

Green Schools and Sustainability in Appalachia

Case Studies in Rural Practice



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Appalachian Regional Commission

The Appalachian Regional Commission's (ARC) mission is to be a strategic partner and advocate for sustainable community and economic development in Appalachia.

ARC is a regional economic development agency that represents a partnership of federal, state, and local government. Established by an act of Congress in 1965, ARC is composed of the governors of the 13 Appalachian states and a federal co-chair appointed by the president. Local participation is provided through multi-county local development districts.

ARC funds projects that address the four goals identified in the Commission's strategic plan:

1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
2. Strengthen the capacity of the people of Appalachia to compete in the global economy.
3. Develop and improve Appalachia's infrastructure to make the Region economically competitive.
4. Build the Appalachian Development Highway System to reduce Appalachia's isolation.

Each year ARC provides funding for several hundred projects in the Appalachian Region, in areas such as business development, education and job training, telecommunications, infrastructure, community development, housing, and transportation. These projects create thousands of new jobs; improve local water and sewer systems; increase school readiness; expand access to health care; assist local communities with strategic planning; and provide technical and managerial assistance to emerging businesses.



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Executive Summary

This report was prepared by Regional Technology Strategies under contract to the Appalachian Regional Commission. These preliminary findings are part of a larger study supported by ARC entitled “Energy Workforce Trends and Training Requirements” which will be released in the Spring of 2011.

Appalachia and energy have been closely linked throughout the history of the nation, from the first discovery and production of oil, to the mining of coal to fuel our industrial growth, to the development of hydropower to bring prosperity and progress to remote rural communities. By using its full range of energy resources and staying at the forefront of emerging energy technologies and practices, Appalachia has the potential to increase the supply of locally produced clean energy and create and retain jobs. ARC believes that this approach will help the Region find new ways to satisfy domestic energy demand, minimize environmental impacts, and attract service and supply side industries and businesses.

In 2006, the Commission released *Energizing Appalachia: A Regional Blueprint for Economic and Energy Development*, to provide a strategic framework for the promotion of new energy-related job opportunities throughout the Appalachian Region. In developing the blueprint, the Commission convened an Energy Advisory Council made up of state energy office directors and other experts. In addition, in 2009 ARC began working closely with White House Council on Environmental Quality and seven other Federal agencies on the *Appalachian Regional Development Initiative*, a process designed to provide federal support to strengthen and diversify the Appalachian economy.

Research sponsored by the Appalachian Regional Commission indicates that new economic opportunities in the energy sector are robust. For example, energy

efficiency investments could create 77,000 net new jobs in Appalachia by 2030, and 70,000 new jobs in the renewable energy sector are projected within the 13 Appalachian states as a result of the production of 74GW of renewable energy nationally.

Throughout Appalachia, educational institutions have been historic leaders in rural communities, and important new strategies and bold new initiatives often are a direct result of the vision and support of local secondary and higher educational institutions. Given this important community role, this publication seeks to address two principal questions:

How can colleges and universities work with communities to promote sustainable development and create new economic opportunities in rural Appalachia?

How can education-community-industry-labor partnerships encourage and lead local policy efforts to create local jobs and retain more wealth in the community while improving energy efficiency, and boosting renewable energy production?

This publication highlights best practices in colleges that are both environmentally sustainable themselves, and that foster education-community partnerships to support local economic growth. It emphasizes those institutions most closely aligned with local economies. The examples provided showcase the policies, people, and resources needed to foster a sustainable approach to campus development and management, as well as energize local communities to pursue new opportunities that are available throughout Appalachia.

For example, a survey of the membership of the Community College Alliance for Sustainability illustrates the strength of commitments to achieving more sustainable communities, economies, and campuses. Four in five member colleges have formed college sustainability committees, almost half have a college sustainability officer, and ninety percent are developing new programs in sustainability.

Research now underway, commissioned by ARC, reveals that over 1,500 community and technical college students are enrolled in credit and non-credit courses in renewable energy in Appalachia, while 1,700 students are enrolled in courses focused on energy efficiency. Looking at specific programs that relate directly to efficient energy use, a majority of community and technical colleges in the Region devote some time to energy efficiency or energy management. When complete by early 2011, this research study will provide detailed information about complete supply and forecasted demand patterns for all occupations related to energy sectors in Southern, Central, and Northern Appalachia.

The case studies presented in this publication provide examples of sustainable energy resources and their uses, and illustrate how educational institutions in Appalachia provide both critical leadership and training to meet the needs of emerging industry, and help communities develop markets and generate demand for green products and services. These profiles represent a cross section of innovative practices at post-secondary institutions. Each college profiled approaches education, training, and community leadership in a slightly different way, and develops its own innovative programs designed to prepare students, and communities, for participation in a new energy economy.

Lessons learned from these case studies are also provided, and include:

1. The majority of demand for “green” skills can be met through existing occupations, not new occupations.
2. Sustainability should be treated systemically, as a goal that generates and retains wealth in a community through employment and self employment, increased incomes, better health, higher quality of life, and public sector support.
3. Educational institutions have major roles to play, not only in reacting to business needs but also in influencing business in adopting more sustainable practices.
4. Community and regional colleges have the pulse of the community, understand local needs and biases, and are able to respond and influence them.
5. Effective programs are those that understand the constraints of their market and design programs with the flexibility to accommodate a wide range of students.
6. Many of the new economic opportunities in green jobs are entrepreneurial.
7. Support in terms of time, resources, and recognition from senior college administrators is essential for the success of these programs.
8. Cross-fertilization among colleges in different regions is valuable to innovation.
9. Measures of success used in higher education are not always consistent with wealth generation and retention goals for a community.
10. Many colleges serve as models for sustainability by emphasizing and rewarding energy efficient practices among their students, managing energy use, and building green facilities. By practicing sustainability in their own institutions they become models for the community and economy.



Introduction and Overview

Appalachia and energy have been closely linked throughout the history of the nation, from the first discovery and production of oil, to the mining of coal to fuel our industrial growth, to the development of hydropower to bring prosperity and progress to remote rural communities. By using its full range of energy resources and staying at the forefront of emerging energy technologies and practices, Appalachia has the potential to increase the supply of locally produced clean energy and create and retain jobs. ARC believes that this approach will help the Region find new ways to satisfy domestic energy demand, minimize environmental impacts, and attract service and supply side industries and businesses. Moreover, because of the importance of energy production and conservation to the growth and competitiveness of so many sectors of the economy, from agriculture to automobiles, this approach will help generate and retain wealth in the region's communities.

In 2006, the Commission released *Energizing Appalachia: A Regional Blueprint for Economic and Energy Development* to provide a strategic framework for the promotion of new energy-related job opportunities throughout the Appalachian Region. Approved by the governors of the 13 Appalachian states and the ARC Federal Co-Chair, the blueprint was developed in response to the changing energy supply, policy, and use environment. In addition, in 2009 ARC began working closely with White House Council on Environmental Quality and seven other Federal agencies on the *Appalachian Regional Development Initiative*, a process designed to provide federal support to strengthen and diversify the Appalachian economy.

In developing the blueprint, the Commission convened an Energy Advisory Council made up of state energy office directors and other experts. Members of this

group used their expertise, ideas, and experience, as well as information gathered by ARC, to develop regional energy strategies and identify opportunities for ARC and its member states to address the changing energy market environment. The three broad strategic objectives highlighted in the Energy Blueprint include: (1) promoting energy efficiency in Appalachia to enhance the Region's economic competitiveness; (2) increasing the use of renewable energy resources to stimulate the growth of new jobs; and (3) supporting the development of clean conventional energy resources to retain the existing economic infrastructure.

National research suggests that energy—both renewable energy production and conservation—will produce millions of jobs. Energy efficiency alone is projected to grow fourfold in the next decade and employ 1.3 million.¹ Another industry-sponsored study estimated that renewable energy and energy efficiency together accounted for 9 million jobs and more than \$970 billion in revenue in 2007.² Many of the jobs will require new skill sets, but many others, such as building and maintaining the transmission lines needed to connect rural wind energy farms to cities, will require more conventional skills.

Research sponsored by the Appalachian Regional Commission indicates that new economic opportunities in the energy sector are robust. For example:

- energy efficiency investments could create 77,000 net new jobs in Appalachia by 2030 while cutting projected energy use by 24 percent, resulting in energy savings of over \$21 billion in the Region
- 70,000 new jobs in the renewable energy sector are projected within the 13 Appalachian states as a result of the production of 74GW of renewable energy nationally.

¹ Goldman, C., et al. (2010). *Energy Efficiency and Services Sector: Workforce and Training Needs*. Berkeley: Lawrence Berkeley National Laboratory.
² Bezdek, R. (2009). *Green Collar Jobs in the U.S. and Colorado: Economic Drivers for the 21st Century*. Boulder: American Solar Energy Society.

As part of its Energy Initiative, the Commission has undertaken a range of activities, including educational conferences, targeted grants programs, and research activities, that have thus far provided funding for over 100 projects to support the creation of over 1,000 new jobs and train over 4,000 workers and students for positions in the renewable energy, energy efficiency, and clean fossil energy sectors.

In addition, the Commission has adopted new policies for enhancing the energy efficiency of all ARC-funded construction projects. These policies include a focus on outreach and education to community leaders and requirements that ARC-funded construction projects address energy efficiency. These new policy measures help ensure that ARC will be promoting efficient development in the Region going forward and help create demand for related green construction employment.

Strategic partnerships have been and will continue to be essential in the development and implementation of all these activities. Some of the leading national organizations and federal agencies that are working with the ARC to develop and implement these programs include the U.S. Department of Energy, National Renewable Energy Laboratory, American Wind Energy Association, National Energy Education Development Project, Southface Institute, Southern Alliance for Clean Energy, U.S. Green Building Council, American Council on Energy Efficient Economy, Penn Future, Tennessee Valley Authority, U.S. Department of Housing and Urban Development, U.S. Department of Labor, and State Energy Offices.

The Role of Educational Institutions

Throughout the ARC region, its educational institutions have been historic leaders in rural communities, and important new strategies and bold new initiatives often are a direct result of the vision and support of local secondary and higher educational institutions. How do colleges and universities work with communities to promote sustainable development and create new economic opportunities in rural Appalachia? How can education-community-industry-labor partnerships encourage and lead local policy efforts to create local jobs and retain more wealth in the community while improving energy efficiency and boosting renewable energy production?

The success of responding to changing demands for efficient energy use and renewable energy production will depend heavily on the region's educational institutions, from elementary through graduate schools. These institutions not only train tomorrow's workforce and educate future entrepreneurs, but they also reach out to the community to improve understanding of the long-term implications of the new energy economy.

To support this leadership role and develop the necessary new programs, the U.S. Department of Labor provided over \$500 million of economic stimulus funds for training for green jobs programs. In addition, leading the way in energy efficiency in their communities, some 3,813 higher education projects across the nation were in the process of obtaining LEED certification in the spring of 2010.³

³ Hough, Mark (May 16, 2010). *The Campus Green: Trampled by the Wheels of LEED?*, Chronicle of Higher Education.

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This publication highlights best practices in colleges that are both environmentally sustainable themselves and that foster education-community partnerships to support local economic growth. It emphasizes those institutions most closely aligned with local economies. The examples provided showcase the policies, people, and resources needed to foster a sustainable approach to campus development and management and to energize local communities to pursue new opportunities that are available throughout Appalachia.

Exemplary and Innovative Practices in Higher Education

Many of Appalachia's colleges and universities have moved quickly toward sustainability, in terms of educating and training for, promoting, and adopting sustainable practices. Although virtually all ARC institutions are responding in some way, this document highlights a few that are particularly innovative or exemplary. Each case study highlights innovative ways that higher education institutions, and community colleges in particular, are responding to and leading the way towards a more sustainable economy and how that change is affecting jobs and wealth across the region.

These case studies draw largely on information and insights gleaned from two sources. The first source is the Alliance for Sustainability, a project supported by the Ford Foundation to engage a group of community colleges in central Appalachia in efforts to generate and retain more wealth while pursuing triple bottom line outcomes—economic, social, and environmental. The second source is an on-going evaluation of the economic impacts of energy and environmental policy in Appalachia with a heavy emphasis on workforce implications.

The Community College Alliance for Sustainability

Formed in 2009 with a grant from the Ford Foundation to support members in central Appalachia, this network seeks to develop new and better ways to

educate, train, promote, and support sustainable rural development. This learning and innovation network has worked to introduce new ideas into their curricula and community that involve forms of renewable energy, energy conservation, and local production aligned with local talents and markets. This project, one of many supported by the Ford Foundation, treats sustainability as part of a local wealth creation system in which the colleges are part of a value chain that connects people, sectors of the economy, community organizations, and places near and far.

The goals of the Alliance are: expanding or improving programs that support employment in sustainable enterprises; attracting and retaining students in programs that lead to employment opportunities; supporting entrepreneurship in green building, energy conservation, sustainable agriculture, and ecotourism; helping local businesses understand the economics of sustainability and social inclusion; building partnerships with government agencies, community-based organizations, and extension services; increasing energy efficiency and renewable energy on campuses; and sharing everything learned or developed across Appalachia and the United States.

A survey of the membership illustrates the strength of their commitments to achieving more sustainable communities, economies, and campuses. Four in five member colleges have formed college sustainability committees, almost half have a college sustainability officer, and 90 percent are developing new programs in sustainability. Programs are slower to appear, as it takes time to get state approval and build the demand among students. Only a few colleges have dedicated two-year degree programs in place in the field of sustainable development, with the largest number of such programs being found in solar installation and repair and electric/hybrid vehicles. All colleges, however, have made adaptations to existing programs by adding courses addressing skills associated with renewable energy or energy conservation.

A sampling of these innovative efforts includes:

Hocking College in Nelsonville, Ohio, has the only eco-tourism program, is in the process of developing a local food systems program with ACENet, and has degree programs in alternative energy and in automotive hybrids. (Details in case study.)

Cleveland State Community College in Cleveland, Tennessee, has a degree program in environmental sciences, is working to make its campus green, and embeds sustainability into all programs. (Details in case study.)

WVU-Parkersburg's two-year college has developed Energy Assessment/Management and Solar Energy Technology certificate and degree programs. The college is a founding member of the Mid-Ohio Valley Green-Up Council, which was created to integrate green practices into current college curricula and organized labor apprenticeship programs. Further, with the support of the West Virginia Community and Technical College System and the WV Division of Energy, the college is becoming the Solar Training Center for the state of West Virginia, providing train-the-trainer and faculty development workshops for other community and technical colleges. Putting sustainability principles into practice, WVU-Parkersburg also has internal and external recycling programs, practices energy and resource conservation, and provides workshops, programs and information that address questions, concerns and careers in emerging energy fields.

Bridgemont Community Technical College in Montgomery, West Virginia, is establishing the Bridgemont Sustainability Institute with a planning grant from the West Virginia Community and Technical College System and help from the West Virginia Department of Environmental Protection. The Institute's threefold mission is to educate West Virginia's workforce in sustainability concepts, enhance West Virginia's

academic offerings in green technologies, and assist communities in their pursuit of sustainability. According to President Jo Harris, "It is vital to our state and our nation that we commit ourselves to sustainability to be good stewards of the environment." The college also purchased a biodiesel reactor and waste wood pelletizer for use in their Diesel Technology and Mechanical Engineering Technology programs to help demonstrate real world applications of green technologies. More than 400 students have taken a new introductory course, Sustainability 101, which covers the triple bottom line of sustainability. Further, the college changed its Building Construction Management degree to Building Sciences Technology to incorporate weatherization training as part of the green construction curriculum and now has a certified Home Energy Rating System rater on staff.

Bevill State Community College in Fayette, Alabama, formed a college-wide Sustainability Committee to comprehensively examine progress towards sustainability strategies. The college received a Department of Labor grant to start a Center for Renewable Energy, the initial focus of which is a certificate program in Bioenergy that focuses on training for biomass companies located in the region. The college also plans to implement several new courses related to sustainability and green technology in a number of career and technical programs. In addition, last summer the college entered into an agreement with an independent contractor to implement a plan for programming, procedures, and other measures to ensure energy consumption savings. The objectives were to reduce the yearly energy consumption and to train personnel for maintaining the building automation systems at an optimal condition. Since implementing this project, Bevill State Community College reduced its annual energy usage by approximately 90,000 kWh, leading to a savings of about \$180,000. Bevill State plans to continue this process and add more buildings for additional energy and monetary savings.

Introduction and Overview

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Walters State Community College in Morristown, Tennessee, is shepherding a Clean Energy Technology A.A.S. degree program through the state-level approval process. It has been approved by the Tennessee Board of Regents and awaits approval from the Tennessee Higher Education Commission. Once the program is approved, it will be added to the college's catalog as a full degree program. The college was also awarded contracts to install a wind turbine and solar arrays on campus and has greenhouses awaiting geothermal design and installation. The college also has a \$1 million grant to develop training in green energy technology with a focus on biomass from wood pelletization and solar panels for public housing and has plans to develop a viticulture program.

Haywood Community College (HCC) in Clyde, North Carolina, is building a Research Demonstration House on campus in cooperation with the USDA Forest Products Laboratory as a model of sustainable building practices, low impact development, and green building technology. The model, which will feature energy efficient technologies, will be constructed by students and will demonstrate green building technologies, the recycling of construction waste materials, and

the relationship of energy efficiency to affordable housing. The college received the top ranking in North Carolina and placed 19th in the nation in the Waste Minimization category in the RecycleMania 2010 competition. RecycleMania, a friendly competition and benchmarking tool for college and university recycling programs, promotes waste reduction activities to their campus communities. HCC received a grant from the Biofuels Center of North Carolina for the Haywood County Biofuels Production, Education, and Training Project to provide alternative fuel supplies for campus and county diesel vehicles; integrate biodiesel training into the college's existing Industrial and Automotive Systems Technology curricula and Continuing Education programs; train the workforce in biofuels technology; and increase awareness of biofuels. HCC was also one of three local community colleges that received a \$100,000 grant from the Appalachian Regional Commission to develop and expand green jobs training programs.

Renewable energy and conservation are making headway in even the most coal-dependent parts of Appalachia. For example:

Mountain Empire Community College in Big Stone Gap, Virginia, is working with the local power company on carbon sequestration and developing a biomass program. The community college received a \$5 million grant for training in weatherization and an ARC grant to develop training for installation of solar and wind energy.

Ashland Community College in Ashland, Kentucky, is moving towards offering training in solar installation.

Southeast Community Technical College in Cumberland, Kentucky, under Kentucky's state-wide program, is developing programs in weatherization, winterization, and energy efficiency.

ARC Energy Workforce Trends and Training Needs

The second source of information for this publication is a study now underway at Regional Technology Strategies for the Appalachian Regional Commission. The study analyzes the workforce trends and training needs for the region's non-renewable and renewable energy industry. Based on 114 responses to a survey of community and technical colleges in the ARC region, Table 1 shows that 198 students were enrolled in credit courses and 344 in non-credit courses in renewable energy, and that 1,207 students were enrolled in credit courses and 394 in non-credit courses in energy efficiency, which has broader appeal because of

its application to so many sectors of the economy. Considering specific programs that relate directly to efficient energy use shows that a majority of colleges do devote some time (in nearly all cases three credit hours or less) to energy efficiency or management. However, in most programs between 25 and 50 percent still do not (Table 2). This suggests that sustainability is still not a high priority in higher education.

When complete by early 2011, the report will provide detailed information about complete supply and forecasted demand patterns for all occupations related to energy sectors for each ARC sub-region.

Table 1: Number of students in ARC region enrolled in Community or Technical Colleges with classes related to sustainable energy issues, 2010

Subject	Enrollments in credit courses	Colleges with courses	Enrollments in non-credit courses	Colleges With courses
Energy Efficiency	1,207	18	394	23
Renewable Energy ¹	198	6	344	18

¹ Wind, solar, biofuels, etc.

Source: On-line survey conducted by RTS for ARC in 2010 with 114 responses.

Table 2: Percentage of Community or Technical Colleges that devote at least one credit hour to energy efficiency or management in selected fields

Program of study	Number of respondents offering	Percent teaching about energy or conservation
Construction	45	74
Manufacturing	48	67
Heating, ventilation, air conditioning	69	79
Automotive technology	45	72
Architectural engineering technology	45	54

Source: On-line survey conducted by RTS for ARC in 2010 with 114 responses.

Introduction and Overview

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The case studies that follow are six of 13 that have been written for this study that relate directly to sustainable energy sources and uses and illustrate places that higher education has provided leadership and workers.

- *Cleveland State Community College* in Tennessee, the Tennessee Valley's only Zero Energy College, offers degree programs in renewable energy and is preparing and retraining the workforce in energy efficient residential construction.
- *Hocking College* in Ohio has offered a degree in fuel cells and automotive hybrids since 2003, developed in part to drive the state's fuel cell cluster initiative.
- The Research Institute for Environment, Energy, and Economics at *Appalachian State University* in North Carolina oversees the schools extensive programs in sustainability.
- In Georgia, *Lanier Technical College* is making plans to add renewable energy to its conventional electric utility programs.
- *Alfred State College* in New York, fully committed to sustainability, is integrating renewable energy and energy efficiency into its School for Applied Technology and is having students work on green houses constructed to Energy Star standards.
- Maryland's *Frostburg State University's* new WISE program (Wind and Solar Energy), organized around eight-week modules, has already graduated almost 200 students.

Lessons from the Field

The college profiles that are included in this publication show a cross section of innovative practices at post-secondary institutions in the region. Each college profiled approaches education and training in a slightly different way and develops its own innovative spin on how to prepare its workforce. There are, however, some commonalities to the success of these programs.

1. The vast majority of green skills are required for existing occupations, not new occupations. Therefore, the most effective way to teach about energy conservation and management is to integrate it into the existing curricula and to develop modules that can be customized to fit multiple programs such as construction, automotive, engineering, and agriculture. For example, a construction technology program would make sure that weatherization practices are made standard practice in basic classes. Green is a context in which students learn as well as a skill set.
2. Sustainability should be treated systemically, as a goal that generates and retains wealth in a community through employment and self-employment, increased incomes, better health, higher quality of life, and public sector support.
3. Educational institutions have major roles to play, not only in reacting to business needs but also in influencing business to adopt more sustainable practices. Energy, energy conservation, and energy management programs are most successful when post-secondary institutions work closely with local industry to ascertain its skill needs and demand for graduates and services, and when institutions demonstrate the potential value of sustainable practices to businesses in terms of bottom line outcomes.

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4. Community and regional colleges have the pulse of their community. They understand the local needs and biases and are able to respond to and influence them. They are sensitive to local political environments and the language that must be used to reach key players, particularly in energy dependent regions of Appalachia. At the same time, higher education institutions are not natural partners of non-profit community and regional organizations. Partnerships that have developed are often based on individual relationships generated by overlapping interests. These relationships are crucial to generating and retaining wealth systematically across the community.
 5. Effective programs are those that understand the constraints of their market and are designed with the flexibility to accommodate a wide range of students, including non-traditional students. Many students pursue careers and skills in energy fields as add-ons to current careers or as basic skills enhancement, and they may not be able to or need to devote themselves to a full-time course of study. Effective programs offer flexibility with online and accelerated curricula plus remedial programs.
 6. Many of the new economic opportunities in green jobs are entrepreneurial. The strongest colleges emphasize entrepreneurial skills that are directly relevant to the energy management and conservation fields. Some even provide incubator facilities.
 7. Support in terms of time, resources, and recognition from the college administration is essential. Without such support, college faculty will not be able to give sustainability sufficient attention and the priority it needs.



8. Cross-fertilization among colleges in different regions is valuable to innovation. Even where political and philosophical differences exist, colleges recognize that common interests offer opportunities for learning from one another.
9. Measures of success used in higher education are not always consistent with wealth generation and retention goals. Colleges' primary responsibilities are first to the students, second to the communities. New, or at least additional, measures for community impact and wealth retention are needed.
10. Many colleges are models for sustainability by emphasizing and rewarding conservation among their students, managing energy use, and building green facilities. By practicing sustainability in their own institutions, they become models for the community and economy.

Case Studies: Green Schools and Sustainability in Appalachia

1



Energy Efficient Residential Construction

Cleveland State Community College, Cleveland, Tennessee

Cleveland State Community College
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BACKGROUND: CLEVELAND STATE COMMUNITY COLLEGE (CSCC) IS LOCATED IN CLEVELAND, TENNESSEE, IN THE STATE'S SOUTHEAST CORNER. THE SCHOOL SERVES THE FIVE-COUNTY AREA OF BRADLEY, MEIGS, MCMINN, MONROE, AND POLK COUNTIES AND HAS AN ENROLLMENT OF APPROXIMATELY 3,500 CREDIT-SEEKING STUDENTS AND 1,500 NON-CREDIT STUDENTS.



CSCC is a community college at the helm of efforts to transform the way energy is used in its region. Through its program in energy efficient residential construction (EERC), CSCC is revamping its curriculum in construction technologies to attract students and companies who see the economic benefits of using energy efficiency to brand them in the marketplace.

Cleveland State's program in energy efficient residential construction began in 2005 with a grant from the U.S. Department of Labor for \$861,840, one of 70 Community Based Job Training Grants. The project that CSCC designed for the grant incorporated concepts of green building, energy efficiency, and sustainability into the existing construction technology curriculum; reached out to the local education community to raise awareness of energy-efficient construction; purchased equipment and technologies to support classroom learning; and offered continuing education to local contractors in the construction industry.

Curriculum: With the DOL grant funds, the college created six courses in topics related to energy efficiency and alternative energy. The courses could be taken as part of the associate of applied sciences (A.A.S.) degree in construction technology; as a stand-alone certificate program called the zero energy home certificate; or on a one-off basis with students taking only classes interesting or relevant to them. The six courses are Renewable Energy; Solar



Photovoltaic (PV) System Design and Installation; Energy Efficient Residential Elements; Ground Source Heat Pumps; Home Energy Rating System; and Service Learning. CSCC is in the process of developing an articulation agreement with the University of Tennessee at Chattanooga for a bachelor of science degree in construction management.

Greening the Construction Industry: Integrating energy efficiency into existing curricula is considered best practice in designing industry-specific training and has been recommended for green job training.

The rationale for embedding energy efficiency courses into the construction technology program is that job descriptions for traditional construction jobs and for energy efficiency construction and retrofitting jobs are not very different.⁴ In fact, in response to the overwhelming enthusiasm over the promise of green jobs, more-cautious analysts have warned that many green jobs are not new but are traditional jobs using new or different skills and inputs.⁵

⁴ Center on Wisconsin Strategy. (2008). *Greener Pathways: Jobs and workforce development in the clean energy economy*. Madison: Center on Wisconsin Strategy.

⁵ Chapple, K. (2008). *Defining the Green Economy: A primer on green economic development*. Berkeley: Center for Community Innovation.

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Energy Efficient Residential Construction
Cleveland State Community College, Cleveland, Tennessee

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In the case of energy efficient construction, this is largely true. The differences between traditional and energy efficient construction are found in materials, equipment and techniques that do not require different technical competencies but rather awareness and knowledge of how to apply them differently. For example, the way a house is framed has an effect on the way it can be insulated, which in turn influences the energy savings that can result from better insulation. The energy efficient framing technique does not require a different set of basic competencies for a framer, but it does mean that a framer needs additional or different knowledge to build an energy efficient home.

Because energy efficiency techniques and principles are taught within the context of a construction curriculum and because the program has flexible enrollment options, the EERC sequence of course at CSCC is being used by some incumbent construction industry workers as a means of upgrading their skills. The average age of students in the EERC program is 28 to 29, reflecting the fact that students are coming to the program “from

both sides,” said Technology Chair Allan Gentry. He estimates that approximately two-thirds of the students in the program are incumbent workers from the construction industry, owners and employees of local construction and building companies.

Some people suspect that the weak job market, combined with the buzz around green jobs, is helping to attract students who desire to have some first-mover advantage in the energy efficient construction industry. In this sense, participation in the program is anticipatory of changes seen as inevitable in the construction industry. Some students are also enrolling with plans to pursue opportunities for contracting and self-employment in the areas of weatherization and home energy auditing and rating.

For students who are self-employed or are business owners in the construction industry, gaining new skills related to energy efficiency is a way of expanding the scope of services they can offer clients. Further, building these competencies is a low-cost way of improving competitiveness, which is particularly important in an economic downturn.

John Proffitt, outreach coordinator for the EERC program, noted that when the national housing boom was at its height, it was harder to get people to slow down enough to listen to pitches about the benefits of energy efficiency. Now, when the market for new construction is soft, energy efficiency is seen as a way of distinguishing one’s products and services from those of other firms. Although some firms have disappeared as a result of the recession, Proffitt senses that the ones that remain are here to stay. He sees value in continuing to educate them about the importance of energy efficient construction because of the lasting influence they will have in the region.

Finding the Right Mix of Alternative Energy: In summarizing the launch of the EERC curriculum, Allan Gentry said that the greatest challenge was figuring out how to package the concepts and elements of renewable energy in a way that makes sense for the region in which the program operates. There were several layers to this challenge.

The first was the culture of energy supply and demand. Tennessee is part of the East South Central census division, which includes Alabama, Kentucky and Mississippi. In 2008, this census division had the highest average monthly energy consumption per capita—twice that of New England—and Tennessee had the highest of the group with 1,302 average monthly kilowatt hours per person. Furthermore, even with one of the lowest average retail prices per kilowatt hour at 8.92 cents, the average monthly residential electricity bill was \$116.02.⁶ For this reason, a large part of what the EERC program aims to do—both in the classroom and through its outreach activities—is raise awareness about the concepts and benefits of energy efficiency and renewable energy.

A second layer to the challenge of packaging renewable energy for the region was to determine which energy sources should be emphasized based on their potential for the region given its climate and local economic conditions. For example, Gentry noted that wind turbines, the popular image of renewable energy, are not a viable option in the Tennessee Valley because of local climate conditions. On the other hand, the local climate does make solar energy a



viable option, particularly in conjunction with energy efficient construction where the solar installation can be downsized as a result of a building's reduced energy demand.

The choice to emphasize energy efficiency is both obvious and ambiguous. On the one hand, as a strategy for reduced fossil fuel use and stimulating economic activity, energy efficiency is a green economy sector that has no geographic constraints. Energy efficient construction and retrofitting is estimated to create 18 times more direct and indirect jobs than the renewable energy sectors in the United States.^{7,8} When acknowledging this plus the trends of high energy consumption and low energy costs in Tennessee, there is a clear rationale for a training program that emphasizes energy efficient construction.

⁶ U.S. Energy Information Administration. (2010). *Average monthly bill by census division and state, 2008*. Retrieved on March 6, 2010 from <http://www.eia.doe.gov/cneaf/electricity/esr/table5.html>.

⁷ Center on Wisconsin Strategy. (2008).

⁸ Tennessee Department of Labor and Workforce Development. (2008). *Growing Green: The potential for green job growth in Tennessee*. Tennessee Department of Labor and Workforce Development, Employment Security Division, Labor Market Information Section.

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Energy Efficient Residential
Construction
Cleveland State Community
College, Cleveland, Tennessee

Case Studies: Green Schools and Sustainability in Appalachia

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Cleveland State Community College as Catalyst:

Outreach, one of four areas of activity funded by the grant that launched the program, has been an important part of the program faculty's role. Part of the DOL grant that launched the EERC program funded seminars and workshops for the local construction and utilities industries, highlighting the benefits of energy efficient construction and the negative effects of inefficient construction on energy consumption.

EERC also educates people about the need for energy efficiency and the opportunities for energy savings afforded by renewable energy sources. A CSCC trailer equipped with a solar panel array travels to career fairs and events to raise interest in the program and provide a visual representation of the idea of green jobs and clean energy.

In early 2010, at "Save Green, Go Green," an event at a local mall, CSCC staff described how creating an energy efficient home and changing energy-use behavior can save homeowners and renters money. Gentry was joined at the event by Kristi Strode of the Local Workforce Investment Area 5, the agency with which CSCC is partnering to offer courses to displaced workers.

CSCC responds to the needs of displaced workers by working in partnership with the local workforce investment agency to offer the EERC courses as a series of modules leading to a certificate. Each EERC course, typically taught over a 15-week quarter, is offered as a 40-hour, week long class. The program follows a week-on, week-off schedule that allows for the classes to be taught to two cohorts at two locations over the same 10-week time period.

Challenges: Continued Outreach and Strengthened

Links to Industry: As the EERC program continues to grow and develop, three issues must be addressed in order to strengthen the value of the program to and its impact on the region. The first is creating employment

opportunities. Finding a job after program completion is of central concern for students who are not incumbent workers. Further, the degree to which technical training programs are able to develop strong ties with local industries—engaging them in curricular design and, in exchange, securing hiring commitments for their students—is often considered a metric of success for training initiatives.

Enrollment in EERC courses has grown each year but remains quite small. In the fall of 2009, 32 students were enrolled in at least one EERC course. Because many students are adults working full-time, it can take several years to complete the sequence of courses, if that is the student's goal. Thus, the pool of people who have taken all or some of the EERC courses remains quite small. This small pool of alumni, the fact that many participants already work in the construction industry, and a soft job market are ample explanations for why the program has no formal job placement service and why connections between the program and industry remain largely informal.

The second and third issues are related and have to do with the skills the EERC program teaches. The program's focus is on hard skills and knowledge, such as the technical skills and know-how to diagnose residential energy use and design and the ability to implement retrofits and new construction that minimize energy use. However, in addition to these hard skills and knowledge, the EERC program also prepares students for work that has entrepreneurial leanings, such as launching new ventures, adding new services to existing businesses, or seeking contract employment for home energy rating and retrofitting work available through government agencies, nonprofit organizations, and utilities. This suggests the need for CSCC to provide EERC students with parallel training and support in skills related to entrepreneurship and business management.



Similarly, EERC program graduates face the challenge of raising awareness of and demand for energy efficient construction among homeowners and renters. They must target different populations with the message of energy conservation and efficiency. These populations include: the general public, reached through participation in fairs and other events; high school students, reached through partnerships with schools with vocational education programs in fields related to construction; and the construction industry, reached through seminars held as part of the initial grant-funded project that launched the EERC program.

Since the outreach capacity of the EERC program is limited by the size of its faculty, an argument can be made for preparing students to be ambassadors for the program and for energy efficiency. This would require training them in soft-skills related to public speaking, presentation, and marketing. It would also require the creation of new venues for outreach activities, so EERC students would have channels through which to promote their skills and so the EERC program can reach a wider audience with its message about energy conservation.

Case Studies: Green Schools and Sustainability in Appalachia

2



Advanced Energy and Fuel Cell Technology

Hocking College,
Nelsonville, Ohio

Hocking College
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BACKGROUND: HOCKING COLLEGE (HC) IS A TWO-YEAR COLLEGE WITH ITS MAIN CAMPUS IN NELSONVILLE, OHIO, 60 MILES SOUTHEAST OF COLUMBUS. THE COLLEGE'S SERVICE AREA IS HOCKING, ATHENS, AND PERRY COUNTIES, BUT THE COLLEGE ENROLLS STUDENTS FROM EVERY COUNTY IN THE STATE, FROM 17 OTHER STATES, AND FROM 30 FOREIGN COUNTRIES. ENROLLMENT FOR THE 2010 SEMESTER WAS APPROXIMATELY 6,000 STUDENTS.



Hocking College and its advanced energy and fuel cell program are a critical element of a statewide strategy for fuel cell industry development, and of local efforts to build a vibrant clean energy sector and revitalize a distressed rural area. Hocking College demonstrates the integral role that community colleges play in building and anchoring clean energy firms and clusters by training a mid-skilled workforce that can meet industry needs. The school also illustrates how a community college, as a prominent local asset in a distressed rural area, can encourage the growth of clean energy-related firms and thus encourage local development that creates good jobs.

Hocking College offers associate of applied science degrees in advanced energy and fuel cells as well as a major in automotive hybrids through the Hocking College Energy Institute (HCEI), which was founded in 2003. A degree in regenerative sustainable agriculture, also to be offered through HCEI, is planned to begin in the fall of 2010.

While the institute and its course offerings are still relatively new, the roots of HCEI and Hocking College's leadership in clean energy date back to the early 1980s when Dr. Jerry Hutton, who grew up on a farm in southeastern Ohio and was a former HC student, helped start the International Energy Center. The Center, which no longer exists, focused on natural gas-powered vehicles.



By the early 2000s, Hutton had left the college and begun working for Quantum Technologies in California, a company making fuel cell systems and other advanced energy technologies. Having maintained his ties to southeastern Ohio and to Hocking College's then-president, Dr. John Light, Hutton suggested starting a program in fuel cells. In 2002, Light asked Hutton to start such a program, and in 2003, HCEI's curricula in advanced energy and fuel cells and automotive hybrids were launched "with three students and a briefcase." In the fall of 2009, the programs enrolled 61 first-year students, twice the number who had enrolled the previous year.

Degree Program Structure: The associate of applied science degree in advanced energy and fuel cells requires 102 to 107 credit hours. Approximately 60 percent of these are technical courses that cover

fundamental theories and practice of energy; fundamental theories and practice of energy components for fuel cells, solar, wind and hydroelectric, and cryogenics; and the fundamental processes and technologies associated with batteries, instrumentation and controls. The remaining 40 percent of required classes are in general education and have a clear relationship to the technical content of the curricula and to the general emphasis of community colleges on preparing students for the workforce.

HCEI's program prepares students to maintain and service installed fuel cells or to be research assistants. The course of study covers the basics of fuel cell technology for residential, commercial, and industrial power and for vehicles as well as the requirements for testing, configuring, assembling, and troubleshooting single and stacked fuel cell systems.

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Advanced Energy and
Fuel Cell Technology
Hocking College,
Nelsonville, Ohio

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For students interested in continuing their education, HC has a new articulation agreement with the University of Minnesota, Crookston (UMC), whereby students can complete an additional 45 credits in the School of Agriculture and Natural Resources and receive a bachelor of science in agricultural systems management with an emphasis in biofuels and renewable energy technologies.

While the name of the program includes the term “fuel cells”, graduates are actually prepared for technician positions that support a range of renewable energy sources and systems: solar, geothermal, biofuels, and hydroelectric. This is an important distinction because HCEI’s programs relate to energy industry activity at both the local and state levels. At the state level, there is a tie-in to a well-defined cluster strategy for the fuel cell industry. At the local level, HCEI is part of a more general strategy to promote alternative energy and green companies. A concentration of local solar and wind installation companies is the major influence on job opportunities for students.

Supporting and Anchoring Cluster Development:

Community colleges play an important role in strategies, like Ohio’s Fuel Cell Initiative, to develop new or strengthen existing clusters. At its most basic level, the match between community colleges and clusters is based on the college’s core competency in training students to fill the ranks of the mid-skilled labor force.⁹

HCEI graduates fill Ohio’s critical need for more workers to service fuel cells than to manufacture them, according to Pat Valente of the Ohio Fuel Cell Coalition. Further, the availability of service providers will be particularly important as Ohio seeks to stimulate the demand and use for fuel cells by end-user industries within the state.

Part of the rationale behind Ohio’s decision to pursue fuel cell cluster building as an economic development strategy is the state’s manufacturing history, particularly in the automotive industry. Ohio’s goal of becoming a leading fuel cell manufacturing site is also a bid to restore job opportunities to workers displaced as a result of contraction of the domestic automotive market which hit Ohio particularly hard. The establishment of fuel cell curricula at HCEI and at Stark State Community College in North Canton is a way of preparing displaced workers for the emerging fuel cell industry. Accordingly, Jerry Hutton estimates that 35% of students enrolled in HCEI’s fuel cell programs are displaced adult workers, while the rest are younger students representing the next generation of Ohio’s workforce.

As with any training initiative, though, there is a fine line to walk between preparing students for future job opportunities, in anticipation of industry development, and training them for jobs that do not yet exist—thus jeopardizing the intended effect of increased employment for trainees. Currently, jobs in research and development outnumber those in manufacturing, though this is predicted to change since the end-goal is for Ohio to be a leader in fuel cell manufacturing.¹⁰ To date, HCEI has not had trouble placing students in jobs in the fuel cell and advanced energy industries. This is probably due to the small size of the program so far and to the fact that there are already a number of fuel cell firms in the state. However, this could change if the program continues to grow at a pace mismatched to the growth in relevant job opportunities in the fuel cell industry.

⁹ Grubb, W. N. (1996). *Working In the Middle*. San Francisco: Jossey-Bass Publishers.

¹⁰ Ohio Department of Development Technology Division. (2009). *An Update on Ohio’s Fuel Cell Roadmap*. Columbus: Ohio Department of Development Technology Division.

Beyond training students for existing employment opportunities, HCEI is playing a critical role in encouraging and anchoring the growth of the fuel cell industry in Ohio. The existence of HCEI's training program—and a similar one offered at Stark State—is a powerful signal to fuel cell companies, demonstrating the commitment of the state to developing a mid-skilled workforce that will meet the needs of the nascent industry. By building a local supply of mid-skilled labor, Ohio is making clear to new and existing fuel cell firms that it is committed to encouraging and retaining fuel cell manufacturing within the state, rather than seeing these blue-collar opportunities shipped overseas.

Further, Ohio is giving teeth to the incentives it uses to attract new firms to the state, to encourage Ohio firms to diversify production into fuel cell components, and to encourage national or international firms—some that may already have a presence in the state—to locate the fuel cell part of their operations in Ohio.

One example is the successful recruitment of Rolls Royce's fuel cell operations to Ohio. Ohio Fuel Cell Coalition Executive Director Patrick Valente was the deputy director of the technology division of the Department of Development when the state entered into recruitment discussions with Rolls Royce. At that time, Rolls Royce had operations in Ohio, but none of its fuel cell work was there, and they were considering two other states as locations to headquarter this work. Valente recalls the president of the division saying to him, "I'm not interested in the [financial] incentives that you have. Let's talk about the other things I need." The division president then listed half a dozen issues that he considered critical, including available training programs and providers.

Encouraging Local Green Growth: At the local level, HCEI benefits from being located in a multi-county area that has embraced the movement towards clean energy as an opportunity for economic development and job creation. HCEI plays two roles in these efforts. The first is as an institutional asset that can bolster efforts to attract and retain clean energy industries by guaranteeing access to skilled workers. The second role HCEI plays is as a partner in local efforts, working with economic development actors and firms to promote the transition to a clean energy economy.

Since its inception, HCEI has operated at a satellite location, the Logan-Hocking Industrial Park (LHIP) in the town of Logan. The relationship between HCEI and LHIP is indicative of how HCEI fits into a broader picture of local economic development strategy. LHIP opened in 2003 and is owned and operated by the Hocking County Community Improvement Corporation (CIC).

Until recently, according to Executive Director Bill Rinehart, the CIC's approach to recruiting was to go after "every and any company". In 2009, the CIC commissioned a study from the Voinovich School of Leadership and Public Affairs at near-by Ohio University to determine the feasibility of adopting a green focus for the marketing and recruitment strategy for LHIP. The study confirmed the instinct the CIC leadership had: that there was an opportunity for LHIP to brand and market itself as a green industrial park because of what makes LHIP unique—its relationship with HCEI. LHIP can offer companies access to a prepared workforce as well as the prospect of increased visibility by virtue of proximity and informal affiliation with HCEI, which is attracting much attention and many visitors to its unique programs and to its new LEED-certified building. The building stands out from the surrounding rural landscape with its distinct look and features.

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Advanced Energy and
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Case Studies: Green Schools and Sustainability in Appalachia

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The relationship between HCEI and LHIP is not just about proximity; it is much deeper than that of tenant and landlord. Around 2003, the Hocking County commissioners approached Bill Rinehart about pursuing a grant in partnership with Hocking College to have a workforce development facility located in the county as a tool to attract companies. Six years later this finally happened with \$1.6 million in funding from the Economic Development Administration (EDA), nearly \$200,000 from the Appalachian Regional Commission, and a matching amount from bonds issued by the CIC.

Classes are taught in the HCEI building located on HC-owned land across the road from the existing LHIP building, which houses HCEI's administrative offices as well as two local start-ups, both of which fit with the new green strategy. EMEGA Technologies is two research and development companies with the same owner and a shared mission of producing advanced, sustainable materials that can facilitate "near-zero energy use" for homes and buildings.

The other tenant, Spark Production, produces a rack system used for solar installations. Patrick Preston, founder of the company, lived in the area, but his career in building specialized machinery was mostly on contract outside of the state. After attending a seminar offered by the state of Ohio on alternative energy and talking to some solar installation companies, Preston saw a need for racking for local solar installation. Most of the mounting equipment had been coming from the West Coast and was unsuited for Ohio's winters. Installers were having trouble getting timely deliveries.

Working closely with Dovetail Solar and Wind, a solar and wind installation firm headquartered in Athens, Preston designed racking systems for a number of their solar installation projects. The collaborative process has allowed him to continually refine his product, and while each installation to date has been customized, Preston is hoping to move to mass production.

Proximity to HCEI has had multiple benefits for Preston and his young company. The first has been assistance in building his pipeline of interested customers as Jerry Hutton brings more and more visitors to Preston's offices. Preston also has used HCEI as an educational resource by taking a one-week, 40-hour course in solar photovoltaic energy that is offered occasionally at HCEI. In a nice bit of synergy, the participants in the course used Spark Production's racks to install a full solar array on the roof of HCEI as a hands-on learning experience.

Though EMEGA Technologies and Spark Production are small, they hope to provide internships for students soon. More importantly, retaining companies like EMEGA Technologies and Spark Production in southeast Ohio increases the opportunity to effect change in the local economy, provide needed employment opportunities, and help stem the tide of workers who commute to Columbus.

Alternative and sustainable energy is one of the three target industries of the Athens County Economic Development Council (ACEDC). The focus on alternative and sustainable energy emerged approximately five years ago and reflects the culture and assets of the county, as well as its needs. In addition to HCEI, the county's other assets include being home to several companies involved in alternative and advanced energy, the chronic unemployment issues its workers have faced, and the existing interest and support for alternative energies and for moving away from reliance on coal.

There are five solar and wind installation companies in Athens County, not insignificant for a rural county of approximately 63,000.¹¹ The critical mass of these firms is important to HCEI because it ultimately will mean employment opportunities for HCEI students and graduates.

¹¹ U.S. Census Bureau. (2008). *State and County Quick Facts: Athens County, Ohio*. Retrieved on March 11, 2010 from <http://quickfacts.census.gov/qfd/states/39/39009.html>. (Shelton, 2010).

Both CIC and ACEDC now are focusing efforts on supporting existing and aspiring local clean energy firms. Towards this end, CIC retained the services of a consulting group to study the feasibility of launching an incubator at LHIP. Incubation is a proactive approach on the part of Athens and Hocking counties to support the growth of local firms that can contribute to their economic development strategies. Incubation can provide support that will fill possible gaps between technological know-how and product innovation and application, and the fundamentals of business management, including access to finances and patents.

For HCEI, county-level support for businesses is promising because it helps ensure that existing solar and wind companies in the area survive and continue to grow. As with Spark Production, the potential incubator at LHIP can offer proximity to HCEI's resources, physical plant, and students as an extra benefit of being a tenant, and HCEI's students will continue to benefit from the opportunities for learning and exchange, both formal and informal, that proximity to new firms can provide. Finally, the presence of an incubator provides encouragement and support for HCEI graduates to pursue self-employment or entrepreneurship as an option once they complete their course of study.

HCEI's presence helps shape the qualitative nature of economic development in the region, acting as a resource and support for firms looking to establish themselves and grow in southeast Ohio—where, because of the region's economic distress, there are a number of financial incentives from the federal government for business establishment and job creation. HCEI's presence influences the types of firms attracted to the region, which is important for economic development actors concerned with not just the quantitative measures of economic growth (e.g. jobs and tax revenue), but also with the qualitative aspects of economic development such as job quality and industry environmental impact.

Challenges: Increasing Access and Opportunity:

HCEI's associate degree programs now function more like programs at a residential four-year college than do most community college programs. Students come from a broader service area, and courses are offered during the business day. This creates access barriers for local people who work full-time, for people who cannot relocate to the Hocking College area to seek full-time training, and for people who lack transportation from urban areas.

Further, because the curricula is taught in a community college setting, HCEI is inadvertently excluding people, such as minorities, high-school dropouts, and other disadvantaged groups, who have struggled within the institutional setting of public education and are therefore unlikely to seek training at a community college.

To date, HCEI has not had trouble with students not being able to find jobs, though Jerry Hutton notes that this could change since the program has grown faster than expected. Interestingly, as the fuel cell industry moves toward greater maturity in Ohio, training programs like HCEI's will likely need to be brought to scale to train the number of workers necessary to maintain and service installed fuel cells. This scaling-up may call for expansion of the curricula to other schools, repackaging the curricula for delivery through different channels (e.g. distance learning), or distilling the broad fuel cell curriculum into shorter certificate-granting programs focused on different technologies (e.g. solid oxide fuel cell technology versus porous exchange membrane technology) or end-uses of fuel cells (e.g. transportation versus utilities). This repackaging of curricula is well within the realm of the community college's core competencies, as flexibility in adopting new and adapted curricula is one way that community colleges have proven to be strong partners to industry.

Case Studies: Green Schools and Sustainability in Appalachia

3



Leading the Green Revolution Appalachian State University Boone, North Carolina

Appalachian State University
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BACKGROUND: APPALACHIAN STATE UNIVERSITY (ASU) IS A PART OF THE UNIVERSITY OF NORTH CAROLINA SYSTEM. ASU IS LOCATED IN BOONE AND DRAWS STUDENTS FROM AROUND THE STATE AND THE NATION. OF THE NEARLY 17,000 STUDENTS ENROLLED IN THE FALL OF 2009, NEARLY 1,500 WERE FROM OUT OF STATE. THE UNIVERSITY OFFERS BOTH UNDERGRADUATE AND GRADUATE PROGRAMS, WITH JUST OVER 2,000 STUDENTS ENROLLED IN GRADUATE PROGRAMS.



Over the past ten years, universities and community colleges around the nation have been frantically creating programs aimed at training their students to enter the green workforce. Whether these programs are created as independent programs or are modules within existing departments, they all tend to represent a new direction for the post-secondary institution that develops them. But for Appalachian State University, the green revolution started more than thirty years ago. Since the mid-1970s, ASU has been training its students on ways to build homes more efficiently and develop new ways to harness the power of the wind and sun. In the process, the university serves as a model for institutions seeking to enter the fields of energy-focused green technology.

Reaching Out to the Community: ASU is located in the beautiful Blue Ridge Mountains of North Carolina, in Boone, a small college town with the distinction of being one of the more culturally funky communities in Appalachia as well as home to the mighty ASU Mountaineers, the winners of three straight NCAA football championships in the last decade. The university enrolls 14,872 undergraduates and 2,086 graduate students.

One of the highest profile activities at ASU is the Research Institute for Environment, Energy, and Economics, an umbrella organization started in 2008 to oversee three main activities at the university: the Appalachian Energy Center, the Center for Economic



Research and Policy Analysis (CERPA), and the Southern Appalachian Environmental Research and Education Center (SAEREC). The Appalachian Energy Center pursues a wide range of activities aimed at helping communities around the region become more energy efficient. Although there is some applied research, most of the work of the center is in outreach.

“The best way to think about it is that we try to improve the energy efficiency of buildings in the state and beyond,” said Jeff Ramsdell, the Energy Center’s director. “We do outreach to improve the construction techniques of builders and create standards for energy efficiency.”

The Center offers a wide range of training programs aimed at helping people involved in the construction industry understand how to retrofit their buildings to

meet new energy standards and how to make new construction more energy efficient.

Workshops offered through the center have included obvious targets such as sub-contractors as well as less obvious targets like realtors and financial institutions. According to Ramsdell, including these types of actors is critical to making energy efficiency ingrained in the home-buying process.

“One big thing there is a movement towards getting recognition of home energy efficiency in the valuation of a home,” Ramsdell said. “Right now when an appraisal is done, energy efficiency is not really counted for. [The Center] put together a conference to help certify raters to perform a diagnostic to help determine the energy efficiency of homes.”

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Leading the Green Revolution
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The Energy Center also works closely in renewable energy fields. The Center operates a site on Beech Mountain to test small scale wind turbines. Manufacturers send their products to the Center for testing on the site.

The Center also promotes the idea of capturing energy from landfills. A particular area of emphasis is developing ways to capture gas from the smaller scale landfills that exist in many small communities in the Appalachian region. The Center works with businesses and communities to help them harness this often untapped energy source.

An Emphasis on Training: The heart of ASU's efforts around energy, however, continue to be on the academic side of the equation. The university offers two main programs, which are both housed in its Department of Technology: building sciences, which has concentrations in construction management and architectural technology, and appropriate technology, which is ASU's renewable energy program.

The building design program offers students comprehensive study in making residences and buildings more energy efficient.

"What has really differentiated our construction program is the emphasis on energy efficiency," Ramsdell said. "We were doing it before it was cool."

Students who graduate from the program find work as project managers for construction companies or enter graduate programs in architecture. Despite the downturn in the construction economy, Ramsdell says ASU graduates are still in demand.

"What is great is that even with the last two years our students are still getting jobs," Ramsdell said. "They are finding work in high performance and green building. There is a huge market for the installation of building systems that save money."

The appropriate technology program, although separate from the building sciences offering, contains significant overlap. For instance, a student who studies how to install solar panels on a house will have to be well versed in the overall construction of the building.

Students who earn a degree in appropriate technology receive extensive training on renewable energy systems and find jobs with many of the renewable energy companies throughout the region. Dennis Scanlin, chair of the appropriate technology program, says those with a bachelor of science in appropriate technology are in high demand.

"People are in need of our graduates," he said. "You may be able to hire an electrician, but you need someone who understands the system as a whole to make sure it is correctly installed."

Ged Moody, a graduate of the program, says he was drawn to ASU in part because of its ability to teach the practical side of the work.

"One thing that really appealed to me was the applied approach," he said. "It is not an engineering school—it is an applied program. The other thing that led me here was that the university has offered the program for decades. I knew they weren't bandwagon people."

In addition to the undergraduate program, the school offers a Master of Science degree in technology with a concentration in either appropriate technology or building sciences. The program is flourishing, attracting students from around the country. A planned program in building science engineering will add to the graduate level offerings at ASU.

A Holistic Approach: The academic environment at ASU is enhanced by the overall commitment to sustainability at the university. Moody, the former student, returned to the college as sustainability director. The high level of administrative commitment is also shared by the university's students. Students voted overwhelmingly to raise their fees by \$10 to help power the campus through renewable energy. Through the Renewable Energy Initiative (REI), students are conceiving, installing and managing different energy-related programs at the campus. Projects have included installing the state of North Carolina's largest wind turbine and installing solar panels to provide power to the university's student union.

Moody believes that efforts like REI show that the entire university is embracing the idea of sustainability not just the Energy Center and its related programs.



"We have this approach that everyone at ASU will leave with a holistic approach to sustainability," he said. "Whether you major in English, health care, or another subject, you will leave understanding elements of green building and renewable energy. We believe that sustainability is the new paradigm. Businesses that don't promote sustainability, I don't think are going to make it."

The College of Business provides an example of how sustainability is being embedded in the campus. This academic year, the school will offer its first sustainable business concentration for its MBA program. Continually imbuing the school with sustainability creates an institution that can stay at the forefront of promoting a green economy.

"When you start with the value-set already built into the institution, it really is a head start," Moody said.

Case Studies: Green Schools and Sustainability in Appalachia

4



Serving the Present Needs,
Preparing for a Sustainable Future

Lanier Technical College
Oakwood, Georgia

Lanier Technical College
Corson Lee Allen, Lead Instructor
Electric Utility Technology
http://www.laniertech.edu/academic-programs_/electrical%20utility%20technology.asp?m=4&deptid=81
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LANIER TECHNICAL COLLEGE, PART OF THE TECHNICAL COLLEGE SYSTEM OF GEORGIA, IS A LEADER IN WORKFORCE DEVELOPMENT FOR INDIVIDUALS AND INDUSTRIES IN AN EIGHT-COUNTY REGION OF NORTHEASTERN GEORGIA. ITS ASSOCIATE DEGREE, DIPLOMA, AND CERTIFICATE PROGRAMS, SHORT-TERM WORKSHOPS, CONTINUING EDUCATION, AND CUSTOMIZED TRAININGS ARE SPREAD OUT ACROSS THE SCHOOL'S FIVE CAMPUSES. UNDERGRADUATE ENROLLMENT IS APPROXIMATELY 3,100.



Electrical Utility Technology Programs: Through its Electrical Utility Technology (EUT) program, Lanier Tech offers three courses of study that prepare students for work in the electrical power industry. Courses of study range from a 42 credit-hour certificate program to a two-year associate in applied science (A.A.S.) degree.

The 42 credit-hour program leads to an electrical utility technician certificate. The certificate program is intended for incumbent workers in the electrical utility industry and is meant as a way for them to upgrade or enhance their academic or professional skills. Required courses include three in core subjects—English, algebra and trigonometry—and six in occupational subjects, including direct and alternating current circuits, computers, and power fundamentals. The certificate offers incumbent workers a way to move up within their industry—for example, from a physically demanding or low-skill job to a mid-skilled technician job.

The electrical utility technology diploma program is meant to prepare students for entry-level positions in the electrical utilities field. Along with a focus on electrical theory, the diploma program emphasizes basic and work skills and practical application of electrical theory in order to prepare students for success in the workplace. Diploma seekers must complete 90 credit hours of coursework, of which one-quarter are general education requirements. The



majority of the courses are occupation courses, which introduce the electrical utility industry and the fundamentals of power production and distribution. This grouping of courses also includes a course in power generation.

The A.A.S. degree in electrical utility technology requires students to complete 102 credit hours. It builds on the diploma curriculum and requires students to complete general education courses in the natural sciences, social sciences, and humanities. These courses are taught at the college level. Most students who choose to switch to the degree program do so during their second year.

Students who graduate from the program are qualified to fill a number of positions in the electrical utility industry: engineering technician or representative, substation maintenance technician or electrician, meter technician or generator technician.

Students in the diploma program are eligible for the state's HOPE grant program, which covers tuition and expenses. Students entering the degree program can be considered for the HOPE scholarship program for students who have demonstrated academic excellence. Together, these opportunities enable students to prepare themselves to enter the electrical utility workforce at virtually no cost.

The EUT program has completed its second academic year. While enrollment was steady for the first two years at an average of 25 students, enrollment at the beginning of the third year has dramatically increased to 38. According to Lee Allen, program director and lead instructor, approximately 75 percent of these students are employed and enrolled part time. Occupational courses are offered in the evenings, since many of the instructors are current utility company employees.

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Serving the Present Needs,
Preparing for a Sustainable Future
Lanier Technical College
Oakwood, Georgia

Case Studies: Green Schools and Sustainability in Appalachia

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Partnership with Industry: The A.A.S. program was born out of collaboration with the Georgia Energy and Industrial Construction Consortium (GEICC). The GEICC is itself a partnership between the state's electrical and natural gas utilities and utility associations; nuclear, oil, and gas industries; the industrial construction industry; and the state and federal offices of workforce development, labor, and education. This coalition was formed in 2007 to engage the energy industry in a strategic, results-driven plan of action to address the workforce needs of the energy sectors across the state.



At that time, one of the biggest problems utilities were facing was the aging of their line workers. To address this issue, the GEICC worked with three community colleges to develop a line worker apprentice program. Similarly, the consortium entered into a partnership with Lanier Tech, with initial funding from the Appalachian Regional Commission, to launch the Electrical Utility Technology A.A.S. degree program. Courses from the lineworker apprentice programs are accepted by the EUT program as transfer credit electives.

Though the state of Georgia has many power companies, Georgia Power and Jackson EMC have been the strongest partners to Lanier Tech so far. Their employees serve as program instructors and members of the program's advisory board.

In preparation for the next year or two, when the program begins graduating a larger number of students, the EUT program is shifting the composition of its advisory board to include workforce development representatives of power companies. Neil Matheson, the original program director, stated that the program's advisory board was composed of "movers and shakers" in the statewide industry who saw the need for training programs and mobilized the resources to launch the EUT program. Now Matheson sees the need for people responsible for hiring to be closely involved with the program, so they can see the quality of the training students are receiving and provide input to refine the training process.



Directions for the Future: In the near future, Lanier Tech is planning to add curricula in solar photovoltaic and solar thermal technologies. These programs will be offered through the electronics technology department of the school's division of industrial technology, and are currently being prepared to undergo the accreditation process. In the meantime, individuals with some knowledge of electricity fundamentals can take a 40-hour course in solar installation that is being offered through the economic development arm of the technical college.

Matheson, now director of the electronics technology department, is looking toward adding a program in smart grid technologies to the department.

The EUT program is ready for replication across the state, and possibly beyond. The EUT program at Lanier Tech was intended to be a pilot program, and it is now in the early stages of replication at Savannah Technical College. The curricula may also expand to schools in other states that fall within the service area of Southern Company, the parent company of Georgia Power, which has been a leader in convening the GEICC.

Case Studies: Green Schools and Sustainability in Appalachia

5



Spreading Clean Energy Across the Campus

Alfred State College Alfred, New York

Alfred State College
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BACKGROUND: ALFRED STATE COLLEGE (ASC) IS PART OF THE STATE UNIVERSITY OF NEW YORK PUBLIC EDUCATION SYSTEM AND OFFERS BOTH FOUR-YEAR AND TWO-YEAR DEGREES. THE COLLEGE ENROLLS APPROXIMATELY 3,300 STUDENTS. ASC OPERATES TWO CAMPUSES, ONE IN ALFRED AND ONE IN NEARBY WELLSVILLE. THE TOWN OF ALFRED IS APPROXIMATELY 70 MILES SOUTH OF ROCHESTER, NEW YORK.



Alfred State College is a small college with a large green agenda. By incorporating training in green practices and technologies into different courses and degree programs spread across the college, and by installing renewable energy sources on the campus, ASC is playing a central role in New York's efforts to become a leader in green-collar employment and clean energy use.

ASC is one of the State University of New York's few technology colleges. The main campus is located in Alfred, a town of nearly 6,000 people in the region of the state known as the Southern Tier. ASC was founded in 1908 and incorporated into the SUNY system in 1948. The college offers 53 associate in applied science and associate in occupational studies degrees and 17 bachelor's degrees, as well as certificates and continuing education courses. Current full-time student enrollment is about 3,300.

Institutional Commitment to Sustainability: ASC has made an institutional commitment to sustainability and renewable energy. The college is a signatory to the American College and University President Climate Commitment, and in 2008, ASC President John Anderson was one of only three college presidents to attend the Clinton Global Initiative Summit, an annual event convened by former President Bill Clinton to bring together leaders from the business, governmental, and non-governmental spheres to find solutions to some of the most pressing global issues, including energy and climate change.



But, as Glenn Brubaker, an assistant professor in the electrical construction and maintenance program, pointed out, vision alone does not translate into a greener college. Rather, Brubaker noted, there is interest in and support for renewable energy at all levels of ASC's leadership. Individual faculty members with interests in renewable energy receive support from the school's leadership for professional development and demonstration technologies. In turn, interested and capable faculty members provide the staffing for implementing special demonstration and training projects for which the college has leveraged resources from public and private funding sources, including the Appalachian Regional Commission.

Integrating Renewable Energy into Existing

Programs: Much of the activity related to renewable energy at ASC has been centered at the 22-acre Wellsville campus, where the School of Applied Technology has been located since it opened in 1968. There, energy efficiency plus solar, wind, and other

renewable energy technologies and techniques are being integrated into the curricula for several of the school's associate of occupational studies (A.O.S.) degrees, most notably the building trades/building construction, electrical construction and maintenance technician, and air conditioning and heating technology programs.

For example, the approximately 90 students earning an associate degree in electrical construction and maintenance receive four weeks of course and lab work that is dedicated exclusively to renewable energy sources, according to Brubaker. This integration of renewable energy technologies and applications into existing programs reflects the college's commitment to providing students with strong foundations in the theory and application of their chosen technical field of study. Further, Brubaker thinks that the use of renewable energy technologies as demonstration in these courses provides a more engaging way for students to learn the foundational theories that they must master to work in any electrical field, renewable or traditional.

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Spreading Clean Energy
Across the Campus
Alfred State College
Alfred, New York

Case Studies: Green Schools and Sustainability in Appalachia

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Craig Clark, dean of the School of Applied Technology, believes that the hands-on approach sets ASC apart and is a reason why the school draws students from every county in New York and from other states. At other colleges, students may gain experience in renewable energy sources through extracurricular activities and clubs. But the way renewable energy has been incorporated into existing courses of study at ASC allows students to learn these theories and skills while fulfilling their degree requirements.

A Wealth of Opportunity for Hands-On Learning:

The commitment of the college to using renewable energy sources provides students with further opportunities for hands-on learning. Leading by example in its commitment to reduced environmental impact, the college has installed three photovoltaic systems and four wind turbines on the Wellsville campus. When it comes to greening ASC's operations, "students do all the work," according to Clark.

For example, one of the installed photovoltaic systems provides nearly 50 percent of the energy demands of the School of Applied Technology's library and administrative offices. Students in the electrical construction and maintenance technician program were involved in the four-day installation process and, with the guidance of a program faculty member and a local solar industry representative, had a great deal of autonomy in deciding the specifics of the installation.

With the support of the Educational Foundation of Alfred, a private foundation with the mission of enhancing learning opportunities for students, faculty and staff, ASC students in the building trades, heavy machinery, and electrical construction and maintenance electrician programs have been learning by doing, building homes from the ground up in a subdivision owned by the foundation. These houses, whose construction is financed by the foundation, are sold at market rates, upwards of \$200,000. The 49th house built was constructed to Energy Star standards, and uses geothermal pumping.

Construction of the 50th student-built house started in the fall of 2009. Unlike the other student-built houses, this one will not be put up for sale. Rather, it will serve as a showcase Green Home, built to meet the standards of the federal Energy Star program and the green building guidelines of the National Association of Home Builders.

As such, it will serve several purposes. First, it will be a learning laboratory for students, constructed so that the home's energy-saving and energy-producing elements can be observed and monitored for energy usage. Second, it will be open to business, industry and community members as a way of raising awareness and understanding of the latest technologies in green building. Lastly, it will house the administrative offices of the School of Applied Technology and include several guest rooms for visitors.



Opportunities for hands-on learning are not confined to the ASC campuses. In 2009, a team of students traveled to Washington, DC, under the supervision of Jeff Stevens, an instructor in the electrical construction and maintenance electrician program. There they led a four-day workshop at the United States National Arboretum on the benefits, functions, design and installation of solar photovoltaic systems. The workshop was attended by homeowners, contractors, engineers and other interested parties, and culminated in the ASC students installing a 1 kWh solar array, which will power the arboretum's irrigation system. This workshop and installation experience is part of a five-year cooperative agreement between ASC and the National Arboretum, initiated by the arboretum with the goal of receiving technical assistance in making their operations more environmentally friendly.

Case Studies: Green Schools and Sustainability in Appalachia

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Banking on Wind and Solar Frostburg State University, Frostburg, Maryland

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BACKGROUND: FROSTBURG STATE UNIVERSITY IS A FOUR-YEAR INSTITUTION THAT IS PART OF THE UNIVERSITY OF MARYLAND SYSTEM. LOCATED IN FROSTBURG IN THE FAR WESTERN PART OF MARYLAND, THE SCHOOL ENROLLS JUST OVER 5,000 UNDERGRADUATES AND 900 GRADUATE STUDENTS.



Not all post-secondary programs around energy are offered on a for-credit basis. Frostburg State University in Western Maryland offers a not-for-credit program that provides participants with the knowledge needed to install residential wind and solar systems.

The program WISE (Wind and Solar Energy) is offered as a two-stage program. In the first stage, students complete an eight-week online course. In the second stage of the program, students travel to Frostburg for an intense three-day workshop allowing them hands-on demonstrations of these complicated systems. At the end of the course, students can choose to sit for a PV entry level certificate of knowledge exam offered by the North American Board of Certified Energy Practitioners (NABCEP). Students who complete the course enter the energy field with the ability to install residential wind and solar systems and an understanding of how these systems work.

The WISE program began in 2007, funded in part through a grant from the Appalachian Regional Commission. Initially, separate modules were offered for solar and wind installation. However, all members of the first cohort of attendees signed up for both modules, so Frostburg decided it made much more sense to offer the combined curriculum.

From the start, the university designed the program to reach non-traditional students. The only pre-requisite for the class is a high school degree.



“We have a very diverse group, which makes administering the class challenging,” said Dr. Soysal, program director and one of the program’s founders and managers. “In terms of knowledge background we have people who have no technical background and people with electrical engineering degrees and post-docs. This makes our work more challenging.”

The individuals come from diverse educational backgrounds as well as diverse careers. Some students come into the program hoping to enter directly into the energy field while others want to use the residential installation training as a way to enhance their current position. The majority of participants are contractors, but some unexpected occupations are included. For instance, Soysal mentioned one attendee with a full-time job as a real estate agent who believed

that knowledge of residential power systems would be valuable in selling and pricing properties. Other participants from non-technical fields include lawyers, dentists, investment advisors, and homeowners.

Students come from a variety of locations. Of the 120 students in the first three sessions of the program, 89 percent came from the ARC states of Maryland, Virginia, Pennsylvania, West Virginia, and New York. Maryland has contributed just over half of the participants. The online component of the class allows for participation from more far-flung locales. Several international students have taken the class, though they still must participate in the intensive workshop.

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Banking on Wind and Solar
Frostburg State University,
Frostburg, Maryland

Case Studies: Green Schools and Sustainability in Appalachia

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Course structure: The online component of the course is divided into eight sessions that cover the basics of wind and solar power and their applications in the residential environment. Specifically the eight weeklong modules are:

1. Electricity Basics
2. PV and Wind Markets and Applications
3. Solar Energy Fundamentals and PV Module Characteristics
4. Wind Energy Fundamentals and Turbine Characteristics
5. Residential Generation Types and Components
6. System Sizing and National Electric Code
7. Mechanical Design Considerations
8. Safety Basics, OSHA Requirements

At the end of each self-guided week, students are invited to take a self-assessment “test” online to gauge their progress. Feedback is given so students can understand what elements they need to work on before progressing to the next module. Classes can be accessed anytime, a necessity given the fact that so many of the participants are not full-time students.

The on-site workshop offers an intensive introduction to the practical world of installing these systems. Students attend labs where they are given instruction on installing a small grid-connected photovoltaic system, given hands-on demonstrations on wind turbine characteristics. Attendees are also given instructions on inspecting residential generation systems and information about regulatory standards for the installation.

Program Director Soysal, who is also a professor of electrical engineering in Frostburg’s Department of Physics and Engineering, has prepared the online curriculum based on a broad range of reference sources. He continually updates the website to include the most recent documents and external links. Faculty members for the hands-on part of the workshop primarily come from private industry, ensuring that students receive real-world instruction on this technology. It is also key that the university has adequate technology on hand for demonstrating the installation techniques. A portion of the \$850 tuition goes towards ensuring that the program has adequate facilities to instruct their students. In addition, Frostburg State has received funding to build the Sustainable Energy Research Facility, which will house WISE and other programs.



Program impacts: To date, nearly 200 individual have gone through the program which has been offered twice yearly since the fall of 2007. Many graduates have gone directly into renewable energy fields while others have used the knowledge to supplement their careers or even install systems in their homes or businesses. One way of measuring the impact is the number of students sitting for the NABCEP certificate of knowledge exam, which is specifically geared towards solar installation. In spring of 2009, 40 students took the test administered by Frostburg State and 36 passed.

Challenges: The program's main challenges come from its non-traditional nature. While community colleges are accustomed to offering non-credit classes, though not always at the ambitious scale of Frostburg State, such programs are more unusual at the university level. Consequently, getting university administrators to embrace the program has been a challenge. Universities are often accustomed to dealing with traditional students in the 18- to 22-year-old range, a cohort that is only a partial component of the Frostburg State program. The success of the program, demonstrated both in terms of impact on students and its financial self-sufficiency, should alleviate the concerns that are brought by university administrators.

Resources for Green Schools and Sustainability

American Association of Community Colleges

www.aacc.nche.edu

www.theseedcenter.org/



In service since 1920, the American Association of Community Colleges has been the “voice of America’s community colleges.” The Association represents and advocates for more than 1,200 associate degree granting institutions enrolling more than 12 million students – almost half of all U.S. undergraduates. The mission of AACCC is to build a nation of learners by advancing America’s community colleges.

The Sustainability Education & Economic Development (SEED) Center is a leadership initiative and resource center created by the American Association of Community Colleges and ecoAmerica that will provide strategic guidance and detailed resources for community colleges to dramatically ramp-up their programs to educate America’s 21st century workforce.

The SEED Center offers access to resources such as promising practices and curriculum materials in subject areas including renewable energy, energy efficiency, green building, general sustainability, and more. The SEED Center offers access to resources such as promising practices and curriculum. In the SEED Community, educators exchange information and ideas using a wiki and topical discussion boards.

The SEED Center is currently focusing on four key green economy sectors: solar, wind, green building, and energy efficiency. In time, the site plans to build out other areas that are known to be crucial to job growth, such as sustainable agriculture, geothermal, smart grid technology, water and wastewater, and alternative fuels.

The American College & University Presidents’ Climate Commitment

www.presidentsclimatecommitment.org



The American College & University Presidents’ Climate Commitment (ACUPCC) is a high-visibility effort to address global climate disruption. Members of this network of colleges and universities have made institutional commitments to eliminate net greenhouse gas emissions from specified campus operations, and to promote the research and educational efforts of higher education to equip society to re-stabilize the earth’s climate. Its mission is to accelerate progress towards climate neutrality and sustainability by empowering the higher education sector to educate students, create solutions, and provide leadership-by-example for the rest of society.

The ACUPCC provides a framework and support for America’s colleges and universities to implement comprehensive plans in pursuit of climate neutrality. The commitment recognizes the unique responsibility that institutions of higher education have as role models for their communities and in educating the people who will develop the social, economic, and technological solutions to reverse global warming and help create a thriving, civil, and sustainable society. Over 650 presidents and chancellors representing the spectrum of higher education have become charter signatories of the ACUPCC.

The Association for the Advancement of Sustainability in Higher Education

www.aashe.org



AASHE is an association of colleges and universities that are working to create a sustainable future. The mission of the organization is to empower higher education to lead the sustainability transformation. AASHE undertakes this work by providing resources, professional development, and a network of support to enable institutions of higher education to model and advance sustainability in everything they do, from governance and operations to education and research.

AASHE defines sustainability in an inclusive way, encompassing human and ecological health, social justice, secure livelihoods, and a better world for all generations. AASHE is a member-driven, independent 501(c)(3). Membership in AASHE covers every individual at an institution.

Campus Environmental Resource Center

www.campuserc.org



The Campus Environmental Resource Center is a library of resources to support campus environmental performance improvement. Developed collaboratively by the National Association of College and University Business Officers, the U.S. Environmental Protection Agency, and other partners, the primary audience

is staff, administrators, or faculty who are looking for resources to better understand environmental regulations, find relevant contacts, seek model practices, track news, or build and manage better environmental programs.

Center for Green Schools, U.S. Green Building Council

www.usgbc.org



The Center will build upon the Green Schools and Green Campus campaigns and collaborate with leading education and environmental associations, creating tools and resources that help make green schools possible. Through the Center, USGBC is escalating its work on green schools caucuses in the U.S. Congress and the 50 for 50 Initiative with state legislatures nationwide; the nationwide Mayors' Alliance for Green Schools; and the Coalition for Green Schools, which represents more than 10 million members collectively and comprises organizations such as the National PTA, the National School Boards Association, the National Education Association, and the American Federation of Teachers. The Center is creating new resources and advocacy tools to support USGBC Student Groups on college campuses and a nationwide network of more than 1,000 Green School Committee professional volunteers. It is also focused on providing training and helpful resources to those who need it most – K-12 schools serving lower-income families, under-resourced institutions, and community colleges. A Center for Green Schools Advisory Board made up of green advocates, experts, educators, philanthropists, and other key stakeholders has also been formed.

Resources for Green Schools and Sustainability

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The Community College Alliance for Sustainability www.rtsinc.org



Formed in 2009 with a grant from the Ford Foundation to support members in central Appalachia, the network develops new and better ways to educate, train, promote, and support sustainable rural development. The goals of the Alliance are: expanding or improving programs that support employment in sustainable enterprises; attracting and retaining students in programs that lead to employment opportunities; supporting entrepreneurship in green building, energy conservation, sustainable agriculture, and ecotourism; helping local businesses understand the economics of sustainability and social inclusion; building partnerships with government agencies, community-based organizations, and extension services; increasing energy efficiency and renewable energy on campuses; and sharing everything learned or developed across Appalachia and the United States.

Second Nature www.secondnature.org



Second Nature's mission is to accelerate movement toward a sustainable future by serving and supporting senior college and university leaders in making healthy, just, and sustainable living the foundation of all learning and practice in higher education.

Since 1993, Second Nature has worked with higher education to transform our economic, social, and environmental habits to ensure a healthy, just, secure, and sustainable future. We believe that creating a thriving, enduring society is *the fundamental purpose of all learning*; sustainability should be a foundational principle of higher education rather than a specialized program or discipline. We call this Education for Sustainability (EFS), and it has grown into a movement synonymous with Second Nature.

Trans-Atlantic Technology and Training Alliance www.ta3online.org



The Trans-Atlantic Technology and Training Alliance (TA³) is a network of leading post-secondary education and training institutions in the United States, Europe, and South Africa. This international alliance is dedicated to sharing practices that prepare workers to be creative and productive employees; improving access for non-traditional students; providing opportunities for multi-cultural faculty development and student exchange; building connections to economy and community; and strengthening and expanding the roles of the colleges in providing business, social, cultural, and entrepreneurial services. The focus of the TA³ is on the intersection of education, economic development, and social cohesion, and beginning with its 2010 conference on building sustainable communities, it is turning its attention to learning and shared practices to improve sustainability among its member colleges and for the emerging work force.



www.arc.gov/energy

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