



PROJECT OVERVIEW

The University of Central Missouri (UCM) worked with the Clinton Climate Initiative (CCI) to develop and implement a best practices energy services performance contracting project with Trane, an Energy Services Company (ESCO). When complete, the project is designed to save at least 31 percent of annual energy costs and reduce carbon dioxide (CO₂) emissions by 7,541 metric tons – equivalent to taking 1,381 cars off the road or preserving 1,714 acres of forested land.

This retrofit project is part of a larger sustainability initiative on campus. At its core is a program to upgrade existing systems with innovative energy efficient technologies. These include geothermal heating, new ventilation and air conditioning (HVAC) systems, and an up-to-date campus-wide building automation system that automatically regulates energy use in buildings. In parallel, UCM has established a program of student internships, awareness campaigns, and additions to the curriculum that inform and involve the campus community in sustainability initiatives. In addition, UCM is now seeking the United States Green Building Council’s Leadership in Energy and Environmental Design (LEED) silver certification for the renovation of its Morrow-Garrison complex and construction of the Student Recreation and Wellness Center.

According to UCM’s Vice President for Administration and Finance Dr. Betty Roberts, “From infrastructure to keyboards, the campus is being transformed, requiring staff training, job description modifications, and the enhancement of procedures to best practice standards.

PROJECT AT A GLANCE

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|---------------------------------|----------------------------------------------------------------|
| ESCO..... | Trane |
| Project Size..... | 1.7 million sq ft 26 buildings |
| Project Cost..... | \$36.1 million (\$16 million of guaranteed energy measures) |
| Annual Energy Savings | |
| • Electricity..... | 35% (6.8 million kWh) |
| • Natural Gas..... | 40% (24,000 million Btu) |
| • Water..... | 10% (4.2 million gallons) |
| Annual Energy & Maintenance | |
| Cost Savings..... | 31% (\$735,271) |
| Annual Emission Reductions..... | 7,541 tons of CO ₂ |
| Financing/Payback Period..... | 15 years |
| Construction Duration..... | 18 months |

In addition, our campus community will be educated on how to operate more efficiently and sustainably. Everyone can learn and benefit from this campus-wide effort.”

INITIAL ENGAGEMENT

The University of Central Missouri (UCM) engaged with CCI through the American College and University Presidents’ Climate Commitment (ACUPCC). As a partner, CCI assists ACUPCC signatories with developing and implementing large-scale energy efficiency building retrofit projects under CCI’s Energy Efficiency Building Retrofit Program (EEBRP) best practices methods. Former UCM President Aaron Podolefsky, a founding signatory to the Presidents’ Climate Commitment in 2007,

Project Timeline



pledged to reduce campus-wide carbon emissions and move toward carbon neutrality. In support of its ACUPCC commitment, UCM began researching ways to improve its sustainability efforts in the face of a deferred maintenance backlog and budget challenges. In June 2008, UCM reached out to CCI to assist with a campus-wide building efficiency program. The University decided to use energy services performance contracting (EPC) to design and implement the large, complex energy efficiency retrofit project. In addition, UCM established the President's Commission on Sustainability, charged with addressing recycling and other sustainability-related initiatives, including curriculum development and education.

ESCO SELECTION

In August 2000, the state of Missouri passed legislation enabling the performance contracting method to be used in project procurement. As a public institution, UCM is required to engage in a competitive bidding process for contractors in compliance with the state's public EPC procurement laws. UCM issued a Request for Qualifications (RFQ) and a Request for Proposals (RFP) for ESCOs that could design and implement a large, holistic energy efficiency program. The RFP required that the responding firms provide a comprehensive solution for sustainability and deferred maintenance needs for the campus within a budget-neutral EPC project. Three interested companies submitted bid proposals, from which UCM selected Trane's for being the most comprehensive. UCM moved forward with Trane on an in-depth auditing and project definition process.

FINANCING SOLUTION

UCM secured a 15-year tax-exempt lease-purchase (TELP) through Bank of America's subsidiary, Banc of America Public Capital Corporation of Chicago, IL. The lease will provide funding for all associated construction costs, including installation of equipment and labor. Trane guaranteed a maximum price for the project with a payback of 15 years, as stipulated by Missouri state statutes.

ENERGY CONSERVATION MEASURES and CONTRIBUTION TO OVERALL SAVINGS

BUILDING CONTROLS 9.7%

Install and upgrade campus-wide network of building automation systems and install "green screen" touch screen energy monitoring system throughout campus

LIGHTING IMPROVEMENTS 37.8%

Install high-efficiency outdoor and indoor lighting, including induction parking lot lighting activated with smart sensors

CENTRAL PLANT UPGRADES 13.3%

New 450-well hybrid geothermal heat pump system

HVAC 22.4%

Retrofit five buildings and upgrade air handlers and ductwork; replace chillers in two buildings and add a supplemental cooler

BOILER & STEAM IMPROVEMENTS 8%

Retrofit seven buildings, including installing new electric hot water boiler and high-efficiency condensing boilers

WINDOW REPLACEMENTS 1.1%

Upgrade windows in five buildings

OPERATIONS AND MAINTENANCE TRAINING

Implement new and improved energy efficient controls and scheduling strategies, including desktop control in Facilities, Planning, & Operations

WATER CONSERVATION MEASURES 7.7%

Install and upgrade efficient water conserving plumbing fixtures in bathrooms, showers, and lockers

Other upgrades include fire alarm systems and sprinkler replacement, roof repairs, fume hood replacement, power factor correction, computer power management, and renovation of pool enclosure.

After reviewing project information such as total estimated cost, projected energy and maintenance cost savings, energy performance contract terms, and conditions, payback period and time line, Public Capital Corporation placed its bid and won the project.

Of the total \$36.1 million project cost, \$16 million is being spent on energy efficiency measures to generate direct energy savings, while the remaining \$20 million is being spent on energy-related deferred maintenance projects such as fixing inoperable HVAC equipment.

PROJECT CHALLENGES

PROJECT DEVELOPMENT

Prior to construction, the largest challenge to this project was ensuring the support of key campus constituents, namely students, faculty, facilities management staff, and UCM's Board of Governors. Throughout the project development process, UCM's Office of Administration and Finance worked to educate constituents on new technologies, new financing models, and sustainability in general. Specifically, they aimed to:

- Build familiarity with ESCOs, energy services performance contracting (EPC), and important milestones in the project development process, such as the Investment Grade Audit
- Demonstrate how energy-saving systems work
- Prove that deferred maintenance costs could be resolved with a budget-neutral plan
- Communicate how and which campus projects were chosen as part of the EPC contract
- Appease concerns that new, high-tech systems could make some jobs redundant by discussing plans for retraining and retaining staff

UCM and Trane went to great lengths to ensure that there was extensive and transparent communication throughout all aspects of the project. They developed an ESCO website showing all affected buildings and

their status. UCM University Relations released regular updates to this website and held town hall meetings giving all campus constituents the opportunity to ask questions and learn about the project and its progress. In addition, building managers and Trane have met weekly for updates since project construction began. These efforts to communicate have helped clarify and define the role of UCM building managers; they have also helped to identify existing gaps in safety procedures, which are now being addressed.

DURING CONSTRUCTION

Throughout project implementation, the campus environment posed some unique challenges to the project:

- A high degree of coordination between class schedules and construction was required. Most classes were able to continue uninterrupted, and faculty, students and construction crews were respectful of one another.
- Older buildings presented several unforeseen problems that delayed the construction schedule, including the need for hidden asbestos abatement; jogs in old flue pipes, which required pipe replacement rather than the planned flue-wrapping; and decades of debris and dirt discovered during ductwork replacement, which caused odors during welding/cutting and were remedied by bringing in large fans to expedite air exchange.
- There were also some challenges regarding the setting of the campus. A faculty-staff parking lot was chosen as the site of UCM's new geo-thermal well field. On removing the paving from the area preparatory to drilling and well installation, the remnants of a neighborhood were found. Cisterns had to be filled, and engineers had to drill through the foundations and basements of old buried homes.
- In addition to the faculty-staff parking lot being used for the well field, further lots were needed as a staging area for ESCO work, i.e. temporary quarters for contractor offices and the housing of

equipment. Vehicle parking therefore had to shift to other lots. Though UCM had plenty of parking to accommodate everyone, a longer walk from vehicles to offices and classrooms caused concern for some. As a result, a shuttle service was established with a regular daily schedule until the parking areas were cleared.

- As part of the water retrofit, old toilets were replaced with new, reduced-water toilets that had only two alternative heights – “standard” and “disabled” (which was 2 inches higher). The concerns that the new toilets be accessible had to be resolved.

CAMPUS IMPACTS

This building retrofit project has directly affected students, staff, and faculty members on UCM’s campus, resulting in increased awareness around the economic, social, and environmental elements associated with sustainability initiatives.

The Association for Advancing Sustainability in Higher Education (AASHE) defines sustainability in an inclusive way, encompassing human and ecological health, social justice, secure livelihoods, and a better world for all generations. UCM strives to incorporate these concepts into its academic realm. In the process of infrastructure retrofits and other sustainability projects and initiatives, a strong and varied educational component emerges, creating a living learning environment.

– UCM Campus Retrofit Presentation

STUDENT INVOLVEMENT

As part of its project plan, Trane agreed to provide access to the project construction for educational and training purposes. Trane also provides two paid internships annually for UCM students engaged in fields of study related to energy services.

CAMPUS AWARENESS

Through the use of touch-activated “green screens” placed throughout the campus, community members can keep up to date on the status of the energy efficiency retrofit, track UCM’s green initiatives, and learn tips on sustainability.



CURRICULUM IMPACTS

There are eight key academic areas that will directly use the data, experiences, and lessons learned from the collaboration between UCM, Trane and CCI. These include the following subjects:

- **Construction Management:** Applying energy utilization data, students will study the economic and environmental implications of employing sustainable materials and practices in construction projects.
- **Interior Design:** Joining the aesthetic and creative with the economic and environmental impact of materials selection, students will better understand associated public health and welfare outcomes of these choices.
- **Geography:** Employing geographic information systems (GIS) modeling tools, students will analyze the relationship between sustainable development and human-environment interactions.
- **Economics:** Reviewing collected cost data, students will learn about the fiscal impact of sustainable practices on the global economy.

- **Biology and Chemistry:** Monitoring the environmental impact of UCM's energy sources, students will better understand what it means for an institution to become carbon neutral.
- **Mathematics:** Reviewing energy utilization data, students will develop deterministic and stochastic models of energy used within UCM's building systems.
- **Sociology:** Studying the social impact of sustainability on and between societal institutions (e.g. family), students will learn about the social co-benefits of sustainability initiatives.
- **Safety:** Department of Safety Sciences faculty members are developing a framework to create awareness, provide guidance, and address occupational safety and industrial hygiene issues associated with green jobs and sustainability efforts. The Department has also developed new environmental courses related to environmental air quality, pollution prevention, and water quality.

CCI ROLE

Through its partnership with the ACUPCC, CCI supported UCM throughout the project development process, including:

- Introducing CCI's best practices in EPC to help UCM design the best possible energy retrofit with maximum transparency and minimum risk
- Reviewing procurement documents and ESCO responses to give an additional, unbiased perspective on the project
- Providing contacts and guidance on securing advantageous financing for the project
- Introducing Trane to CCI's purchasing alliance supplier partners, which provided access to discounted pricing on energy efficient technologies
- Championing UCM's best practices project and leadership within the ACUPCC and the higher education sector globally

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