches, and are deployed alongside any existing switch, with no changes to the current infrastructure. An exclusive PowerView Pro™ option supports both IPv4 and IPv6 addressing for remote device monitoring and control, including resetting PDs, disconnecting them during power failures, and/or selectively shutting down ports to cut power consumption as much as 70 percent. A distributed power architecture further improves energy efficiency by enabling small, economical internal default power supplies to be augmented with external supplies as needed for added power capacity or redundancy.

## IT Network Supports Infrastructure Improvements

The infrastructure upgrades at UCM will be incorporated into the existing IT network using a robust, scalable, secure approach. The control system for building automation will connect to the network to automatically control and collect data about indoor air quality, temperature, energy consumption, and heating, ventilation and air-conditioning systems. Data will be disseminated to users throughout the campus who need the information. Data can be accessed remotely by connecting to the university's network, and changes to temperature and other parameters can also be completed remotely.

"Green awareness" video display systems throughout the campus will provide students with 24/7 data about utility use at the campus. For example, there will be a 42-inch flat-screen "green awareness" monitor in the student union that students can check while passing through or hanging out in the union. Each of the 14 academic buildings on campus will also have a "green awareness" monitor. Monitors will post real-time information on energy use, including a comparison of energy use by building. If desired, monitors can also provide historic comparisons of energy use by day, month, or year and will include information about green career opportunities for students.

Roberts and her team met with each group of key stakeholders at least once. With some groups, such as the Board of Trustees, Dr. Roberts and her team met as many as five or six times. After meeting with each group, she invited them to additional meetings with attendees representing a mix of stakeholder groups.

This approach built campuswide support for the effort. Questions and concerns were addressed early in the process so that each group of stakeholders felt heard and understood.

### Next Steps: Team Plans Stakeholder Support 2.0

Now that Roberts and her team have garnered stakeholder support for the project, they are working closely with the university's internal communications staff to ensure that status updates are ongoing for the project as it unfolds.

"We have been working with Dr. Roberts and her team to ensure that we maintain a high level of internal communication throughout the process," said Jeff Murphy, assistant director, University Relations-Media Relations at UCM.

"We're working to establish building manager meetings on a regular basis and town hall meetings for the campus community and to create a question-and-answer section on our website to help keep the communication process flowing to avoid misinformation," Murphy said. "Trane also launched a separate website that is linked to the university home page and provides project updates and timelines." To tie the program to the school's curriculum, the school will explore hands-on learning opportunities, such as internships for students who are studying sustainability issues.

### Creative Solutions Bridge Technology Gap

While the preparation process for the improvements generally proceeded smoothly, it did require ongoing support. For example, facilities management staff will now need to update heating, ventilation, and air conditioning systems via computer instead of using manual tools. Uncomfortable at the keyboard, some of these individuals were unsure whether they could master computing skills as solidly as they wield their manual tools—and even feared for their jobs.

To reassure staff, Roberts and her team will provide computer training and frame the need for comfort at the keyboard as a career-enhancing opportunity, because it increases their skills, opening up additional job opportunities within the university. She believes this approach will help overcome fears and increase the comfort of staff.

Another challenge presented by the improvements will be completing the upgrades in a 24-month period in occupied buildings where classes are in session. The solution will be an "in-out scheduling approach" that involves sitting down with faculty and staff to identify the class schedule in each individual building. The work will adhere to that schedule.

If classes are being held on the second and third floors of a building, for example, work on infrastructure improvements may proceed on the first floor. The next semester, when first-floor rooms are needed for classes, work would then move to the second and third floors. Whenever possible, work will be scheduled when fewer people are around, either during the summer months or during evenings and weekends.

Roberts is confident that the school has paved the way for a successful transition for the school and its stakeholders. "It's probably no surprise at an educational institution that it all comes down to the same advice we give our students," she said. "When it comes to being ready for what we anticipate will be a successful improvement process, it's really all about being prepared. It's all about doing your homework."

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