FUELING THE FUTU

URE THROUGH CTE

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BY SUSAN REESE

Two of the most pressing issues we face today are finding new sources of clean energy and recovering from the recession that has been devastating our country. Increasingly, these two issues are tied together, as many of our leaders—in government, industry, science and education—have come to view the transition to alternative energy sources such as solar, wind, natural gas, geothermal and hydropower as one path toward growing our economy and creating new jobs. The U.S. Department of Labor's National Renewable Energy Laboratory Web site states the belief that renewable energy and energy efficiency research and development is only part of the new energy future equation.

"Educating students, teachers and consumers is the other key to finding new renewable ways to power our homes, businesses and cars."

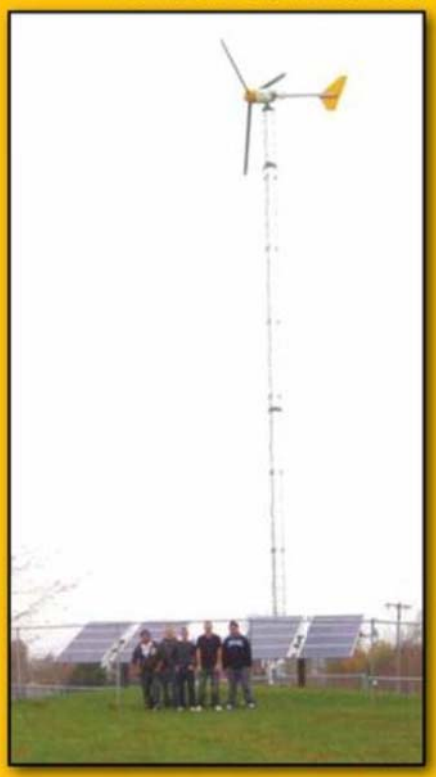
There appears to be a great deal of agreement on the need for alternative energy sources; however, there is also a great deal of work ahead for our nation in developing those sources, building the systems that will deliver them, and training the workforce needed to create and sustain the emerging industry of alternative energy.

A Vision that Begins in High School

Wayne Technical and Career Center (WTCC) in Williamson, New York, is a program of the Wayne-Finger Lakes Board of Cooperative Educational Services. WTCC offers more than 400 students from 11 school districts in Wayne County the opportunity to obtain the skills they will need to transition into college, the workplace or the military. Many of the programs follow a nationally recognized curriculum, and students may earn technical endorsements on their diplomas. They also have the opportunity to participate in work experiences such as internships, co-ops and job shadowing, as well as the opportunity to join career and technical student organizations, among them SkillsUSA and Health Occupations Students of America (HOSA).

One of the programs offered at WTCC is called New Vision Renewable Energy. This one-year interdisciplinary program is open to seniors who are interested in exploring the technical, economic, governmental and political aspects of designing and installing renewable/alternative energy systems. Students apply to the program during their junior year, but there are some prerequisites for admission. They must be academically strong in the sciences, possess basic knowledge

PHOTO COURTESY OF WAYNE TECHNICAL AND CAREER CENTER



Wayne Technical and Career Center students stand in front of the school's 2kw solar array and 10kw Bergy Turbine.

of residential and commercial wiring/electrical theory, and be planning to attend postsecondary education or training. Among the other attributes required are being able to work both independently and on a team, the desire to be outside in the elements—and as teacher James Buck notes, the students must exhibit maturity. They also have to submit a well-written essay and a recommendation from their home high school counselor, science or technology teacher.

According to WTCC Principal Craig Logan, although the program officially started four years ago, the planning for it began when they reintroduced electrical trades about eight or nine years ago. As a career tech educator of adults and high school students, Buck recognized the changes occurring in the industry and began learning about renewable energy so he would be prepared to teach the skills his students would need for the future. "With the changes over the years in the electrical field, electricians have to change or be unemployed," he explains. "So I started teaching students about category 5 wire and fiber optics and then added solar and wind so they could see the different avenues available to them."

With the first grant of $1,000 from a local teacher resource center, WTCC was able to install a small solar array system. It has since received grants from the N.Y. State Energy Resource Development Authority for a solar array and wind turbine, and plans are in the works for a solar thermal installation with photovoltaic panels. The center was also awarded a grant to create a commercial wind turbine technician program for secondary and adult students slated to open this spring. The units of study in the WTCC program include alternative fuels/biomass, biodiesel; current and future environmental issues; emerging technologies; geothermal; photovoltaic systems; solar heating; wind systems; battery technology/maintenance; electrical connections; energy conservation efforts; governmental agencies/resources; and site codes and restrictions.

In addition to receiving interdisciplinary instruction in English, meteorology, economics and technical/applied science, the students have the opportunity to participate in job shadowing and internships, working in the field and learning from certified installers and professionals at local businesses. "The businesses have been great," said Logan. "Sustainable Energy Development has provided guest speakers and scholarships for our students. Students have participated in internships and cooperative learning at Rochester Solar Technologies, and they are going to have the opportunity to intern with eVANHEE Clean Energy."

Through dual credit agreements with local postsecondary institutions such as Finger Lakes Community College and SUNY Morrisville, students in the WTCC New Vision Renewable Energy program have the potential of earning up to 12 college credits. Although the program only started four years ago with three students, all three of those students went on to college, and according to Buck, one of them hadn't even planned to go to college until he took the class. "Two of them went to Hudson Valley Community College's photovoltaic program, and one went to the commercial wind energy program at Laramie County Community College in Wyoming. They all graduated with 3.5-4.0 GPAs, and they all are working in the field and doing phenomenally well," Buck reports proudly.

Graduates in the second and third years of the program have also gone on to postsecondary studies, some of them at Alfred State College. Buck notes, "One instructor at Alfred said he knew he had a couple of my students in his photovoltaic program, and he was very happy to have them."

There are challenges even in good economic times to building a CTE program, but Logan and Buck now have the success of their graduates to help them in their efforts to convince high school students that this is a great opportunity for their future. "We go everywhere we can," said Logan. "We try to promote the program through the Boy Scouts, Girl Scouts and 4-H."

Buck has taught about renewable energy at a couple of summer science camps, and one female student who attended the camp two years ago is now a student in the WTCC program because of that experience. Each year he also takes students on the National Solar Tour to visit green homes and buildings using solar energy. "This year some of the parents wanted to go," he said.

"We are trying to spread renewable energy as a theme throughout the campus," said Logan. "We want to get different students involved and help them see the impact sustainable practices can have on their industry—for example, making and using biodiesel in the power mechanics program, and the designing and building

of Electrathon electric race cars in the engineering/CAD and metal trades/motorsports fabrication programs."

Logan and Buck will continue to make improvements to the WTCC renewable energy program and will continue their efforts toward promoting it, but as Logan notes, "It takes time for people to understand the value of a program like this, but the more it becomes mainstream, the more it becomes viable." It also helps to have the commitment of a dedicated principal and instructor.

PHOTOS COURTESY OF CENTRAL CAROLINA COMMUNITY COLLEGE

▲ Top: The new Sustainable Technology Center at Central Carolina Community College.
▲ Bottom: Instructor Robert Armantrout works with students in the Central Carolina Community College biofuels lab.

Building a Biofuels Program in North Carolina

Since 2002, Central Carolina Community College (CCCC) has offered an innovative program in sustainable agriculture, and more recently began a sustainable technologies program offering tracks in alternative energy and green building. The alternative energy track includes education in solar energy, wind power, hydroelectric, biofuels, and other sources of renewable energy.

In the fall of 2008, CCCC began offering an associate degree in Alternative Energy Technology: Biofuels, and although the degree program was new, biofuels education wasn't new to CCCC. The school had been offering workshops and courses through continuing education since 2002, but thanks to a 2007 grant from the North Carolina Community College BioNetwork, it became the first community college in the state to offer a full-time biofuels curriculum designed to equip students with the skills needed for a career in this growing industry.

The N.C. BioNetwork supports the N.C. Community College System by aligning workforce education and training to the biotechnology, pharmaceutical and life science industries. It has seven centers hosted by community colleges across the state, where it develops courses to meet the needs of the industry.

CCCC, which serves the N.C. counties of Chatham, Harnett and Lee, built a comprehensive biofuels testing lab with support from N.C. BioNetwork and the N.C. General Assembly, which provided $50,000 for equipment. The biofuels program is an interdisciplinary curriculum that combines chemistry, biotechnology, industrial design, sustainable agriculture and energy resource management. In addition to the associate degree, CCCC also offers a certificate in biofuels production, which is designed to provide students with the necessary skills for obtaining a technical position in the industry. The 16-credit course includes Biofuels I and II, as well as Biofuels Analytics and Bioprocessing Practices.

The Associate in Applied Science in Biofuels Technology degree program is designed not only to provide students with the technical skills they need to obtain employment in the biofuels industry, but it also provides them with the education that will help them be able to create a new business dealing with biofuels. The

PHOTO COURTESY OF LANSING COMMUNITY COLLEGE

The team from Lansing Community College won first place in the Mac Zero Project, and the team's logo exemplifies the commitment to net-zero energy performance by utilizing a design that is very traditional while still state of the art.

curriculum includes general education courses such as expository writing, professional research and reporting, survey of mathematics, and a humanities and a social science elective. The students also study organic and biochemistry, computer concepts, environmental health and safety, electricity, mechanisms, and pumps and piping systems. In addition to their biofuels courses, the students also learn about bioprocess plant operations, and they get an introduction to the techniques and procedures for planning and opening a small business.

In the associate degree program, students participate in a co-op work experience that emphasizes integrating classroom learning with related work experience. According to N.C. Energy Curriculum Improvement Project Director Andrew McMahan, who is the CCCC biofuels program coordinator, most of the companies providing the co-op experience are small, locally owned fuel producers such as Carolina Biofuels and Triangle Biofuels. The program has an especially good relationship with nearby Piedmont Biofuels.

In the biofuels project experience that is part of the program, students pursue an individual project, which they are expected to complete with accurate records and demonstrate an understanding of the process. Upon completion of the CCCC biofuels program, students should be able to evaluate career selection, demonstrate employability skills and satisfactorily perform work-related competencies.

McMahan notes that some graduates of the program have gone on to four-year institutions—even some who didn't really see themselves as college students before entering the program. Others have gone on to work in the industry, but McMahan says, "One of the realities of biofuels is that right now it's a small industry. However, we have a great relationship with the industry, so when there is a need for employees, they solicit us. People now are aware that we are here, and they find great value in what we teach. We also have placed graduates in related industries, such as solar installation, which we are able to do because of the electrical courses they take in our program."

CCCC, which notes that it has been a leader in biofuels education on the East Coast since 2002, continues to serve the industry in its state by hosting a number of biofuels-related workshops and conferences throughout the year, including weeklong biodiesel workshops, fuel quality workshops and N.C. biodiesel community conferences.

An Alternative Energy Leader in Michigan

In 2004, Michigan's Lansing Community College (LCC) received a Hydrogen/Alternative Energy Center Award of almost $1 million from the U.S. Department of Energy Hydrogen Program for its energy initiative. LCC then became one of the first colleges in the nation to incorporate alternative energy into its curricula and to offer an associate degree in alternative energy engineering technology.

Today LCC alternative energy students study wind, solar, geothermal, energy efficiency, and biomass/gas energy production systems. In two alternative energy classrooms, LCC students get hands-on experience with commercial alternative energy systems equipment and sophisticated high-power hydrogen fuel cell systems with computer-aided diagnostics. The West Campus of LCC is even heated and cooled by a geothermal system.

The college's heating, ventilation and air conditioning (HVAC) students also learn energy management and alternative methods for heating and cooling buildings. The residential energy course provides students with a foundation upon which inspectors and auditors

can build an accurate understanding of modern buildings. Each topic includes an overview of the technology, examples of typical installations, procedures for performing audits and guidelines for analyzing potential retrofits. The students learn about topic areas included in the Building Performance Institute Building Certification Model, the Residential Energy Services Network Home Energy Rating Standards and the Weatherization Assistance Program Core Competencies.

In the associate degree program, students prepare to become professional energy specialists involved in the inventory, evaluation, planning, design, installation and maintenance of a wide variety of systems and will gain a working knowledge of "green building concepts and energy efficient design principles." They study the basic principles and history of alternative energy sources as well as the current industry and government status of geothermal, wind, solar, biomass, fuel cells and other energy sources. They also learn about evolving alternative energy career areas.

In the fall of 2009, LCC's Alternative Energy Engineering Technology Program began offering five new certificates: the Alternative Energy Engineering Technology Certificate of Completion, the Energy Efficiency Technician Certificate of Achievement, the Geothermal Technician Certificate of Achievement, the Solar Energy Technician Certificate of Achievement, and the Wind Turbine Technician Certificate of Achievement.

Sean Huberty, lead faculty for the LCC Alternative Energy Engineering Technology Program, says that their students are finding success upon graduation. "Our graduates have taken several paths," he explains. "Some have become entrepreneurs, energy auditors, energy managers, governmental policy analysts, academic researchers, engineers, and a variety of other careers. There is definitely a population of people who use the program to transfer to a four-year university, most often Lawrence Technological University or Michigan State University."

LCC has also partnered with other schools on developing alternative energy curricula. "We work with several other institutions," says Huberty. "We have partnered with Ferris State University, Kettering University and other neighbors, and we currently have a relationship with Lawrence Technological University and The University of Michigan. We have other partnerships in the works with a handful of well-known national and international universities."

The program continues to evolve to meet the needs of the students and the industry. "We have recently revised the curriculum substantially in order to get the most number of students into their chosen career fields successfully," Huberty said. "We have focused on being able to shift quickly and respond to employment gaps in the 'green energy' job market. Our research suggested a pathway approach where students could be at several places on a continuum and find an 'off ramp' to a job. These jobs range from weatherizer to sustainable architect. We have also moved away from conventional technician training and are now focused on preparation for jobs that involve analysis and design of large building projects. The certificates will probably stay around, as we do have a demand for technician training from the electrical side of the college."

Last year LCC participated in the Mac Zero Project of the Build UP! Building a Brighter Michigan Sustainable Housing Design Competition, an open interdisciplinary competition in which seven student teams from across the state design a net zero home to be built on Mackinac Island. Proceeds from the home will be used to establish a trust fund that will provide annual scholarships to students attending a university in Michigan. In April, LCC was awarded first place in the contest. In October, a team of faculty members made a presentation about the competition at the 2010 STEMtech Conference, sharing how planning for sustainable construction required development of integrated learning objectives to ensure successful project delivery from diverse student backgrounds.

Lansing Community College is taking the message of education for a more energy-efficient future beyond its own campus, as are Central Carolina Community College and Wayne Technical and Career Center and other CTE institutions around the country. In doing so, they are not only fueling the education of our students, but they are also fueling the future of our nation. T

Explore More

To learn more about some of the organizations cited in this article, here are the Web sites to explore.

Building Performance Institute
www.bpi.org

Central Carolina Community College
www.cccc.edu

Lansing Community College
www.lcc.edu

National Solar Tour
www.nationalsolartour.org

North Carolina BioNetwork
www.ncbionetwork.org

Residential Energy Services Network
http://resnet.us

Wayne Technical and Career Center
www.waynetechcenter.org

Weatherization Assistance Program Technical Assistance Center
www.waptac.org

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