The Greening of Higher Education Facilities and Operations:
A Race to Sustainability

Faculty Senate Green Campus Task Force
March 7, 2006

Executive Summary. Colleges and universities are suddenly racing to green their campuses. Within the last few years, green buildings and renewable energy sources are sprouting on college campuses across the country. Campus administrators are using them to grab media attention and promote their schools as "sustainability leaders" to attract students and funding.

LEED certification has become the standard for green building. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ was developed by the U.S. Green Building Council, composed of building industry leaders dedicated to environmentally sound and sustainable buildings. Twenty-one states (including Maryland but not Virginia) are considering initiatives, or already have policies, to require or encourage LEED certification for new public buildings. Sixty-one municipalities, including Boston, Chicago, Dallas, Denver, Kansas City, Los Angeles, New York, San Francisco, and Seattle have adopted or are considering similar policies. In many cases the state policies apply to state schools, but many schools have independently adopted policies that require LEED certification for campus buildings.

College and universities are also racing to reduce energy usage and switching to renewable energy. Midwest colleges are building wind turbines, and solar panels provide power to more than 100 college campuses. Other campuses are saving money and reducing carbon emission by converting fossil-fuel power plants to run on biomass. Purchasing renewable energy is another ready alternative; students across the country have voted to increase their own fees to pay the premium clean energy may still require. Some schools run on 100 percent clean energy.

Transportation is another key arena where colleges and universities are making changes in the direction of cleaner fuels and fewer cars on campus. Car sharing programs, like "Zipcar" and "Flexcar," are expanding across college campuses. Campuses are working hard to integrate with local mass transit, promote carpooling, improve bicycling and pedestrian access, and provide better shuttle service. Cleaning up the campus fleet of vehicles with fuel efficient vehicles and vehicles that run on lower emission fuels (like bio-diesel) can contribute significantly to overall campus sustainability.

Those universities that have a comprehensive approach to integrating sustainable practices throughout the operation of the institution also have active programs in recycling, sustainable purchasing, and sustainable landscaping practices.

Financial obstacles to greener campuses have not proved insurmountable. Although some initiatives require upfront costs, saving energy and water also saves money. Because greener campuses attract positive media attention, donors, and students, administrators have recognized that they can't afford not to invest in a more sustainable future.

The Greening of Higher Education Facilities and Operations:
A Race to Sustainability

Introduction

College and universities have entered a new era of greener campuses – they've joined a race to "sustainability". Environmental consciousness has long been found on college campuses, but there is a new difference. As one commentator recently put it, "Today, it's not just about doing a few good, green things -- recycling, buying green energy, building green buildings, and all the rest -- and it's not just about saving money or being seen as a good neighbor. It's about being seen as a sustainability leader in order to attract students, funding, and media attention."[1]

The modern movement dates back to at least 1990 when university administrators from over 40 countries signed a commitment in France (The Talloires Declaration) to respond to the challenge of helping to create a more sustainable world.[2]

Sustainability is an inherently vague term, but it is fundamentally about an obligation to the future – an obligation to protect our environment so that future generations can continue to thrive on the earth. Most scientists see climate change as the most severe threat to sustainability; and the campus sustainability movement has found strength by focusing on measures to limit climate change.

The movement is deep. It is not confined to groups of eager students and faculty experimenting with new ideas. Rather, in many universities, it has already permeated all levels of operations and management.

The movement is widespread. It extends from coast to coast, from north to south, and throughout the nation's heartland. If it is particularly vigorous in the most elite schools, it has also reached the junior colleges.

The results of a survey by *University Business* magazine, released last year, testify that campus sustainability has become main stream and involves top management. Eighty-four percent of those surveyed indicated that sustainability was taken into account on decisions ranging from new construction and building systems to a whole range of purchasing categories.[3]

This paper gives a brief overview of what other colleges and universities are doing to green their campuses, focusing primarily on buildings and operations, energy usage, and transportation initiatives.

Green Buildings and Operations

Hundreds of colleges and universities are now racing to certify their first green building; those that have already done so bask in the glow of positive media coverage. Dozens of campuses have already adopted policies for new buildings and major reconstructions to meet environmental standards. Others are being pulled along by new state policies for "LEED certification."

LEED certification has quickly become the nationally accepted standard for environmental design. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ was developed by the U.S. Green Building Council, composed of building industry leaders dedicated to environmentally sound and sustainable buildings. Many departments of the Federal Government, including the Departments of Agriculture, Interior, State, the Environmental Protection Agency, and several branches of the armed services now require new buildings to be LEED certified.[4] The Department of Energy supported the development of the standards.[5] Buildings are rated with a point system to achieve increasingly higher levels of performance: Certified, Silver, Gold, and Platinum.

Twenty-one states (including Maryland but not Virginia) are considering initiatives, or already have policies, to require or encourage LEED certification for new public buildings. Sixty-one municipalities, including Boston, Chicago, Dallas, Denver, Kansas City, Los Angeles, New York, San Francisco, and Seattle have adopted or are considering similar policies and policies that will encourage green commercial development as well.[6] In many cases the state policies apply to state schools. For example, all new buildings on University of California campuses (with minor exceptions) must meet the LEED Silver certification level. State University of New York campuses are encouraged to follow LEED guidelines.

The country's best universities, however, whether public or private, are eagerly touting their green building achievements. Emory University boasts more green buildings than any other campus – five buildings are LEED certified and another seven are in the certification process. Dartmouth, Duke, Tufts, and Harvard attract students to live in their new green dormitories. In September of 2006, Harvard welcomed students to a newly renovated residence hall redesigned to achieve a LEED Gold certification. Within the last two years, Yale has opened two new green buildings, Penn State has opened an architecture building that meets the LEED Gold standard, and Southern Methodist University has opened a new engineering building that lays claim to being the first university building in Texas built for LEED Gold certification.

But green buildings are not just for elite schools with bulging endowments. The comprehensive design approach produces buildings that do much more than attract attention, students, and donors. Green buildings also save energy and water, and result in significantly lower operating costs. The University of Minnesota Duluth, for example, is building a 65,000 square-foot Labovitz School of Business and Economics for $23 million. Scheduled to open in mid-2008, operational costs of the building are expected to be 40 percent lower than under conventional design.[7] The University of Illinois is also building a new facility scheduled to be ready for business classes in the fall of 2008. The $60 million building features a photovoltaic array on the roof of the auditorium that will collect solar power to supply 5 to 7 percent of the building's electricity needs. Most rooms will have exterior windows and sensors that dim lights as daylight

enters. The building is expected to be up to 50 percent more energy efficient than comparably sized campus buildings.[8] (Both schools acted without state LEED policies in place.) Oregon State University has already completed two LEED rated buildings. One of them is a LEED Gold-rated engineering building. American University will begin construction on a building for the School of International Service in the summer of 2007, designed to meet LEED Silver standards. Even schools like Western Illinois University are moving toward requiring LEED Silver standards on all new buildings.[9]

The *University Business* survey mentioned above testifies that LEED standards have become main stream in university facilities and operations. Of the 470 colleges and universities surveyed, 75 percent said they would consider LEED certification in future construction or renovation projects. An even higher 90 percent would use green criteria to evaluate building products and furnishings.[10]

The LEED guidelines do not end with new buildings; they extend to existing buildings and operations as well, and they can be fully integrated into facilities operations and management. In 2003, the Facilities and Services of the University of Illinois at Champaign-Urbana launched a program called "BLUE Illinois" – Building a Lasting University Environment. Each year Facilities and Services set fiscal year goals to improve sustainable practices on campus. Fiscal year 2006 goals include aligning internal commissioning procedures to be consistent with LEED certification, attaining a LEED Gold rating in the next major campus building project, and researching the feasibility of requiring the recycling of construction projects.[11]

Cleaner, More Efficient Energy Use

Green university buildings may attract the most media attention, but steps to reduce energy consumption and switch to cleaner energy sources are at the core of campus efforts to move toward sustainability. Soaring energy prices have also made energy efficiency increasingly attractive to budget conscious administrators.

On-Campus Renewable Energy

Nothing beats the media appeal of on-campus renewable energy sources. Wind turbines are popping up on colleges and universities all across the Midwest. St. Olaf College in Minnesota began producing its own electricity with a 1.65 megawatt wind turbine in 2006. The turbine provides for a third of St. Olaf's electricity needs and reduces carbon emissions by 20 percent.[12] Neighboring Carlton College was the first college campus to erect a wind turbine the previous year, just 1.5 miles off campus. Carlton's turbine produces 40 percent of the electricity for the campus. The University of Illinois plans to construct three wind turbines, all of a similar size (1.5 megawatt), but they will generate less than three percent of the university's annual power needs. Nevertheless, the University of Illinois hopes to have the first multi-wind-turbine project on any campus in the country, although construction will be slowed by a backlog of orders at companies that produce wind turbines. A $2 million grant from the Illinois Clean Energy Community Foundation will pay a significant part of the $5.7 million cost.[13] Other schools planning or building wind turbines include Fort Hays State University in Kansas, University of Minnesota Morris, Cloud Community College in Kansas, Milwaukee Area Technical College, Connecticut College, and the University of the Virgin Islands.

Solar panels provide power to more than 100 college campuses.[14] The largest project is a 1.2 megawatt solar field that provides Napa Valley College with 40 percent of its power needs. A handful of other solar fields provide power to public universities or community colleges in the state of California. Solar panels on the roofs of buildings and parking facilities are far more typical, however, and can be found all across the country. A notable example is the 337 kilowatt solar array atop the Intercultural Center at Georgetown University; it supplies 50 percent of the building's electricity needs. This project was funded by the U.S. Department of Energy.[15] Montgomery College in Maryland also has roofs with solar panels, built with the help of a Department of Energy program. Ithaca College students, on the other hand, have built a solar-powered fountain for the college.

Other campuses are saving money and reducing carbon emissions by converting fossil-fuel power plants to run on biomass. (Biomass is considered "CO2 neutral" because whether left to rot or burned, the biomass would give off an equal amount of CO2.) The power facility at the University of Iowa had historically operated on coal and supplied 100 percent of campus heat and 30 percent of campus electricity. Now it runs partially on oat hulls from the nearby Quaker Oats Company, saving the university $500,000 annually in fuel costs.[16] The reduction in CO2 emissions was a relatively modest 4 percent, but still allowed the University of Iowa to join the Chicago Climate Exchange and sell the credits obtained by reducing emissions. Central Michigan University converted their natural gas boilers to run on salvaged woodchips from local timber operations. The cost per 1000 lbs of steam has been reduced from $14 to just $4.[17] Middlebury College is currently constructing a biomass plant to run on woodchips. The plant will begin operation in the fall of 2008 and should cut college greenhouse gas emissions by nearly 12,500 metric tons annually. The college hopes it will also help stimulate the local bio-energy economy.[18]

Purchasing Renewable Energy

For hundreds of colleges and universities, purchasing renewable energy provides a more practical alternative to building on-campus renewable power sources. Students all across the countries in elite schools, public universities, and even community colleges have voted to increase student fees to pay the premium clean energy may still require.

The U.S. Environmental Protection Agency (EPA) has launched a Green Power partnership to facilitate renewable energy purchases by U.S. organizations, including institutions of higher education. Currently at least 69 colleges and universities purchase renewable energy through the Green Power Partnership.[19] The EPA provides credibility and expert advice, the latest market information regarding sources of renewable power, and a variety of resources to help estimate the costs and benefits of switching to green power. The EPA also actively recognizes Green Power Partners in multiple ways, providing the publicity and positive attention that institutions of higher education covet.

Currently New York University is the largest purchaser of green power among the EPA's college and university partners with a 118 million kilowatt-hour annual purchase of wind power. In October of 2006, NYU surpassed the University of Pennsylvania which purchases 112 million kilowatt-hours of wind power annually.[20] Wind power provides 29 percent of total electricity for the University of Pennsylvania. The California State University System comes in third with 75.4

million kilowatt-hours annually, providing 13 percent of electricity for all institutions within the state system.[21]

Others schools have already moved to 100 percent renewable energy or electricity, albeit with smaller annual purchases. The College of the Atlantic in Bar Harbor, Maine has committed to 100 percent wind power for the next 20 years. Colby College will rely on Maine hydropower and biomass for 100 percent of power needs, completely eliminating fossil fuel energy. Western Washington University was able to commit to 100 percent of its electricity from wind and solar sources because of a student-led initiative that passed with 84.7 percent approval by students to increase their fees.[22]

The students at Western Washington University are not an isolated case of students voting to increase their own fees for cleaner energy. Connecticut College students had a similar vote in 2003. Just within the past year, students from the University of Wisconsin Green Bay, University of Kentucky, American University, C. Oregon Community College, UC Santa Cruz, Middle Tennessee State University, Tennessee Technological University, and the University of Illinois have all voted to increase their own fees to help pay for renewable power. Yale tried a different approach – the administration challenged students to cut their energy use and then used the savings to purchase green power. At Bates College, the senior class gave green energy as a departing gift.[23]

As is the case with green buildings on campuses, part of the push for renewable fuels is coming from state governors in a race for green leadership; they recognize the key role that state universities play. Under a March 2006 directive from the Governor of Oregon, all state agencies, including universities, will switch to 100 percent renewable energy by 2010. The Governor hopes to make Oregon the first state government in the U.S. to achieve that goal.[24] The Governor of Wisconsin is also vying for green leadership points. As part of a drive to make Wisconsin a leader in energy independence, four University of Wisconsin campuses will become completely energy independent by 2012, emphasizing renewable energy. The four campuses identified in September 2006 are Green Bay, Oshkosh, River Falls, and Stevens Point. Solar, wind, fuel cells, and a switch to biomass are all under consideration as energy options. Currently the campuses burn fossil fuels, including coal, for their heat and cooling. The move will certainly reduce greenhouse gas emissions; and, by increasing energy efficiency, it should save taxpayers money as well.[25]

Conservation & Energy Efficiency

Many schools have made important strides with drives to conserve energy and improve energy efficiency. In so doing, they save money and reduce CO2 emissions, often with minimal investment.

The EPA has another program called ENERGY STAR, sponsored jointly with the U.S. Department of Energy, to identify and voluntarily label energy efficient products. The program began in 1992 and has evolved to encompass more product categories. The ENERGY STAR program has helped universities and other organizations upgrade to more efficient technologies.[26] ENERGY STAR computers, for example, power down to sleep when they are not in use. Universities have shifted to more efficient fluorescent lighting, "Vending Misers" – a product designed to save energy in vending machines, high efficiency LED (light emitting diode)

exit signs, more efficient washing machines in dorms, occupancy and sunlight detectors, and more efficient heating systems.

Case Western Reserve, for example, recently reduced consumption of electricity in the library by 30 percent by installing motion and natural light sensors. The investment should be paid back in energy savings within a year.[27] Eastern Illinois University spent about $1million a few years ago to audit and retrofit the facilities for energy savings opportunities. Each year they save between $250,000 and $300,000 in energy costs.[28]

Some universities are increasing energy efficiency by upgrading their heating and power systems. The University of Maryland has been recognized with an ENERGY STAR Combined Heat and Power (CHP) award for their new CHP system.[29] The CHP system uses the same fuel to produce both heat and power, typically through the production of steam. In effect, the CHP system recaptures steam that would otherwise be lost in the production of electricity and uses it for heat. Fuel savings relative to standard power stations are on the order of 35 percent.[30] West Chester University of Pennsylvania recently received a $248,458 grant from the state of Pennsylvania (under the Pennsylvania Energy Harvest Grant Program) for an energy efficient geothermal heating and cooling system for a 50,000 square-foot building under renovation.[31]

Colleges and universities are also reducing energy usage through campaigns to adjust thermostats, turn off lights and generally increase awareness about energy usage. Friendly competitions between dorms are a popular alternative. In 2005, Dickinson College was able to reduce electricity consumption by 20 percent with a "Green Devil Challenge" (The school's mascot is a red devil.)[32] The University of Colorado rewards staff members who implement energy-saving strategies with monetary bonuses.[33] The University of Wisconsin-Madison launched a "We Conserve" campaign in May of 2006 intending to reduce campus energy consumption by 20 percent by 2010. "People on campus will be asked to turn off lights and computers when feasible, dress to the season for comfort, set thermostats sensibly and use laboratory and other equipment wisely." Increasing energy costs helped prompt the effort: campus energy costs increased by 12 percent from 2003-04 to 2004-05.[34]

Improving Transportation Options

Transportation is another important arena where colleges and universities are rapidly making changes in the direction of cleaner fuels and fewer cars on campus.

Fewer Cars on Campus

Car sharing programs, like "Zipcar" and "Flexcar," are quickly expanding across college campuses. Car sharing is a relatively new phenomenon in the United States; both of the aforementioned companies first had cars on the road only in the year 2000. Car sharing differs from car rental in that members have "no-hassle" access to cars, and can pay either by the hour or by the day. In September of 2006, Zipcar announced that seven more universities had joined its program, bringing its partnership with colleges and universities to 33 institutions. George Mason University is among the partner universities. Flexcar works with at least 10 other colleges and universities. Both companies have a presence in the Washington DC metro area –

especially at metro stations. Zipcar announced plans in December to double the 350 vehicles it has on Washington DC metro area streets.[35]

Having convenient access to car sharing can be a viable alternative to car ownership for many students and reduce pressure on limited parking spaces, even as it reduces CO2 emissions. According to Zipcar surveys, 10 percent of university Zipcar members would bring cars to campus in the absence of Zipcar. At MIT, 1500 students, faculty, and staff use Zipcar, and that translates into 250 fewer cars on campus. Both car-sharing companies had initially restricted their membership to drivers 21 years of age and older, but both have now introduced college and university programs to include undergrads 18-20 years of age.

Many colleges and universities are also working hard to integrate with local mass transit, promote carpooling, improve bicycling and pedestrian access, and provide better shuttle service. In 1991, Cornell University restructured their transportation system with the help of the local transit system and avoided building a new parking garage for 2500 vehicles. Commuters that carpooled were given discounted parking passes, and parking fees were increased for others. Cornell estimates savings of about $40 million over 14 years in avoided construction, maintenance and transportation costs.[36] UCLA runs a Vanpool Program that serves 1500 faculty, staff, and students with 150 vans.[37] Like Cornell, UCLA has worked with local mass transit to facilitate university access. The EPA reports that, "More than fifty colleges and universities currently have Unlimited Access Programs (also called Upass) that provide fare-free transit service to more than 825,000 students and staff."[38]

Other colleges and universities work with the surrounding community to make bicycling a more viable option. Duke encourages bicycles with a campus bike station to provide minor repairs. Duke also offers free car parking passes to bike commuters, who might otherwise pay penalties when forced to occasionally drive and pay expensive daily rates to park their cars.[39] Some campuses have bike-sharing programs, leaving free re-conditioned bikes (painted yellow in some cases) around the campus that anyone can use.

Cleaner Energy Fleets

Given the large number of vehicles that colleges and universities own, cleaning up the fleet with fuel efficient vehicles and vehicles that run on lower emission fuels can contribute significantly to overall campus sustainability.

An increasing number of universities now use bio-diesel in campus bus fleets. The University of Virginia is among them. After a pilot program in the summer of 2005, UVA's Parking and Transportation began using "B20 bio-diesel, a blend of 80 percent diesel fuel and 20 percent vegetable oil, for the University's entire 30-bus fleet." The director reports "fewer emissions and noxious smells and no loss of efficiency. It also reduces our dependency on petroleum, and it comes from American farms." The department also intends to begin replacing the 18 cars and trucks in P&T's fleet with diesel and hybrid vehicles.[40] The Parking and Transportation Services of the University of Minnesota Minneapolis-St. Paul also recently converted to a 20 percent bio-diesel blend for the 50 vehicles on campus that run on diesel fuel. The campus had already been using an 85 percent blend of ethanol and gasoline on another 50 vehicles.[41] Students at Rice University, Illinois State University, University of New Hampshire, and the University of Tennessee have programs to convert waste vegetable oil from the university food service into

bio-diesel for use in university vehicles. Among other universities that currently use the 20 percent bio-diesel blend in diesel vehicles are Duke, University of Wisconsin Madison, Cornell, and University of North Carolina Chapel Hill.

Recycling, Purchasing, and Landscaping

Those universities that have a comprehensive approach to integrating sustainable practices throughout the operation of the institution also have active programs in recycling, sustainable purchasing, and sustainable landscaping practices.

The BLUE (Building a Lasting University Environment) program at the University of Illinois is a good example of such an approach. Launched by Facilities and Services, the program involves all of its employees. The purpose of the program is not only to increase awareness and educate employees about sustainable management practices, but it also recognizes the progress being made and "promote[s] initiative and creativity in our normal job responsibilities to reduce waste and chemical usage, save energy and water, improve the efficiency of buildings, conserve resources and protect the environment."[42]

Goals for Fiscal Year 2006, among others, include using sustainable materials for renovation work, researching the "feasibility of incorporating a new requirement for projects to recycle construction materials", selecting "eco-friendly" maintenance supplies and other green purchasing, working with students to increase recycling, the installation of at least one sustainable landscape planting on campus, and the incorporation of native plants into landscape planning.

The Grounds Maintenance Department of Michigan State University has joined the EPA GreenScapes Program in search of more sustainable solutions for large-scale landscaping.[43]

The Facilities Management Director at American University wrote to Kimberly Clark Corporation explaining that American would not be using Kimberly Clark products until the company made a commitment to incorporating more recycled fiber in paper products and only using virgin fiber from logging operation certified by the Forest Stewardship Council.[44]

During the last year, students have lobbied "Jazzman's Cafes" (which operate on more than 120 campuses) to provide "Fair Trade" coffee and other environmentally sensitive products. Tufts University has switched to cage-free eggs in the dining hall. The use of locally grown produce at colleges and universities has also drawn media attention.[45]

Financial Opportunities

Financial obstacles to greener campuses have not proved insurmountable. Fundamentally, saving energy and water also saves money. While many steps to improved campus sustainability require some upfront investment, often that investment can pay off with significantly lower costs in the future. Renewable energy is not always fully competitive, but the availability of state and federal grants, in combination with the willingness of students to pay the differential, has proved the feasibility of many clean energy projects.

Sometimes upfront costs can be avoided altogether in projects to improve energy efficiency by contracting with Energy Service Companies (ESCOs) that specialize in such audits and retrofits. In many cases the ECSO guarantees a minimum level of energy savings and shoulders the cost of the investment. The ECSO is compensated by a share in the energy savings and the college or university can enjoy a net financial gain.[46]

The University of Maryland financed its combined heat and power system by working with the Maryland Economic Development Corporation to issue $73 million in state bonds. The bonds will be serviced over 20 years with the savings in energy costs.

Other universities, such as Carlton College, have borrowed from their endowments to initiate green projects. Carlton borrowed $1.8 million from its endowment and subsequently found state grant money to help reduce the payback period.

Revolving loan funds have also proved to be a useful mechanism to help create greener campuses. Grants and gifts may be available for start-up money, and improvements in energy efficiency can yield high rates of return to provide funding for renewable energy projects that may require a longer payback period. Energy savings can be used to finance clean energy purchases.

Indeed many colleges and universities have recognized that because greener campuses attract positive media attention, donors, and students, they can't afford not to invest in a more sustainable future.

---

[1] http://www.grist.org/biz/tp/2006/09/12/green-U/
[2] www.ulsf.org
[3] See www.universitybusiness.com/facilities to download an executive summary of the results.
[4] See LEED Initiatives in Governments and Schools, U.S. Green Building Council, October 2006, available at www.usgbc.org.
[5] www.eere.energy.gov/buildings/highperformance.
[6] See LEED Initiatives in Governments and Schools, U.S. Green Building Council, October 2006.
[7] www.businessnorth.com/construction.asp?RID=1498
[8] Illinois Alumni, November/December 2006.
[9] http://www.wiu.edu/provost/strategicplanupdate/juneupdate.shtml
[10] An executive summary of the results of the survey can be downloaded at: www.universitybusiness.com/viewpage.aspx?pagename=staticpage/BestofUBFacilities.htm
[11] See http://www.fs.uiuc.edu/blue/index_main.htm
[12] http://fusion.stolaf.edu/news/index.cfm?fuseaction=NewsDetails&id=3484, www.worldwatch.org/node/4520
[13] Illinois Alumni, November/December 2006.
[14] http://www.aashe.org/resources/solar_campus.php
[15] http://www.nrel.gov/ncpv/documents/seb/seb10.html
[16] http://www.facilities.uiowa.edu/BiomassFuelProject.pdf
[17] http://www.news.cmich.edu/news/index.asp?id=1248
[18] http://www.middlebury.edu/about/pubaff/news_releases/2006/news632951384540792349.htm
[19] http://www.epa.gov/greenpower/index.htm
[20] www.worldwatch.org/node/4702
[21] http://www.epa.gov/greenpower/partners/index.htm
[22] http://climatechallenge.org/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=50&MMN_position=87:4
[23] http://www.aashe.org/archives/bulletin.php

[24] http://www.governor.state.or.us/Gov/p2006/press_031006.shtml
[25] http://www.wisgov.state.wi.us/journal_media_detail.asp?locid=19&prid=2344
[26] www.energystar.gov
[27] http://library.case.edu//ksl/info/news/200600225lights.html
[28] Marsha Declue. "How a University Changed Some Light Bulbs and Saved a Bundle." *Forester Communications.* 2004. www.distributedenergy .com/de_0401_how.html
[29] http://www.epa.gov/chp/awards/winners2005.htm
[30] See "New Energy for Campuses: Energy Saving Policies for Colleges and Universities," The Apollo Alliance and Energy Action, 2005, p. 4. The report is available at www.apolloalliance.org/strategy_center/reports_and_resources/index.cfm.
[31] http://www.state.pa.us/papower/cwp/view.asp?A=11&Q=457019
[32] http://www.dickinson.edu/news/nrshow.cfm?985
[33] http://www.colorado.edu/news/releases/2006/356.html
[34] www.news.wisc.edu/12528.html
[35] http://www.washingtonpost.com/wp-dyn/content/article/2006/11/29/AR2006112901458.html
http://www.flexcar.com/default.aspx?tabid=364
http://www.zipcar.com/images/universities/downloads/Z2universities.pdf
[36] http://www.epa.gov/NE/assistance/univ/pdfs/bmps/Cornell-Transportation2-7-06.pdf
[37] http://www.transportation.ucla.edu/faculty/commuting/vanpools/index.htm
[38] http://www.epa.gov/NE/assistance/univ/pdfs/bmps/Cornell-Transportation2-7-06.pdf
[39] www.duke.edu/web/bikeadvocacy/
http://www.duke.edu/sustainability/2005-12-01bicyclepermit.html
[40] http://www.virginia.edu/insideuva/2005/16/biodiesel.html
[41] http://www.ur.umn.edu/unsreleases/find.php?ID=3191&from=umnnews
[42] www.fs.uiuc.edu/blue/index_main.htm
[43] http://www.epa.gov/greenscapes/
[44] http://www.greenpeace.org/usa/assets/binaries/AU-KC-Letter
[45] http://www.aashe.org/archives/bulletin.php
[46] See http://www.naesco.org/ for more information on ESCOs. This section on financing relies heavily on "New Energy for Campuses", pp. 13-16.