



# The Future of Energy

## Faculty and Students Work together to Shape Future of energy Use

*By Walter F. Fullam, Director of Continuing Education*

**A GROUP OF FACULTY AND STUDENTS AT PENN STATE Berks**, with the assistance of industry partners, is shaping the future of energy use in the United States. A hint of the evolving research program is provided by the recently installed ground-mounted solar array behind the Gaige Technology and Business Innovation Building. But solar energy generation is just one part of an emerging energy research and education program at the campus. And the campus program is a small part of the vast energy research program at the University.

For the past forty years, the United States has become increasingly dependent on foreign oil supplies to meet its expanding energy needs. One result has been periodic and dramatic spikes in the cost of crude oil, creating a demand for alternative sources of energy generation. The latest crisis that erupted about three years ago has resulted in alternative energy investments in wind turbines, solar panels, and bio-diesel refineries, apparent all over the state.

With funding from a Keystone Innovation Zone grant and technical assistance from Jim Kurtz of the RER Energy Group and his staff, Penn State Berks students have had the opportunity to

participate in the alternative energy build-out. Under the direction of Dr. Dale Litwhiler, Associate Professor of Engineering, students Chris McCartney, Jill Hartman, and Brandon Johnson gained direct experience in planning and designing the installation of the solar array and an electric vehicle charging station. The project fits into one of Litwhiler's research areas—energy harvesting.

McCartney, who spent his first two years studying at Penn State Berks and graduated in December 2012 with a degree in Energy Business and Finance, successfully solicited solar power manufacturers and distributors for equipment, resulting in twelve solar panels donated by Motech Industries, an inverter donated by Fronius International, and a charging station donated by Schneider Electric.

Hartman, an Electrical Engineering Technology major, selected the site for the installation of the array and helped develop the design with assistance from the engineers at the SSM Group. Meanwhile Johnson, an Information Sciences and Technology major, designed the data collection system.

In the past, investments in alternative energy have typically been

short lived since high prices also create an incentive for energy companies to locate and procure new supplies of oil and natural gas, which lead to a reduction in the price of energy. The result is a drop in the demand for alternative energy generation, which historically has required high energy prices to be competitive.

It appears that history could be repeating itself in 2013 as new extraction technologies bring abundant supplies of domestic natural gas and oil onto the energy market. So are alternative energy technologies fated to once again get placed in storage until the next crisis looms?

Interestingly, the answer this time is probably not.

Three reasons explain why alternative energy will continue to have a future. First, our energy challenges now involve more than just the price of crude oil. Second, the cost of some types of alternative energy has declined enough to be competitive with other forms of energy generation. Third, U.S. businesses have begun to embrace sustainable energy practices.

Nevertheless, the challenge remains to identify the most cost-effective applications for alternative energy solutions, and Penn State faculty and student researchers are pursuing those answers.

One emerging trend in the United States and around the world is distributed energy generation. Instead of large power plants generating power that is then distributed over wide areas by power lines, in the future more power may be generated and used locally. A microgrid is one model for distributed energy generation. The microgrid model uses a localized grouping of electricity generation and energy storage facilities.

At Penn State Berks, a significant focus of research relates to the development and installation of a microgrid in the Engineering Automation Lab in the Gage Technology and Business Innovation Building. Here, energy is being generated by the solar panels, stored in batteries in the lab, and used to provide lighting for the engineering lab via an Armstrong DC Flex Zone Ceiling grid. Details about the microgrid project are included in the article titled "College and Industry Collaborate To Make Microgrid Network a Reality" on page 19.

Students in engineering and engineering technology will collect and monitor data on energy generated by the solar panels, stored and distributed by the batteries, and used by the ceiling grid. That information will be valuable in designing microgrids in the future that could power not just a room, but also a building, a campus, town, or even a city. Creating a microgrid will allow for the smarter use and management of energy in the future. The project looks like

Jim Kurtz of the RER Energy Group (center) and his staff provided technical assistance for the solar array. He worked closely with Dr. Dale Litwhiler, Associate Professor of Engineering (right) and Jeff Wike, Supervisor of Engineering Labs.



it will continue to expand as companies, such as Canadian Solar Inc. and East Penn Manufacturing Co. Inc., have expressed interest in participating.

The campus initiatives also relate to two energy projects at the Philadelphia Navy Yard involving researchers from the Penn State College of Engineering. The first is GridSTAR, which involves research and education on the development of a smarter power grid and is funded through a \$5,000,000 U.S. Department of Energy grant with matching funds from the Commonwealth of Pennsylvania. Dr. Gregory Dobbs, Director of Distributed Power Research, is the lead researcher with this project on site at the Navy yard. Dobbs has collaborated with Litwhiler and Elizabeth Wiggins-Lopez, Instructor in Engineering at Penn State Berks, on the microgrid and solar charging station projects.

The other project is the much larger Energy Efficient Building (EEB) Hub, which has received \$122,000,000 in funding from a variety of federal sources including the U.S. Department of Energy, with matching funds from the Commonwealth of Pennsylvania and private industry. Dr. James Freihaut, Associate Professor of Architectural Engineering and Director of Operations and Technology for the EEB Hub, has made several presentations to faculty and students at Penn State Berks regarding opportunities in energy efficient building design.

As for the market for energy efficient solutions, in a recent article titled "Making Sustainability Relevant for Everyone," Hunter Lovins and Steve Wilton state the following: "A majority of Fortune 1000 companies are now implementing more sustainable operations. These companies are not doing it from the goodness of their hearts, but because sustainability delivers superior financial performance, competitive advantage, and long-term resilience."

In other words, with the help of researchers and students at Penn State, energy efficiency is becoming an everyday fact of life for more and more Americans.

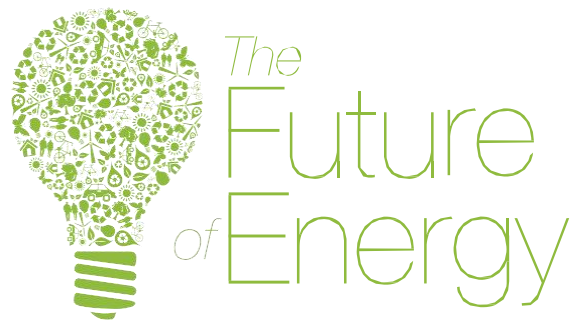


throughout the region. By providing space for two new and creative initiatives—the Center for Entrepreneurship and Economic Development and the Learning Factory—the facility helps to make the campus an even more important leader for growth and innovation.

The roots of Penn State Berks are based in engineering. It all began when two German entrepreneurs, Ferdinand Thun and Henry Janssen, opened Textile Machine Works (TMI) in Reading in 1892. As their business expanded and they opened Narrow Fabric Company and Berkshire Knitting Mills, Thun and Janssen found they needed trained workers, so they started a program in 1927 called the Educational Department of Textile Machine Works. Penn State instructors helped facilitate the program. In 1933, the school was granted a state charter and renamed the Wyomissing Polytechnic Institute (WPI). That same year, Penn State announced that it would give two years' college credit to graduates of the WPI program.

WPI closed its doors in 1958, a victim of difficult economic times for the textile industry. Since WPI and Penn State had a long and successful relationship, its founders offered the WPI buildings to Penn State for the establishment of an extension center.

The Mechanical Engineering degree will join the college's fourteen other baccalaureate degree programs, providing a full complement of diverse and varied four-year degree programs to meet the needs of students in the Berks County community and beyond. For more information about the B.S. in Mechanical Engineering program, contact Dr. Rungun Nathan at 610-396-6170 or via e-mail at [rungun.nathan@psu.edu](mailto:rungun.nathan@psu.edu). ■



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## Student Parlays Internship into Career

Chris McCartney, an Energy Business and Finance major, had a keen interest in energy projects throughout his academic career at Penn State, and it was his involvement in the Penn State Berks solar array project that led to

his current position with RER Energy Group upon his graduation in 2011.

As a key part of an in-depth renewables energy project at Penn State Berks, McCartney was a student when he contacted manufacturers and helped secure the donation of a 2,800-watt solar array, an inverter, and an electric vehicle charging station.

His involvement with RER Energy Group began in 2011 when he completed an internship as part of the solar array project between the company and Penn State Berks.

"I had a great experience working on the solar array project in the Gaige Technology and Business Innovation Building," comments McCartney. "We had a great team of students as well as faculty and advising from RER. This was certainly one of the most valuable experiences I had at Penn State."

After his internship, he went to work for the company, helping to research bioenergy development projects. From there, he transitioned to a position spearheading the creation of a sales team to promote the SpringBoard Biodiesel product line. Today he holds the title of BioEnergy Project Developer.

"I'm thankful I was able to help contribute to the campus while also developing a relationship with RER that would become an opportunity after graduation," states McCartney. ■

