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# Energizing Liberal Education

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# Energizing Liberal Education

FEATURED TOPIC

COLLEGES ACROSS THE COUNTRY are hosting on-campus renewable energy projects. The general assumption is that trade schools, community colleges, or technology-oriented universities with large engineering departments make the most appropriate sites for training future leaders in renewable energy innovation. While it makes sense to take advantage of existing strengths when developing new initiatives, we argue that

nearly all schools

offer interesting avenues for energy education and that renewable energy projects provide important opportunities for advancing liberal education. To demonstrate frequently overlooked synergies, we explore how liberal arts colleges, a subset of higher education institutions rarely assumed to be leaders in the field of energy technology, deliver unique prospects for researching, developing, and expanding the use of renewable energy and for promoting educational initiatives associated with on-campus and community projects.<sup>1</sup> We highlight place-based examples from Swarthmore, Middlebury, Pomona, Amherst, and Williams Colleges.<sup>2</sup>

Physical plants, academic and administrative buildings, housing, food services, groundskeeping, information technologies, athletic facilities, and other operations on college campuses utilize significant energy that is mostly generated from nonrenewable fossil fuels. As institutions that train leaders and

decision makers, colleges play a fundamental role in educating for a healthier and more sustainable future and are often called upon to provide ethical leadership and demonstrate civic responsibility. In 2007, Middlebury College's board of trustees approved a plan to become a carbon-neutral institution by 2016, and members of this academic community hope their efforts to lower greenhouse gas emissions will inspire others to make similar changes. This commitment is especially important in the context of renewable energy because while there is a valid ongoing need for experimentation to improve efficiency and lower the cost of alternative technologies, one of the biggest constraints is resistance to change whereby institutions hesitate to be policy leaders. However, colleges advocating liberal education often pride themselves on being current, flexible, and innovative and by doing so are able to attract and retain excellent students, faculty, and staff. Furthermore, schools that seek to significantly reduce greenhouse gas emissions realize that, while conservation is essential, they also must move away from the use of fossil fuels.

## Renewable energy projects at liberal arts colleges

Opportunities for transformative education related to renewable energy projects are cross-disciplinary and encourage both critical analysis and experiential learning. Evidence suggests that experience with renewable energy projects can frequently help open doors for employment after graduation. Some liberal arts advocates bemoan initiatives that could be interpreted as "tooling" students or providing job training; however, core liberal education values and practices can be found within

**Nearly all schools offer interesting avenues for energy education, and renewable energy projects provide important opportunities for advancing liberal education**

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**Core liberal education values and practices can be found within interdisciplinary renewable energy programs**

interdisciplinary renewable energy programs. Planning, implementing, and assessing energy projects makes available numerous prospects for students and faculty to explore issues in ethics and leadership, aesthetics and design, social psychology, media and communication studies, public relations, business and finance, human behavior and ecology, physics, technology, planning, and mathematics, among other areas. Renewable energy projects provide hands-on education involving real-life applications, while encouraging students to play a part in making their campus more sustainable and addressing climate change. Environmental education, advocacy, and action arguments resonate with dedicated faculty and staff who oversee the implementation of on-campus renewable energy initiatives. As the examples described below illustrate, liberal arts colleges that are experimenting with renewable energy have demonstrated remarkable success.

**Swarthmore College.** Like many schools initiating a transition away from fossil fuels, Swarthmore College decided to purchase Renewable Energy Credits (RECs), in this case from Direct Energy Renewable Choice. Today, 100 percent of the electricity the college purchases comes from wind power, and 40 percent of its total energy use comes from wind-powered sources. This amount has risen steadily from REC purchases targeting wind power starting in the late 1990s that initially made up 2 percent of total campus energy use. The student environmental organization Earthlust has been instrumental in pressuring the college to increase its commitment to wind energy. Swarthmore students are part of a vibrant, national student movement promoting clean energy, and with their efforts they “hope to inspire other universities and state, local, and national governments by demonstrating that solutions to global warming are within reach” (Swarthmore College 2012).

The college’s RECs, along with the Borough of Swarthmore’s own RECs, are why Swarthmore has become one of the Environmental Protection Agency’s Green Power Communities (GPCs). The town of Swarthmore ranked second in the nation as of March of 2011 in terms of the percentage of total green power electric use. Swarthmore was the first GPC

located east of the Mississippi River; most GPCs are found in California, Colorado, Utah, and Washington. After a positive experience with renewable energy education linked to RECs, Swarthmore

College is now preparing to host its own on-site renewables. Students in an engineering class conducted a study on the feasibility of installing solar panels on the performing arts center building. The students modeled the energy use, researched systems, and calculated paybacks. Student researchers have also worked with the sustainability office to assess geothermal and cogeneration options.

**Middlebury College.** Alongside teams from large research-oriented universities applauded for advancements in science and technology, Middlebury College competes annually in the US Department of Energy’s Solar Decathlon. During the 2011 competition, the Middlebury team designed an energy-efficient and solar-powered farmhouse that drew from New England tradition, while also incorporating modern designs for collaborative living spaces. Solar technology is just one area where the college has gained national recognition. Building from an environmental studies class proposal, a ten-kilowatt wind turbine installed on campus in 2005 provides energy to a nearby recycling facility.

In 2009, Middlebury College started generating heat from a biomass gasification plant that replaces one million gallons of fuel oil annually with locally sourced, sustainable woodchips and reduces the college’s greenhouse emissions by 12,500 metric tons. Although the investment in the gasification project totaled \$12 million, officials expect a payback period of a dozen years at the same time that the college injects \$800,000 into the local economy annually through the purchase of woodchips. Meanwhile, faculty and students are researching willow trees as a fast-growing woodchip source that could provide additional income to local farmers as well as exploring how to expand the use of alternative fuels for other campus operations. For example, Middlebury’s Nordic ski team travels to competitions in a biodiesel truck powered by waste vegetable oil from campus dining halls. Research on alternative energies is integrated into the college’s academic curriculum, and students work closely

with faculty mentors to assess positives and negatives.

**Pomona College.** Solar hot-water systems that generate nearly 250 kilowatts of electricity from photovoltaic solar arrays have been installed on dorms and athletic facilities at Pomona College. In addition to embracing renewable energy infrastructure and solar technology, campus leaders define education as an essential component of any sustainability initiative (President's Advisory Committee on Sustainability 2011). Pomona is a national leader in using the campus as a living-learning laboratory and seeks to increase the use of campus facilities as topics of academic inquiry, both within the curriculum and through cocurricular activities that complement classwork. As an example of this commitment, students in a class called "Physics in Society: A Critical Analysis of Energy Policies" study rooftop solar panels for lab assignments. They measure the panels' power output depending on their angle in relation to the sun and with varying levels of resistance. To provide user-friendly information to occupants in Pomona's new North Campus Residence Hall, flat-screen panels within the building provide data on solar production from panels on the roof. Solar data and other real-time feedback on building energy, water, and gas use is also available online, as it is at many schools that use building "dashboards" to educate occupants and other members of the campus community about consumption and to promote behavioral change toward conservation.

A highly successful renewable energy initiative at Pomona with great potential for replication at other schools is a "solar rover," a portable one-kilowatt array called SolTrain that students helped design and create. In 2008, the President's Advisory Committee on Sustainability approved funding for the mobile solar station, which is used as a renewable power source for the school's organic farm, powers campus events and activities, and serves as a showcase project for renewable energy. In 2011, SolTrain won the Excellence in Innovations for Sustainability award from the Association of American College Unions International. According to Pomona's associate dean of students, SolTrain "provided and continues to provide real-world education on campus. The first group of students involved

### Students are often the driving force behind on-campus sustainability initiatives

learned about budgeting, funding processes, and committee work. A second group served as the construction crew and learned valuable skills in building, engineering, problem solving, and teamwork. Now each time SolTrain is used, it has signage and information about how it works, how it saves energy and resources, which has reinforced the work of the President's Advisory Committee on Sustainability" (Peters 2011). David Tanenbaum, a Pomona physics professor involved in the creation of SolTrain, notes that students were



Pomona College

highly enthusiastic about the solar rover. When eager-to-learn students asked for technical help, he became convinced that it was worthwhile to dedicate his time to the initiative. Students are often the driving force behind on-campus sustainability initiatives, although faculty, staff, and administrators must provide needed support.

**Amherst College.** Solar hot-water systems have been mounted at three sites at Amherst College, including the physical plant, a student dormitory, and the president's house. Solar and wind research is integrated into physics courses, along with data from a rooftop weather station that monitors conditions such as solar intensity, wind speed, temperature, and humidity. While these renewable

energy pilot projects are designed predominately for educational purposes, power generated from solar and wind technologies feeds into batteries used to energize a laptop computer and classroom projector, providing students with a working example of an “off-grid” energy system.

**Williams College.** Two different types of solar projects are underway at Williams College: photovoltaic arrays have been installed at two sites, and solar thermal water heaters have been installed on three buildings. Real-time readings allow for ongoing analysis in campus research projects, including internships and class work. Student research analyzing the potential for wind, biomass, biodiesel, and geothermal projects is featured prominently on the college’s website. These research projects are the result of course projects for a class titled “Renewable Energy and the Sustainable Campus” and for internships offered throughout the year by the Zilkha Center for Environmental Initiatives at the college. According to Amy Johns, interim director of the Zilkha Center, students are crucial to the fulfillment of the center’s goals. Johns says that for certain students, the practical application of classroom education energizes their education and gets them deeply involved in campus renewable energy projects. The Zilkha Center drives many of the on-campus renewable energy projects at Williams, and works directly with in-house facilities personnel and outside consultants to conduct feasibility studies.

In many cases, the studies have demonstrated that the proposed projects would either save money or be cost neutral. The fact that the projects make sense from environmental and economic perspectives has made it easier to gain the support of school administrators. Students are involved throughout the entire process, gaining research and decision-making experience. Student researchers have been involved in multiple efforts to investigate the potential of wind turbine use on a nearby ridge since the 1970s. Additionally, the science building hosts a tower with three anemometers measuring wind speeds, and subsequent investigations concluded that on-campus wind potential appears insufficient for energy production. While discussions continue to evolve on the use of wind in nearby locations, there is clearly educational

value from involving students in real-life decision making about alternative energy technologies, whether projects are ultimately determined to be viable or not.

### Benefits

Renewable energy projects, such as those described above, capture student attention because they resonate with lived experiences and foster the deep learning that comes from personal engagement. “The best teacher of all, sometimes, is the campus as a learning laboratory, and how the students live and what kinds of gardens we have and the energy we use,” says Mitchell Thomashow, former president of Unity College. Thomashow suggests that for sustainability education to be most effective, “it has to be ubiquitous, it has to be done by everyone, it has to be part of the whole infrastructure. Because it does not matter what you teach, if you do not demonstrate it through the actual practices of the institution, it is not going to have nearly as much of an impact. So let us make sure that the hands-on tangible overhaul of institutional infrastructure is crucial to this sustainability-infused learning. . .” (Rowland et al. 2009, 346).

In addition to providing excellent student learning opportunities, renewable energy projects provide new avenues for interaction with local communities, as shown in both the Swarthmore and Middlebury examples. Across a spectrum of different types of colleges and universities, energy initiatives have also proven fruitful as a means to involve alumni and donors. Finance for alternative-energy research and analysis is directed toward highly regarded institutions, including Stanford University, where alums spearheaded the donation of \$100 million for an energy institute in 2009. In promoting the project, the president of Stanford stated that universities “need to focus their full talent on the greatest challenges facing the world today” and argued that “energy is certainly one of those issues” (Stanford University 2009). By being part of this trend, liberal arts colleges and other institutions that provide a liberal education can demonstrate their relevance while, at the same time, developing strong curricula for integrated student engagement involving the head, heart, and hands.

Alternative-energy initiatives are just one element of a broader “green school movement”

## Renewable energy projects provide new avenues for interaction with local communities

that has emerged internationally over the past two decades and can be found today at all levels of education, from preschools to postdoctoral programs. There is increasing recognition that sustainability education bridging the natural and social sciences with applied and practical education can lead to the development of intellectually, socially, and ecologically valuable problem-solving skills. Since sustainability challenges are so vast, there is an ongoing need for experimentation and innovation.

The inclusion of credits for innovation is one of the most exciting elements of the Association for the Advancement of Sustainability in Higher Education's Sustainability, Tracking, Assessment, and Rating System (STARS), which requires the presence of social, ecological, and economic dimensions of sustainability and has so far been used to rate a total of 185 schools on dozens of practices. The innovation category covers new and ground-breaking practices that are not covered in standard STARS assessments or that exceed the highest criterion of current credits. Nearly 75 percent of schools accredited under STARS have pursued at least one innovation credit, commonly addressing public engagement, curricular and cocurricular activities, and energy projects. The opportunity to obtain innovation credit for curricular and cocurricular activities, in addition to listing education credits first in the STARS reporting tool, emphasizes the need to provide all students with opportunities for exposure to sustainability, both in and out of the classroom. Evidence of innovation is important because it suggests that leading academic institutions are constantly looking to improve and expand sustainability in their daily practices, and that students and future leaders are being trained to "think outside the box" in order to address important challenges.

Initiatives at the colleges cited above demonstrate a few of the ways that infusing sustainability projects into higher education encourages moral and civic leadership, inspires experiential curricula, and energizes students, faculty, staff, alumni, and donors around a shared goal. On-campus and community-based renewable energy projects create innovative, empowering, and transformative experiences for students, while also reducing the physical

and environmental impact of energy consumption linked to academic institutions. Moral, practical, and intellectual interconnections such as these reinforce strengths and opportunities underpinning liberal education. □

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### NOTES

1. The authors thank David Tanenbaum, Laura Carr, Amy Johns, and Clara Fang for communicating with them about renewable energy initiatives at their schools.
2. While there is disagreement over the use of national rankings, the fact that, in 2011, *US News and World Report* listed these five as the top liberal arts colleges in the country based on such criteria as peer assessment, graduation and retention rates, class size, admissions test scores, and alumni giving, while *Washington Monthly* listed the same schools among their "top twenty" in 2011 based on social mobility, research, and service, nonetheless provides evidence of institutional integrity and educational quality.

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