



COMPILED BY STEVE GLAZNER



Students and Staff IMPROVE CAMPUS SUSTAINABILITY

THERE IS SO MUCH INNOVATION, COLLABORATION, AND SUCCESSFUL OUTCOMES OCCURRING TODAY WITHIN EDUCATIONAL FACILITIES.

We wanted to highlight a few campus projects that are leading the way and providing valuable, portable models to other colleges, universities, and schools throughout North America.

Following are 17 campus projects from 16 institutions, which barely scratch the surface of the thousands of energy and sustainability initiatives planned or underway every day at our campuses. Students, faculty, staff are alternately taking the lead or banding together to improve their campuses' energy efficiency, reduce costs, enhance the educational experience, and minimize the effects of their environmental footprint within the community. Also included is a description of LEED Lab, a project of the U.S. Green Building Council.





DEERFIELD ACADEMY

Deerfield, Massachusetts

Submitted by David Purington, Environmental Management Coordinator, Deerfield Academy



Chamber Hall.

WATER CONSERVATION: SUSTAINABILITY RESULTS YOU CAN MEASURE WITH A BUCKET

Deerfield Academy's sustainability mission statement reads in part that the school "will educate all its members on local and global impacts of personal and institutional choices, encouraging long-term thinking and modeling environmental best practices." Among our first initiatives was saving more water.

Our students are graduating into a world with a growing water crisis, and our classrooms routinely discuss this global theme. But we also know there are local implications. As a boarding school of 650 students in a small town, we are the largest user of our municipal water supply and wastewater systems. The majority of our water is pumped from a riverside well and travels several miles up to a hillside water tower far above the school.

For many reasons, we knew it was important to review our water usage, update our systems, and model best practices for our students and community. We hired a water conservation specialist to conduct an audit and help us craft a strategy for savings.

We are underway implementing recommendations from that audit, and over the past two years, Deerfield has lowered its demand by more than 2 million gallons per year—an impressive 15 percent. The majority of changes have been simple equipment substitutions and do not rely on behavior modification.

Here is what we learned:

- Frequently people think there is little room for further water savings. An expert consultant will help you find significant opportunities and strategies to show results fast.
- Many people are wary of high-efficiency fixtures and appliances. By doing our homework and testing different products, we found commercial-quality options that perform well, often while using less water than recommended by

the U.S. Environmental Protection Agency's WaterSense guidelines.

- There is still a lot of opportunity for savings by making some easy changes:
 - » **Pre-Rinse Spray Valves:** Dining-hall prep food areas have very different needs—gentle sprays are enough for the salad room cleanup, while hard-hitting chisel sprayers perform better in the bakery. Working closely with dining staff, we found name-brand replacements that use between 0.65 gallons per minute (gpm) and 1.07 gpm.
 - » **Shower Heads:** As we are a boarding school, we have hundreds of showers in student and faculty housing. Finding a good, commercial-grade, low-flow shower head was important. After testing many, we opted for a 2.0 gpm model, but we seriously considered a 1.75 gpm model. With a projected payback period of six months, don't forget locker rooms!
 - » **Faucet Aerators:** Faucet flows should vary based on their purpose and location—kitchen faucet flows (2.2 gpm) are different than public bathrooms (0.5 gpm), which are different than private bathrooms in housing (1.5 gpm). The audit found that about 60 percent of our faucets could be improved by retrofits, with payback periods ranging from one to nine months.
 - » **Pint-Flush urinals:** On newer WaterSense fixtures flushing at 0.5 gallons per flush (gpf), you can often change the flush valve to 0.125 gpf for a 75 percent savings. Payback on valve-only retrofits was projected to be about two years. Full-fixture replacements of older, higher-flow urinals were projected to pay back in six to ten years.
 - » **High-Efficiency (HE) Toilets:** In faculty housing, we now install toilets using only 0.8 gpf during renovations. We do not use these toilets in housing with rusted cast-iron sewer lines or long sanitary drain lines in isolated areas of buildings, because of worries about downstream clogs.
 - » We were surprised by the use of **water-cooled ice machines** (projected payback period less than 1 year), and also by the aged fleet of washing machines in our **student laundry**.
- **Some things don't make the list.** With a 96-year payback, replacing old dishwashers in faculty housing isn't on our to-do list.
- **Facilities-related savings** are available in heating/cooling systems, irrigation, pool operations, and more. Include them in your audit and your modifications.



BEREA COLLEGE

Berea, Kentucky

Submitted by Vicky Broadus, Big Ass Fans

GREEN COMFORT COMES TO COLLEGE

Kentucky's Berea College has been a pioneer in liberal arts education since its founding in 1855. In recent years, it's also been a pioneer in sustainable living.

In 2013, it pushed the limits of green design and construction with the opening of the Deep Green Residence Hall, an eco-dorm that serves as both living space and learning laboratory. With two LEED-certified buildings already on campus, Berea's design committee explored new certifications for Deep Green through the Living Building Challenge, a program of the International Living Future Institute.

Because HVAC accounts for about 35 percent of an average residence hall's energy use, Deep Green required innovative HVAC design and extensive energy modeling. The finished project features rooftop solar panels and a geothermal heating system, as well as high-efficiency windows and insulation.

Each dorm room and public space is also equipped with ENERGY STAR's highest-rated ceiling fan to provide cooling airflow in summer and to distribute heat in winter. The fans allow the students direct control over their personal comfort without cranking the thermostat.



Deep Green's Common Room.

Altogether, these innovations help Deep Green use half the energy of similar dorms and contribute to a healthy environment. The thoughtfully designed space, with abundant natural light and healthy air circulation, gives students a comfortable, sustainable place to live and study.



BLACK HILLS STATE UNIVERSITY

Spearfish, South Dakota

Submitted by Kimberly Talcott, BHSU

CAMPUS GARDEN INSPIRES COMMUNITY-WIDE FOOD INITIATIVE

Black Hills State University's campus garden has cultivated community connections along with fruits and vegetables. The garden, established in 2008 by students living in the residence halls, has grown through volunteer efforts of faculty, staff, and student organizations. Facilities staff working in the garden began connecting with local food producers throughout the Spearfish area.

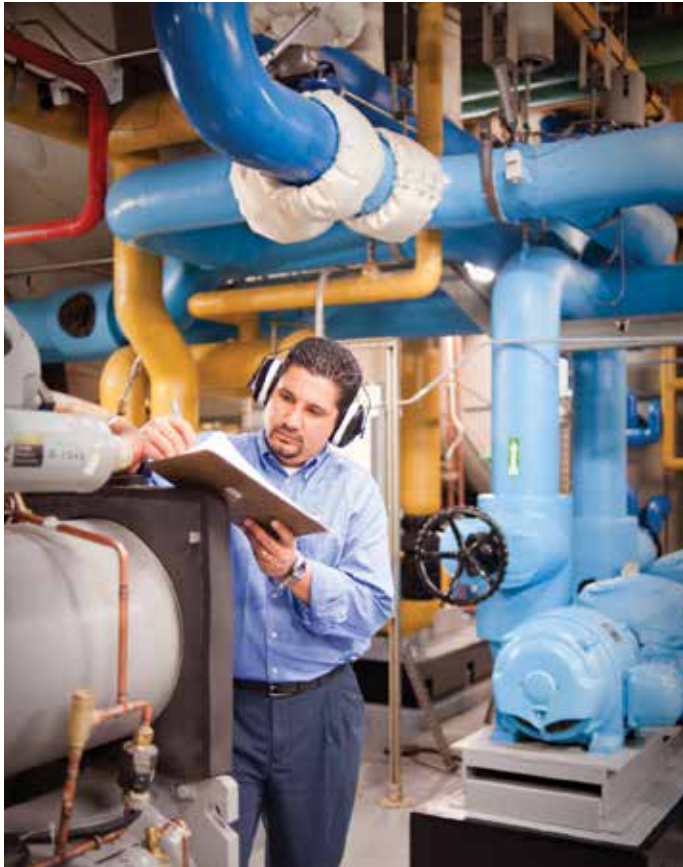
BHSU continued its commitment to sustainability by bringing together local food producers, distributors, retailers, and consumers while engaging students in a new initiative—Spearfish Local. Spearfish Local provides work experience and research opportunities for BHSU students. After discovering barriers to local food purchasing in area cafeterias, including its own campus dining facility, BHSU devised a plan to overcome this distribution gap with a local food hub.

In fall 2015, BHSU received a \$100,000 U.S. Department of



BHSU's campus garden team.

Agriculture (USDA) Local Food Promotion Program grant to incubate a local food hub serving the entire Black Hills region. The Black Hills Food Hub aims to use a farm-to-cafeteria distribution system at schools, hospitals, and nursing and retirement homes. The university is partnering with a local company, Cobblestone Science, to serve as a point of contact between farmers and cafeteria managers and will begin transporting local food to cafeterias in spring 2016.



The University of Montana's energy upgrades save the university \$500,000 a year.

OVERCOMING OBSTACLES: HOW TO REACH A SUSTAINABLE FUTURE FOR HIGHER EDUCATION FACILITIES

Just as students invest in education to reach their professional goals, higher education facilities must invest in new technology and innovative strategies to ensure their buildings run efficiently and are well maintained to decrease costs and expand system and building lifetimes.

According to a Schneider Electric survey, an overwhelming 96 percent of higher education facilities managers agree that energy efficiency is necessary to fulfill their facilities' core missions. However, development and organizational issues hinder many from reaching their efficiency goals.

To meet efficiency and sustainability goals, facilities managers can make improvements to the energy efficiency of their facilities, invest in the proper training for employees, and integrate multiple departments into efficiency programs. This all starts by identifying and addressing the issues at hand and by recognizing problems that hinder innovation and success.

DEVELOPMENT ISSUES

"If you're not learning in this industry, you're falling behind," said the recently retired Tom Javins, former associate director for engineering and utilities at the University of Montana (UM). Falling behind in the world of energy efficiency can mean missing the opportunity to save thousands of dollars and a significant amount of time—two highly coveted resources on every university campus. Investments in employee training and the most efficient building operations technology can help higher education facilities realize long-term sustainability.

The U.S. Department of Energy's Better Buildings Challenge reports that U.S. higher education facilities spend about \$14 billion on energy costs each year. An investment in employee development through opportunities such as a building-operator training program can create a sustainable system that helps reduce costs.

After 12 individuals, students, and staff joined together in the Building Operator Certification (BOC) training program, UM began making changes. An energy conservation project created to develop more efficient air handlers for the recreation center employed a variable speed drive to keep leaky dampers from freezing as they had in past years. This effort decreased the building's utility costs by 25 percent, saving electricity and steam heat that had been driving up energy costs.

Including students in UM's energy efficiency projects gave them an opportunity to learn about an issue they care about, which directly benefited the university's energy efficiency goals. The students at UM have advocated for energy efficiency on campus by voting to tax themselves to fund a revolving energy loan for energy conservation work, Javins said.

Thus far, the revolving loan has funded solar photovoltaic systems, pipe insulation, heating and air conditioning renovations, and more. The joint efforts of students and building operators show how an integrated university effort can improve energy efficiency on campus and help meet the university's strategic plan.

ORGANIZATIONAL ISSUES

When it comes to navigating organizational challenges, building operators can team up with their colleagues to create strategic solutions for implementing energy efficiency programs. According to Tara Canfield, Schneider Electric's segment director of education and commercial office buildings, "Steps need to be taken to streamline organizational processes and establish a clear definition of success among stakeholders to achieve each school's energy efficiency goals."

Building managers, technicians, and administrators joined forces at UM to learn more about energy efficiency options. The

cooperation among those with different areas of expertise allowed the campus to develop successful energy efficiency programs.

For example, bringing together two university heating and ventilating technicians resulted in a new development for the university's building automation system. Talking about energy efficiency together led these technicians to refurbish the main steam valve with electronic controls. This upgrade allows the building operators to have an occupancy schedule that prevents simultaneous heating and cooling in the summer.

Javins attributes UM's success to teamwork. "The value is

that no one person sees everything, and everyone brings their interest, their perspective, to the job," he said.

By investing in proper energy efficiency training and organizing colleagues to work together, the university has already seen results. After spending \$6 million on energy efficiency over more than three years, the university saves approximately \$500,000 a year on energy costs. With continuing savings on costs and time, there is only room for greater success in the future.



UNITED STATES GREEN BUILDING COUNCIL

Washington, D.C.

Submitted by Jaime Van Mourik, Director, Higher Education, USGBC



LEED[®] Lab[™]

LEED LAB: TRANSFORMING CAMPUSES AND CAREERS

At the USGBC's Center for Green Schools, we believe that everyone entering a classroom should have the opportunity to learn in a green school. And we are actively connecting with campuses worldwide to change the way their buildings are designed, built, and operated. We work toward transformation for the built environment through our globally recognized Leadership in Energy and Environmental Design (LEED) green building program.

THE STATE OF SUSTAINABILITY IN HIGHER EDUCATION

Higher education institutions are committing to sustainability and climate neutrality on a daily basis and have shown tremendous leadership in the green building movement. Currently, there are over 6,800 projects participating in LEED, comprising over 657 million sq. ft. of space. But there is still work to be done, especially in existing buildings.

Since it can take up to 80 years to make up for the environmental impacts of demolishing an old building and constructing a new one, LEED for Building Operations and Maintenance (O+M) holds incredible promise for existing campus facilities. LEED O+M promotes the ongoing implementation of best practices in building operations with the goal of sustaining high levels of performance throughout the life of a building.

By employing these strategies and certifying a building to LEED O+M, campuses ensure that their building can maintain and improve current performance over time. The implementation of LEED O+M reduces the environmental

impact of buildings and grounds, has a positive effect on student, faculty, and staff health, and prepares students to be global sustainability citizens.

OUR SOLUTION: UTILIZING YOUR UNTAPPED RESOURCES WITH LEED LAB

With the goal of transforming existing campus facilities, USGBC sought to develop a clear vision for the future. LEED Lab, an innovative solution for integrating sustainable practices into daily campus operations and maintenance that is directly powered by students, is a critical part of our strategy. As an interactive, multidisciplinary immersion course, LEED Lab is designed to transform the academic environment by preparing students for 21st century careers in sustainability.

In the course, students learn the principles of LEED and assess the performance of existing facilities on campus, choosing one building where they will facilitate the LEED O+M process. Students lead the complete process of LEED O+M on a campus facility with the goal of certifying the facility. By participating in LEED Lab, campus sustainability officials and facilities managers can utilize untapped resources to achieve LEED O+M certification—students at their own institution—and, in doing so, bridge the building capacity gap on campus for sustainable integration efforts.

The campus environment serves as the perfect learning laboratory to engage students in projects that are experiential in nature, providing them with the knowledge, expertise, and skills needed to solve 21st century challenges. Our vision for campus sustainability is simple: to integrate LEED O+M strategies so that our campus buildings perform at a higher level and human health is prioritized and enhanced, and to train the next generation of sustainability leaders by engaging students in the process. Offer LEED Lab today at your institution and help us achieve green schools for everyone within this generation.



CHESAPEAKE COLLEGE

Wye Mills, Maryland

Submitted by John Jameson, ICF International

ENERGY EFFICIENCIES THROUGH RETROFITS AND UPGRADES

Although the Health Professions and Athletics Center at Chesapeake College is technically a retrofit, the building was completely overhauled before its reopening in August 2015. The building houses the health professions and wellness programs in renovated former gymnasium and pool space, along with newly constructed classrooms. Aiming for LEED Platinum certification, a 1.7-MW solar project has been installed over three acres of adjacent parking and six acres of nearby open space. The array will reduce campus fossil fuel reliance by one-third and will be accompanied by electric vehicle charging stations and a planned 500-kW battery to supplement grid interconnection. The building is expecting energy savings of 31 percent and cost savings of 56 percent.

This project is being showcased through U.S. Department of Energy's Better Buildings Challenge. As a partner in the Challenge, Chesapeake College has established itself as a



Health Professions and Athletic Center.

national leader by committing to reduce energy use across its entire building portfolio by 20 percent over 10 years. The Better Buildings Initiative was introduced in 2011 to cut energy waste in commercial buildings across the United States. Through the Better Buildings program, public and private sector organizations across the country are working together to share and replicate positive gains in energy efficiency.



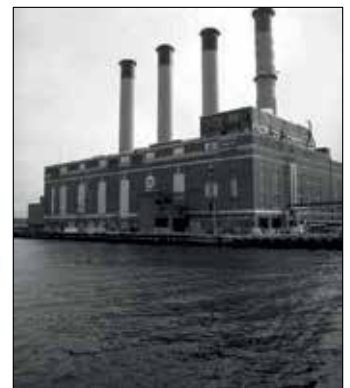
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EARLHAM COLLEGE

Richmond, Indiana

Submitted by Ian Smith, Earlham College

ADVANCING TO LEED

As late as 2012, Earlham College had no LEED-certified buildings on its 160-acre campus. Since then, Earlham has renovated two major buildings and built two others, all LEED certified and representing 14 percent of the college's square footage.

The campus sustainability plan guided this effort, and steering committees representing all affected departments led the design of each project. The college's director of facilities convened these committees. The four projects are:

- Stanley Hall (renovation of biology, chemistry, and biochemistry spaces), LEED basic certification;
- Tyler Hall (renovation of campus welcome center and new spaces for admissions and marketing/communications), LEED basic certification;
- Center for the Visual and Performing Arts (new construction for art, music, and theater), LEED Gold; and
- Center for Science and Technology (new construction for



Main entrance view, Center for the Visual and Performing Arts, Earlham College.

math, computer science, and physics), LEED Gold (pending).

The new buildings consume approximately half of the total annual energy per square foot in comparison with other major buildings on Earlham's campus. The Center for Science and Technology is also Earlham's first building to be heated and cooled by ground-source geothermal wells and is the first large-scale geothermal system in Wayne County.

MILLERSVILLE UNIVERSITY

Millersville, Pennsylvania

Submitted by Chris Steuer, Millersville University



A portion of the loop feed system.

ELECTRICAL INFRASTRUCTURE UPGRADE

Underpinning an effective energy management strategy is modern, reliable energy infrastructure. Millersville University recently completed a multiyear, \$11.5 million project to upgrade its electrical infrastructure to prepare for broader energy

management and energy reduction activities.

Specifically, the university converted an aged radial-feed electrical delivery system to a loop-feed system that connects over 40 campus buildings. The project entailed running over 42 miles of 15-kV electrical wire and installing 41 loop-feed switch boxes to upgrade distribution to each building and replace failing wire and terminations. The new loop-feed system greatly increases the flexibility, safety, and resiliency of the university's electrical system. "The loop-feed system provides redundancies that we didn't have before," said Greg Petruno, Millersville's project manager. "It will also allow us to take each building offline independently from other campus buildings. This will greatly enhance our ability to do preventive maintenance on our electrical equipment."

Millersville also used the project to install utility-grade meters on each building and tied the meters into the building energy management tracking system. "We can now track energy consumption at the building level to evaluate building performance and to identify opportunities for energy and cost savings," said Petruno.



SAN DIEGO COMMUNITY COLLEGE

San Diego, California

Submitted by John Casadonte, Cree, Inc.



LED lighting at SDCC.

HOW LIGHTING CAN PLAY A ROLE IN CAMPUS SUSTAINABILITY

Accounting for 40 percent of energy consumption in most buildings, lighting offers a significant opportunity to curb a

campus' energy costs. Light-emitting diode (LED) lighting is an energy-efficient solution for indoor and outdoor lighting, offering better light over traditional light sources, an attractive price, improved performance, and a long lifetime.

LED lighting can achieve an expected 50 to 70 percent energy savings, and can reach up to 80 percent savings when coupled with smart controls. With the extended lifetime virtually eliminating maintenance costs, LED lighting enables lifetime financial benefits and an exceptional return on investment. Many incentives and rebates are also available through utilities and government programs, accelerating payback and savings.

For example, San Diego Community College is saving about 75 percent of the energy used by incumbent technology with lighting control technology, meeting California's Title 24 energy standards, and generating over \$80,000 of rebates for instant savings. The college installed more than 1,200 wirelessly controlled LED light fixtures, each with a life expectancy of 75,000 to 100,000 hours.



TUFTS UNIVERSITY

Medford, Massachusetts

Submitted by Lauren Martin and CJ Ghanny, Tufts

TRANSFORMING TENNIS BALL WASTE INTO AN ACE GAME

In the summer of 2014, Tufts University partnered with Project Green Ball, a nonprofit organization that transforms recycled tennis balls into surfaces such as equestrian turf and donates them to organizations serving people with disabilities or life-threatening illnesses. Project Green Ball's website notes that of the 125 million tennis balls discarded each year in the United States, most are sent to the landfill where they slowly break down and take up unnecessary space.

Tennis ball recycling stations can be found on the indoor courts in the Gantcher Center during the winter and on the outdoor Voute Tennis Courts during the summer. Tufts was the first



Tufts tennis courts.

university to work with Project Green Ball on this initiative. In 2015, Tufts recycled 444 tennis balls, amounting to 55 pounds.





UNIVERSITY OF ALBERTA

Edmonton, Alberta, Canada

Submitted by Shannon Leblanc, UAlberta

FIRE PUMP-TESTING WATER CAPTURE AND REUSE

Every year the University of Alberta is required to test North Campus' 18 fire pumps at full capacity, a test that uses approximately 378,500 liters (100,000 gallons) of water. Although this is a necessary water expenditure, the university wanted to find a way to mitigate the impact.

Previously, all the water used for the testing procedure would drain to nearby stormwater drains. In 2013, UAlberta successfully began capturing fire pump test water and transferring the water to a 95,000-liter underground cistern for temporary storage. UAlberta's Grounds Department transfers the saved water from the cistern to a water truck to be used for irrigation and water features on campus.

Since the implementation of this innovative initiative in 2013, UAlberta has recovered approximately 500,000 liters of



Grounds staff reuse water from fire pump testing to maintain UAlberta landscape features.

potable water. This sustainability initiative is unique to UAlberta and, more important, saves water while still meeting fire code regulations.



UNIVERSITY OF BRITISH COLUMBIA

Vancouver, British Columbia, Canada

Submitted by David Woodson, UBC



UBC's new Campus Energy Center.

TRANSITIONING TO DISTRICT ENERGY

On November 20, 2015, UBC activated its new Campus Energy Centre (CEC). This marks a major milestone in UBC's transition from its legacy steam-heating infrastructure to the new hot water-based Academic District Energy System (ADES). The five-year, \$88 million project began in 2011 and is integral to achieving UBC's Climate Action Plan.

The project involves:

- Laying 11 trench kilometers of new hot water pipes
- Installing over 100 new energy transfer stations
- Construction of a 45-MW, natural gas-powered Campus Energy Centre (CEC)
- The demolition of the existing steam powerhouse and decommissioning of the steam distribution system

The ADES project is funded from an internal loan repaid through operational cost savings and avoided capital investments. The new hot water system is estimated to be 24 percent more efficient than the legacy steam system because of improved combustion and distribution of thermal energy. Commissioning of the new system will extend into 2017.

Despite providing only partial service in 2015, the new hot water system, combined with the Bioenergy Research and Demonstration Facility (BRDF), completed in 2012, and UBC's building recommissioning program, have achieved a 30 percent reduction in campus greenhouse gas emissions compared to the 2007 baseline.



UNIVERSITY OF VIRGINIA

Charlottesville, Virginia

Submitted by Jesse Warren, Sustainability Program Manager, UVA



Students learn about UVA's sustainability efforts.

OVERCOME FINANCING BARRIERS WITH A SUSTAINABLE BANK

College campuses large and small would like to lower their energy use, upgrade their facilities, and see tangible energy and financial savings. One major barrier at most college campuses is the need for capital for energy efficiency projects, because funding sources are typically not the same entities that capture resulting cost savings. As a partner in the U.S. Department of Energy's (DOE's) Better Buildings Challenge, we have committed to reducing building energy use on our campus by 20 percent by 2020. With this goal in mind we've had to find a way around this split incentive issue.

AN HISTORIC CAMPUS

The University of Virginia (UVA), located in Charlottesville, Virginia, serves over 39,000 students, faculty, and staff and comprises more than 500 buildings. Founded in 1819 by Thomas Jefferson, the campus contains a number of landmark buildings—as well as a UNESCO World Heritage site (UVA's Academical Village). Like many college campuses, many of our buildings brim with history and character but are in need of energy upgrades.

MAKE YOUR ENERGY PROJECTS PAY FOR THEMSELVES

UVA's energy team created Delta Force, a streamlined, soup-to-nuts program for getting energy efficiency done across the Grounds. Named after the difference, or "delta," between the original energy bill and the post-retrofit bill, this internal, cross-functional team manages and in some cases implements upgrades to some of our most energy intensive buildings.

A lynchpin of Delta Force is an internal "bank" that utilizes savings captured from previous project money to fund retrofits

of additional existing buildings, often with the help of our own UVA engineers and staff. When a project progresses far enough to generate savings, the energy management team from Delta Force compares pre- and post-retrofit energy use data to calculate the energy savings from each project on a monthly basis. Savings are then allocated to pay off the costs of the new project until 125 percent of the cost is recovered. The additional 25 percent recovery is used to fund future projects.

GETTING PROJECTS STARTED

Many campuses wrestle with deciding which project to tackle first. The Delta Force team targets the biggest energy consumers in the building portfolio, based on building-level energy metering. The team then performs an energy audit to determine which conservation measures will be the most effective in these buildings.

The energy management and in-house engineers pursue a number of energy efficient upgrades including:

- Lighting—replacing lamps with higher-efficiency versions and light-emitting diodes (LEDs)
- Insulation and windows—Sealing leaks in the building's envelope and repairing damaged and missing insulation
- Optimizing control settings—implementing schedules, resets, variable speed control, and other conservation measures for new digital controls

PUTTING SAVINGS TO WORK

Since 2007, Delta Force has funded over 20 projects using some of the university's \$15 million in avoided energy costs. Delta Force projects typically cost from \$100,000 to \$600,000 and last no more than two years. A UVA energy engineer oversees the whole process to ensure work quality.

Between fiscal years 2008 to 2014, almost \$6.4 million was invested in the Delta Force existing commissioning initiative. The dozens of projects that have been implemented provide added comfort and aesthetic improvements to UVA facilities—including a lighting retrofit at Campbell Hall (built in 1969), and modernizing and finetuning the HVAC at Thornton Hall, a 1936 building made up of engineering classrooms and offices.

STAFF BENEFITS

Many universities struggle to find and keep energy management professionals, losing them to the private sector and larger salaries, so an additional benefit of this program model is its appeal to qualified energy management staff. The revolving fund allows the team to remain relatively nimble and autonomous while sidestepping bureaucratic red tape. With a constant stable of upcoming projects, this positive work



environment attracts and retains high-quality staff because, according to our energy managers and engineers, they like to see the immediate impact of their work.

ABOUT THE DOE'S BETTER BUILDINGS CHALLENGE

The DOE's Better Buildings Challenge is working to share solutions used by U.S. universities like UVA and by K-12 schools. More than 250 organizations from the corporate, public, housing, and industrial sectors have already committed to reduce energy use by 20 percent portfolio-wide over 10 years and to share successful strategies with the public. To date, partners have shared energy data for more than 32,000 properties and are reporting energy savings of 20 percent or more at 4,500 properties, and of 10 percent or more at 12,000 properties.

Learn more about Better Buildings Challenge partner results and showcase projects and innovative solutions being shared with others at <http://betterbuildingsolutioncenter.energy.gov/>. Learn more about UVA's Delta Force at <http://betterbuildingsolutioncenter.energy.gov/implementation-models/delta-force>.

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UNIVERSITY OF CONNECTICUT

Storrs, Connecticut

Submitted by Eric Grulke, UConn

A SAFE PATH FOR UCONN WILDLIFE

UConn's new gateway road, opened in December 2015, was designed and built to ensure that the surrounding vernal pool complex and forested wildlife habitat will be protected. Wildlife will be able to cross safely beneath the road, bike path, and pedestrian walkway that links the Storrs campus to Route 44.

After UConn's amphibian studies identified migratory patterns between vernal pools located on both sides of the proposed roadway, it became clear that box culverts at three wetlands crossings would be insufficient to protect the area's wood frogs and spotted salamanders, not to mention larger wildlife passing through. Consequently, UConn constructed a 72-ft. clear span bridge, complete with wing walls and barriers to direct amphibians, and a 40-ft. long, 6-ft. tall culvert. Together, these structures added \$2 million to an \$18 million project budget.

These additions, along with a permanent conservation agreement prohibiting development around the vernal pools, add



Photo by Peter Morenus of UConn

UConn's clear span bridge protects wildlife.

101-acres of preserved land to UConn's adjacent 64-acre Hillside Environmental Education Park. To enhance the habitat further, an additional 985 trees are being planted along the roadway by spring 2016.

Thanks to the extra care given throughout the design and construction process, UConn's wildlife will continue to be protected.



UNIVERSITY OF MARYLAND

College Park, Maryland

Submitted by Stefan Bangerth, UMD



Photo by John Consoli.

McKeldin Mall.

STUDENT COLLABORATION PAYS OFF

When students and faculty work on sustainability projects on campus, they not only raise acceptance of these projects, but they can also be a valuable asset to facilities management. Under the guidance of Professor Michael Ohadi, students at the University of Maryland recently analyzed four high-energy consumption buildings on campus. They investigated the buildings' energy consumption profiles, including mechanical and electrical equipment, and the buildings' envelope energy efficiency. The

project was a win-win for the sponsor and the students, who benefited from working on a real-world problem.

Working with facilities management personnel, students and faculty arrived at energy saving opportunities ranging from 20 to 50 percent. One of the studies involved a dining hall that had recently achieved LEED Silver certification but consumed 58 percent more energy than the national average for this

type of building.

The students found that the chief reasons for this lackluster performance were complicated building automation features and the lack of a systematic and regular maintenance program. With energy cost savings already in place from the initial implementations, the building is on course to cut its energy usage by nearly one-half once all the modifications are made, saving over \$170,000 per year.

UNIVERSITY OF MARYLAND

College Park, Maryland

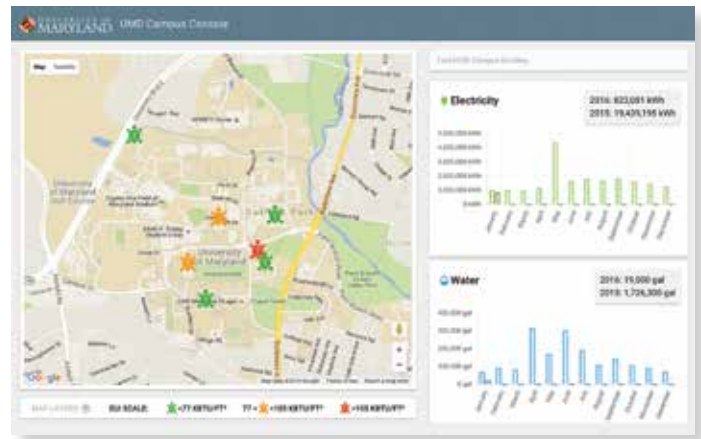
Submitted by Nicholas W. Mattise, UMD

UNIVERSITY OF MARYLAND CAMPUS DASHBOARD

As part of ongoing integrations of sustainability principles and academic experiences, UMD's facilities management (FM) department is collaborating with CITY@UMD, a UMD research group, on a dashboard for energy commodities and water use.

The dashboard, which utilizes existing meter databases at UMD maintained by FM, is able to collect, clean, and aggregate meters of varying energy types and intervals. The online dashboard is available to facility managers, faculty, and students with the goal of transforming the campus into a living laboratory where each group participates to create a more sustainable university.

Centered around a map view of campus, the dashboard quickly provides a visual overview of each building's energy use intensities (EUIs), along with monthly charts of utility usage for the entire campus. At the building level, the dashboard provides weekly, monthly, and yearly views of each meter belonging to



Prototype version of Facility Dashboard at UMD (as of 12/13/15).

a building; additionally, there are options for Excel exports of meter data and printable building utility reports.

The dashboard designs to aid users in monitoring utility usage at every level, from the entire campus to building submeters. The current version of the dashboard can be found at <http://code.buildsci.us/dashboard/>.

UNIVERSITY OF MINNESOTA TWIN CITIES

Minneapolis, Minnesota

Submitted by Annie Pottorff, U of M



Bi-level LED lighting.

LIGHTING EFFICIENCIES FOR PARKING STRUCTURES

The University of Minnesota has been making strides toward sustainable energy use with the It All Adds Up campaign, encouraging the university community to join in on energy conservation. Now, Parking and Transportation Services is adding to the university's list of accomplishments with the installation of high-efficiency lighting in all 16 parking structures on campus.

This project started with an assessment of campus parking structures. A test in one popular ramp with sensors installed on different light fixtures showed that these lights were at full output for less than 5 percent of the hours in a day. The result of the assessment showed that bi-level LED (light-emitting diode) fixtures and advanced lighting controls could provide a better solution for the institution. This approach enables the university to significantly reduce energy costs while meeting illumination standards.

Annual energy savings compared to existing energy usage is estimated at 52 to 58 percent and, when paired with newly installed motion and light sensors, there are less maintenance and replacement costs, making these lights a longer lasting, sustainable option.

These efforts resulted in the University of Minnesota becoming nationally recognized for its energy conservation through the Better Buildings Challenge Lighting Energy Efficiency in Parking Campaign.

UNIVERSITY OF MISSOURI

Columbia, Missouri

Submitted by Srinivasan Raghavan, MU

ADAPTIVE MATERIAL REUSE OF CONSTRUCTION WASTE

The University of Missouri's adaptive material reuse program repurposes construction waste from demolished buildings, helping to meet a sustainability goal. Recent projects have salvaged and stockpiled building materials for reuse in new construction.

Stafford and Cramer residence halls were built after World War II, when many soldiers and sailors returned home and took advantage of the G.I. Bill. Fast forward 50 years: To care for an influx of baby boomers, MU Health Care needed additional space.

Campus master planning efforts identified the fact that Stafford and Cramer sat on land better suited for the healthcare campus. The two halls were demolished in 2008, but not before Mizzou chose to preserve this part of MU's history by salvaging stone from the buildings to reuse in new construction.

Other projects have repurposed hardwood doors for interior wall cladding and repurposed limestone shower partitions for interior casework.

- **Patient Care Tower**

Stone was salvaged and recut for louvers on the exterior walls of the Patient Care Tower. Stone was reused and repurposed as a wall of the Healing Garden.

- **Gateway Residence Hall**

Stone was reused as a feature element in Gateway Hall.




Salvages stone used in retaining walls at Pershing Commons.

- **Pershing Commons**

Stone was reused as retaining walls on the Pershing Commons renovation and Patient Care Tower.

- **Wolpers and Johnston Halls**

Salvaged shower portions were used in interior casework construction. Salvaged hardwood doors are featured in new wall and ceiling elements. 

Steve Glazner is APPA's director of knowledge management and editor of *Facilities Manager*. He can be reached at steve@appa.org. Many thanks to the institutions and individuals who submitted their projects for inclusion, and to the Higher Education Associations Sustainability Consortium (HEASC), the Association for the Advancement of Sustainability in Higher Education (AASHE), the Association of College and University Housing Officers-International (ACUHO-I), and other networks for their assistance with this compilation.

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We will offer topical content in the following areas:

Preventive Maintenance for People

- Check Mate – Matching the Right People for the Right Job
- What Are You Worth? – Recognizing Your Value

Space: The Ever Changing Frontier

- Your Space, My Space, Our Space – Partnering With Academic Colleagues
- It's All One Big Sandbox – Best Practice In Flexible Space Usage

Economy

- Where Did My Tuition Go? – Funding Usage and the Impact on Facilities
- My Piggy Bank Is Full – Understanding the Benefits of Energy Credits

Innovations & Technology

- Impact of Facilities and the Student Experience
- Click Here – Technology What's Next & Are You Ready?

Future of the Built Environment

- Staying Ahead of the Curve – What's Next in Regulatory Codes?
- Dealing with the Rising Costs of Higher Education

Leave them Laughing!

APPA/SRAPPA/TNAPPA are pleased to announce our opening breakfast speaker **Dr. Stuart Robertshaw** will kickoff our 2016 historic event with the Healing Power of Humor. Dr. Robertshaw, Professor Emeritus of Psychology and Education at the University of Wisconsin-La Crosse and an attorney, will share his personal journey on the benefits of humor. He will also share what he has learned about the psychological and physiological benefits of humor and laughter as they relate to how we take care of ourselves, our friends, and our loved ones.



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PLUS BONUS PROGRAMMING

Emerging Professionals Summit (EP Summit) and our Senior Facilities Officers Summit (SFO Summit)

As APPA continues to ensure the strength of our organizations' future, we bring together our future and our legacy through the unique formatting of the EP Summit and SFO Summit. Programming this year for these distinct constituency groups will deliver messages specific to their needs as professionals while offering critical topics for crossover learning. The 2016 'Crossover Networking' opportunities are:

Remaking the Facilities Organization

Join us for our breakfast presentation as we discuss the realities of today's facilities organization as the world is rapidly changing around us. How will we meet the challenges/opportunities brought on by the changes in workforce demographics, innovative pedagogy, and even more rapidly changing technology? Is the current hierarchal organizational model still relevant? Will our emerging professionals embrace the same old way of doing business? This joint Senior Facilities Officers (SFO) and Emerging Professionals (EP) session will dive into the issues of the organization of the future. After the presentation, join in group discussions to further explore the topic and to share your thoughts with all summit participants.

BONUS: Jack Colby, APPA's Thought Leaders Chair, will deliver an Executive Update as a follow-on to this session.

Speed Mentoring

You have heard of speed dating, so join in as we make a twist to this phenomenon and spend time with the SFOs sharing lessons learned and gaining a better understanding of today's rising facilities professionals. This fast-paced knowledge transfer activity will not only be informative, but also a lot of fun. Come prepared to share your love of our profession and learn something unexpected.

Nothing is Certain but Change

Always a controversial topic, but worthy of continued discussion. Come join in a self-directed discussion with your colleagues on the best practices in change management. Are you a Change Champion? Share or learn about what works or doesn't in our rapidly changing profession.

Seats are limited for both these pre-conference sessions that will be held July 11, 2016 from 8am – 5pm. We encourage you to register early. As a reminder, your registration for either summit will also provide you full access to the APPA/SRAPP/TNAPPA 2016 Annual Meeting and Exposition.

Visit www.appa.org today to register!

APPA's HALL OF RESOURCES

The APPA/SRAPPA/TNAPPA 2016 Annual Meeting & Exhibition will be held in Nashville, Tennessee with our hall of resources activities taking place at the Nashville Music City Center. A perfect location for programming, exhibiting, and networking with colleagues while reminiscing with old friends. APPA/SRAPPA/TNAPPA's 2016 annual meeting and exhibition will be a fantastic event full networking—this is where you need to be!

Research has shown that nothing compares to exhibiting at a conference where you will have the ability to meet many potential clients face-to-face. Studies have also shown that exhibiting at conferences and meeting with attendees is one of the most effective ways to acquire new clients.

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- Senior Facilities Officers (SFO) Summit

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- Guidebook App
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