2012

Climate Action Plan 2.0

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Climate Action Plan 2.0
A Vision for 2020 & Roadmap towards Carbon Neutrality

University of Massachusetts, Amherst
First Annual Report to the Chancellor
Environmental Performance Advisory Committee
8/1/2012

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The University of Massachusetts Amherst is a STARS Gold Institution
1. Acknowledgements

By providing a signature, Chairs of the Environmental Performance Advisory Committee (EPAC) Subcommittees endorse the contents of this document. Thank you to the following EPAC Chairs:

Current EPAC Committees:
Education & Research Subcommittee Chair
- Craig Nicolson
  Director, Academic Sustainability Programs

Energy Subcommittee Chair
- Pat Daly
  Director, Physical Plant

Food Subcommittee Chair
- Ken Toong
  Executive Director, Auxiliary Enterprises

Green Building Subcommittee Chair
- Shane Conklin
  Interim Director, Facilities Planning

Transportation Subcommittee Chair
- Glenn Barrington
  Assistant Manager, Transit Services

Waste Reduction Subcommittee Chair
- Terri Bechta
  Assistant Manager, Environmental Hazardous Material, EH&S

New 2012 EPAC Committees:
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- Elena Sharnoff
  Director of Communications, College of Natural Sciences

Campus & Community Programming Chair
- Eddie Hull
  Executive Director, Residence Life

Finance Subcommittee Chair
- Lynn McKenna
  Senior Budget Analyst, Budget Office

EPAC Chairman
- Ezra Small
  Campus Sustainability Manager
This report would not have been possible without the assistance of the many members of the campus community who voluntarily serve on EPAC. Thank you to the following EPAC Members:

Scott Civjan, Associate Professor, Civil and Environmental Engineering
Rachel Dutton, Sustainability Coordinator, Auxiliary Services
Steve Goodwin, Dean, College of Natural Sciences
Susanne Hale, Plant, Soil, and Insect Sciences
Ryan Harb, Sustainability Manager, Auxiliary Services
Sarah Hebert, Student Sustainability Coordinator, Campus Sustainability Initiative
Katherine McCusker, Green Building Researcher, Facilities Planning
Ted Mone, Associate Director, Operations, Residential Life
Ludmilla Pavlova-Gillham, Senior Facilities Planner, Campus Planning
Steve Schreiber, Director and Professor, Architecture and Design
Katrina Spade, Green Building Researcher, Facilities Planning
Bill Stanton, Green Building Researcher, Facilities Planning
Sharon Tracey, Associate Director, The Environmental Institute
Lawson Reed Wulsin, Green Building Researcher, Facilities Planning
2. Executive Summary

Recent History of Campus Efforts
The University of Massachusetts Amherst is committed to reducing the environmental impact of campus life and operations. The UMass Amherst Climate Action Plan (CAP), approved in 2010, was the first campus document to identify strategies to help the campus reach carbon neutrality by 2050, a goal to which former UMass President Jack M. Wilson committed the five UMass campuses in 2007 when he signed the American College & University Presidents’ Climate Commitment (ACUPCC). In order to put this commitment into action, Former Chancellor Thomas Cole appointed the Environmental Performance Advisory Committee (EPAC) and charged the committee to implement campus sustainability projects and develop a Climate Action Plan (*Chancellor Cole’s Letter: Appendix I*). Having been guided by this initial plan for two years and having accomplished many of its initial objectives, EPAC began in February 2012 to prepare an updated CAP: this current document reviews those accomplishments, and presents a comprehensive plan for future sustainability efforts across all aspects of the Campus.

Current Accomplishments
During the leadership of former Chancellor Holub (*Chancellor Holub’s Letter: Appendix II*), UMass Amherst made extraordinary progress towards reaching the goals set forth in the ACUPCC\(^1\). Within a five year period, the University has demonstrated a level of leadership in sustainability that few peer institutions can claim, as evidenced by the 2011 Gold rating in sustainability leadership from the Association for the Advancement of Sustainability in Higher Education (AASHE)’s Sustainability Tracking, Assessment & Rating System™ (STARS), one of 27 research universities to receive this distinction\(^2\).

The University’s Campus Sustainability Initiative, comprised of students, faculty, and staff, has originated a range of projects, including the Sustainability Internship Program, a Campus Bike Share Program, Sustainable Move Out, the “Green Games” (sustainability competitions in the residence halls), composting and recycling at sporting events, and extensive programming for Earth Day and Campus Sustainability Week. These efforts have led to international recognition, placing first in “Education & Awareness” and in the “Top Ten for Most Acts of Green” in Earth Day Network’s MobilizeU 2012 competition. The UMass Amherst Permaculture Initiative has generated a great deal of excitement around sustainability on campus by receiving the most votes nationally and winning the 2012 White House Campus Champions of Change Challenge.

Even before President Wilson signed the ACUPCC in 2007, the campus had already made a strong commitment to improving its environmental performance: between 2004 and 2008 we reduced our overall carbon footprint by over 30% by phasing out the use of coal combustion and by building an award-winning co-generation central heating plant. Our two most recent buildings have been awarded LEED Gold certification by the U.S. Green Building Council, and three additional new buildings are pending certification.

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\(^1\) Text of the ACUPCC: [http://www.presidentsclimatecommitment.org/about/commitment](http://www.presidentsclimatecommitment.org/about/commitment)

The Challenge
The Commonwealth of Massachusetts’ Executive Order 484 “Leading by Example-Clean Energy and Efficient Buildings” mandates that by 2020 all state agencies must reduce overall emissions by 40%, reduce energy consumption of their buildings by 35%, and must obtain 30% electricity from renewable energy.

The particular challenge that this mandate places before us is that the University expects to add almost 2 million square feet of state-of-the-art laboratories, residence halls, and learning spaces as well as enrollment an additional 3,000 students and hiring almost 1,000 new staff over the next 4-8 years (documented in the 2012 UMass Amherst Campus Master Plan3 and the Framework for Excellence).

If UMass Amherst is to achieve these important goals in a responsible manner, it is essential that the campus sustainability plan addresses the energy needs and environmental impacts of planned future growth as well as carbon mitigation strategies.

The solution proposed in this document includes strategies, policies, and technologies that will impact the new construction of buildings, performance of existing buildings, energy generation and management, and human behavior.

Mission
Our campus has long committed itself to explore and communicate ways to improve upon current university practices by fostering innovative ideas and technologies both within the campus community and beyond; to educate the campus community to create a healthier and more responsible environment; and to develop progressive solutions to reduce negative environmental impacts in ways that are economically beneficial4.

The Solution
If we are to achieve our sustainability goals, the campus as a whole must agree on specific strategies and must set performance metrics for each strategy (see grid in Chapter 6 “The Solution”). We offer the following recommendations to the Chancellor and the Chancellor’s Leadership Council:

1. EDUCATION/ENGAGEMENT: Continue integrating and expanding sustainability across the curriculum and campus life

   • Extend sustainability learning outcome requirements5 to a majority of majors and degrees.
   • Offer more sustainability focused and related academic courses.
   • Increase student engagement in residence halls and student organization activities and increase faculty and staff engagement in classroom and administrative offices.
   • Conduct a bi-annual assessment of sustainability literacy of all students, focusing the assessment on knowledge of topics, and not merely on values or beliefs.

3 UMA Campus Master Plan: http://www.umass.edu/cp/MPFinal.pdf
4 UMA Campus Sustainability Initiative About Page: http://www.umass.edu/livesustainably/about
• Renew the ACUPCC: Reaffirm leadership and recommit the University to the goals within the commitment text.
• Restructure and grow EPAC to include members from University Relations, Budget office, Student Affairs and Residence Life, Diversity Office, Alumni & Development, and Athletics.
• Place a spotlight on research that is contributing to a just and sustainable future; begin tracking the financial commitment to sustainability related research to highlight how it can potentially offset campus emissions.

2. ENERGY/EMISSIONS/BUILDINGS: Meet the state (EO484) energy and carbon emission goals by converting to renewable energy sources, greening existing buildings, encouraging reductions in individual energy consumption, and adopting net-zero growth policies

• Develop a campus renewable energy plan to produce electricity from 30% renewable energy sources by 2020 (EO484), ultimately reducing campus emissions by 25-30%.
• Develop a Reduce Your Use Campaign, including the piloting of innovative energy management technologies, reductions in individual energy consumption through student energy competitions and green office programs, reducing energy usage and campus emissions 5-10% by 2020.
• Continuous commission existing buildings across campus to improve energy efficiency, yield an average of 16% energy costs per building, reduce energy usage and emissions 10-25% by 2020.
• Develop campus wide sustainable development policy for carbon neutral growth, which recovers the costs of greening new and existing buildings through energy efficiency measures.
• Preserve the E+ Energy Efficiency Program by continuing to improve the project selection process and ultimately the effectiveness of the program.

3. FUNDING: Fund our ongoing advancement in sustainability through a Student Green Fee, creating revolving loan funds, and by developing new external partnerships.

• Seek approval for a student green fee to help finance objectives 1 and 2 above by funding highly visible projects on campus chosen by students that improves the quality of campus life and increases the opportunities for hands-on learning for all students.
• Appoint a taskforce to report on the advantages and drawbacks of establishing a revolving loan fund (RLF) to finance our energy efficiency upgrades.
• Bring in new sustainability funding through external partnerships and alumni support.
3. The Challenge
The Commonwealth of Massachusetts has recognized since 2008 the broad scientific consensus regarding climate change. The Legislature acknowledges also that these regional- and global-scale changes are largely due to the combustion of fossil fuels and other human activities6.

In response, Massachusetts Executive Order 484 “Leading by Example-Clean Energy and Efficient Buildings” mandates that all state agencies reduce overall emissions 40%, building energy consumption 35%, and obtain 30% electricity from renewable energy by 2020. If UMass Amherst is to achieve these goals, and in order to begin enacting our ACUPCC carbon neutrality commitment, the campus must embark on multiple mitigation strategies, each of which will likely require some fundamental changes in how our institution thinks, operates, and grows.

In the spirit of leading by example, we have already achieved some impressive results in these areas, and have demonstrated our ability to implement major operational improvements. Between 2004-2008, for example, the campus reduced its overall carbon footprint by over 30%; we phased out the use of coal combustion and we built an award winning co-generating central heating plant, all during difficult budget times and growing student numbers.

However, the critical challenge that now faces UMass Amherst is to continue accomplishing our campus’s strategic vision for excellence, and to do so in a sustainable way. By FY16, we have committed to add almost 2 million square feet of state-of-the-art laboratories, residence halls, and learning spaces. Integral to our framework for excellence7 is the accommodation of additional enrollment of 3,000 students and almost 1,000 new staff over the next 4-8 years (figure 1).

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6 MA Department of Environmental Protection: http://www.mass.gov/dep/air/climate/
Achieving these important goals is well within our reach. UMass Amherst was recognized and lauded by the Commonwealth of Massachusetts as a leader in energy efficiency in 2010 for our progress in reducing carbon emissions. We have successfully implemented close to 60 discrete energy conservation measures; we have built a new award-winning Central Heating Plant that produces our electricity and steam for the campus at lower rates than before; we have phased out the use of the coal-fired power plant; and we have recently completed a feasibility study exploring ways to replace a substantial percentage of our annual fuel oil with cleaner and renewable alternatives.

If the campus grows, however, **without** implementing thoughtful carbon mitigation strategies, it is inevitable that the combination of new construction and major renovations coupled with poorly-performing older buildings will lead to increased carbon emissions for the next 8 years.

To avoid this scenario of unsustainable growth, we propose that UMass Amherst should embrace the challenge of the carbon mitigation strategies outlined above in figure 2 and should retain its place of national leadership in sustainability and our flagship role within the Commonwealth. It is critical that we educate the faculty, staff and students about the impacts of climate change and that we demonstrate solutions to reducing emissions. Thus far, sustainability efforts on campus have largely been driven by the energy of the students through curricular and co-curricular programs such as the Eco-Rep Program, the Permaculture Initiative, and the innovative research that takes place each day on campus. The administration must play a leadership role by supporting EPAC in achieving the goals outlined in Chapter 6, the Solution. Achieving these goals will benefit each and every member of the University.

![Figure 2: Mitigation Strategies and Campus Carbon Emissions](image-url)
4. Campus Sustainability: EPAC Report

a. Campus Emissions & Energy Data (Climate Subcommittee)

UMA’s carbon footprint for Fiscal Year 2009 was 125,077 metric tons of carbon dioxide equivalent (MT eCO2), roughly 22 pounds of emitted carbon per person per year. This compares with a high of 176,673 MT eCO2 in 2004, about 36 pounds of emitted carbon per person per year, resulting in a 30% emissions reduction over a 5 year period (figure 3). Since the publication of the CAP, total emissions reached a low point in 2010, but are now rising due to campus growth.

In December 2011, EPAC decided to create a Climate Subcommittee in order to more accurately capture the campus’ carbon footprint and to track the progress of the goals and commitments established within the CAP and reporting agencies. During the first six months, the committee focused on three projects:

COMPLETED: Tracking and reporting campus energy and emissions
In March, 2012 the Director of the Physical Plant Division approved the Policy and Procedures Manual for Utility Data & Reporting Requirements. This document defines and documents how specific data

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8 Utility Data & Reporting Requirements: https://www.umass.edu/livesustainably/sites/default/files/u7/PP02M002.pdf
for numerous Utility and Environmental reports is collected in order to ensure data consistency from year to year and throughout the various reports. The Physical Plant is required to report utility data, energy usage, and greenhouse gas emissions to various federal and state agencies throughout the year. The process is complicated due to varied data requirements over different reporting periods with multiple reporting entities using numerous sources for the data. This protocol is an attempt to document those details in order to ensure consistent reporting from one period to the next while providing the ability to reconcile data with invoices and meter readings.

IN PROGRESS: The UMass Energy Utilization and Benchmarking Project
EPAC strongly believes in the old adage, “you can’t manage what you don’t measure.” This ongoing project is meant to develop a process to calculate and visualize the energy performance (figure 4) and carbon footprint of individual buildings and campus entities on a square foot and per person basis. This data will be used to evaluate performance levels based on building use and classification to implement carbon reduction strategies. The committee worked with Campus Planning GIS experts and graduate students from the Building Construction & Technology program to create a visual tool, including a campus map\(^9\) of building energy use intensity levels (EUI, kBTU/sf), for EPAC and for the greater campus community to facilitate a discussion on carbon reduction strategies.

\[\text{Figure 4: UMA Building energy performance by age (year built)}\]

IN PROGRESS: Setting and Meeting Greenhouse Gas (GHG) Reduction Targets
As the largest agency in the state of Massachusetts, UMass Amherst has a great responsibility and opportunity to reduce its overall impact on the environment and global climate change. According to a Massachusetts Department of Energy Resources (DOER) presentation given on April 17, 2012 at the President’s UMass Sustainability Symposium, the UMA campus emits nearly 10,000 MTCO2e more each year than all other state institutions combined and 42% of the total UMass emissions (figure 5).

\[\text{Figure 5: UMA Greenhouse Gas Emissions by Year}\]

\[^9\] UMA Building EUI Map: https://www.umass.edu/livesustainably/sites/default/files/u7/Building%20EUI%20FY2011%20Campus%20Map.pdf
Setting and achieving emission reduction targets is required as an ACUPCC signatory institution and mandated by the Commonwealth of Massachusetts Executive Order 484. The ACUPCC baseline year for setting reduction targets is 2008, the year UMA first reported GHG emissions to ACUPCC whereas the EO484 baseline year is 2002, the year all state agencies first reported greenhouse gas inventories. In addition to the ACUPCC 2050 carbon neutrality goal, the Climate Subcommittee has set a “40x20” campus goal, 40% CO₂ reduction by 2020 relative to our peak emissions year of 2004 (176,706 MTCO₂e). The ACUPCC 2012 Progress Report\textsuperscript{10} sets two interim goals of 8% reduction by 2016 and 16% by 2020 relative to 2008, which corresponds with the campus 40x20 goal (figure 6).

\textsuperscript{10} UMA ACUPCC 2012 Progress Report: http://rs.acupcc.org/progress/254/
UMass energy efficiency projects in 2012 (see Energy chapter) are expected to reduce emissions by more than 2,000 MTCO₂ allowing campus emissions to stay somewhat level through 2013 but the Master Plan’s 1.9 million square feet of planned growth during the first phase can be equated to an additional 22,241 MTCO₂, bringing our campus emissions close to 150,000 tons by 2016. Meeting the ACUPCC interim goals, the 40x20 campus goal, and complying with EO484 will require more implementation of wide scale energy conservation measures and renewable energy generation.

Implementing carbon mitigation strategies across campus will be crucial in order to meet the ambitious reduction targets mentioned above. The next chapter (2.b Energy Subcommittee Report), provides specific low carbon and carbon free energy projects that are currently being considered for the campus.
b. Energy Subcommittee

In 2010 UMass Amherst received the Massachusetts Leading By Example award for our advanced energy generation and energy efficiency measures which helped the campus meet our state mandated EO484 carbon reduction goals three years ahead of our 2012 deadline. The campus achieved these reductions through the elimination of coal combustion, a $42 million energy performance contract, and the installation of the 10MW natural gas co-generation combined heat and power plant. The fact remains however, that UMA is the largest energy user among all state entities. In FY11, UMass Amherst reported total consumed energy of over 131 million kWh at an estimated cost of over $10.1 million. Reducing utility consumption through innovative technologies and behavioral changes would benefit the entire Commonwealth by creating cost savings as well as positioning the University as the leader in sustainability across the region. The “Energy Conservation” and “Renewable Energy” chapters of the 2010 CAP provide recommendations for energy and carbon mitigation strategies. This chapter will review the progress of those recommendations and provide a look ahead to future programs and goals.

Energy Conservation Projects

Over the past five to ten years, the University has invested a great deal of resources into improving the energy efficiency of the buildings and utilities system. It is important that the campus continues to meet the energy needs of the growing campus infrastructure through all available, cost-effective energy efficiency and demand reduction resources. Prioritizing efficiency will not only save the University millions of dollars, but will also create more realistic opportunities for clean and renewable energy generation. The following projects reflect a diverse approach to energy conservation including infrastructure improvements and behavioral energy conservation:

IN PROGRESS: E+ Program

UMA continues to build on the 2004 Johnson Controls energy service contract (ESCO) projects that yielded a 42% reduction in campus water use, a 24% reduction in steam use, and a 9% reduction in electricity by creating an in house extension of this contract called the E+ Program. The program designates millions of dollars each fiscal year for energy conservation projects, which upgrade or replace inefficient physical structures or technologies on campus. The program is designed as an eventual payback system, where the annual savings that the project creates actually pays for the initial cost of the project within seven years. After the initial payback period, the projects will continue to reduce utilities costs. The CAP recommended a number of measures including the installation of 2MW steam turbines in the CHP, replacement of steam lines across campus, installation of occupancy sensors in classrooms and the library, and automation controls in the Student Union. The contract for FY11 E+ Projects has been awarded to Thielisch Engineering, Inc. and will begin implementation during the summer of 2012. The FY11 projects are projected to save the campus over 2,100 MTCO₂ (figure 7).
IN PROGRESS: Energy Reductions through Behavioral Change

A multitude of research shows that schools can save 5-10% of their utility budget through behavioral change, such as shutting off lights and eliminating phantom loads. For this reason, UMass Amherst is focusing on not just infrastructural changes, but behavioral changes as well. If everyone on campus--student residents, administrative staff, and faculty--alters their daily habits to use a little less energy, the University will save a significant amount of money and reduce its overall negative impacts on the environment. UMass Amherst continues to expand these current programs:

Energy Dashboards

The Campus Sustainability Manager and Johnson Controls are currently piloting this program to keep students involved and aware of their effect on the environment. In an effort to encourage students to modify their behavior, seven touch screen 42" monitors will be installed around campus that will display the UMass Amherst Energy Kiosk\(^{11}\) and energy data of 82 buildings on campus. To this date, two of the dashboards, in Berkshire and Worcester Dining Commons, are installed and displaying real time data. The remainder of the dashboards are currently being sited and shipped by Johnson Controls.

Green Games\(^{12}\)

The dashboards also features the Green Games Residence Hall Competition Score Board\(^{13}\). The goal of this program is to further promote sustainability awareness across campus while encouraging residents to reduce their consumption of resources in the residence halls. In the spring of 2012, the University of Massachusetts launched the first annual Green Games Residence Hall Competition in 23 residence halls over the course of 6 weeks. Participating residence halls were selected on a volunteer basis through collaboration with the Residence Hall Association (RHA). These halls were then divided into six teams based on residential area: Team Northeast, Team Central, Team Orchard Hill, Team Sylvan, Team Southwest North and Team Southwest South. The RHA representatives for each of the participating halls served as team leaders for their respective teams. Ultimately, UMA would like to run this competition across all residence halls on its campus to stimulate the participation of over 12,000 students in sustainability efforts.

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\(^{11}\) UMA Energy Kiosk: http://www.bedashboard.com/kiosk/20

\(^{12}\) UMA Green Games Youtube Video: http://www.youtube.com/watch?v=ggcsMQU-C3g

\(^{13}\) UMA Green Games Scoreboard: http://www.bedashboard.com/GreenGames/Competition/5
In an effort to engage faculty and staff across the campus in sustainability efforts and to decrease the amount of energy and waste produced in campus offices, the Campus Sustainability Initiative created the Green Office Program. Designed to help the university reach the emissions and waste reduction goals outlined in the CAP, this program aims to alter daily office practices. The offices that choose to participate in the program work to complete requirements based on a four level scale: bronze, silver, gold and green. Each level focuses on five topics: energy, recycling, waste reduction, kitchens and purchasing, which outline more sustainable office behaviors and operations. Completion of the program occurs once an office fulfills the criteria for the “green” level (figure 9).

The Campus Sustainability Initiative student interns act as consultants by working individually with each office to devise a customized plan to meet the office’s needs. The system allows for a friendly competition between offices to see who can reach the green certification. Recognition is rewarded for every level completed, both with a congratulatory certificate and acknowledgement in Campus Sustainability Initiative publications.

To date, ten offices on campus are at least certified at the bronze level. Eight of those offices belong to academic departments within the College of Natural Sciences, which has shown incredible leadership as
environmental stewards through wide participation in the program. The UMA Libraries System, Alumni & Development, and the Sociology Department are among some of the offices planning to join the program in 2012.

DOWN THE ROAD:

Continuous Building Commissioning
The UMass Retro-Commissioning Plan outlines a targeted approach for improving the efficiency of existing buildings on campus. The goal of the plan is to reduce unnecessary energy use in buildings by systematically checking and adjusting controls and systems to optimize their efficiency. The plan recognizes the great potential for reducing the energy costs and carbon footprint of our existing building stock, as well as the need for improvements in occupant comfort and indoor air quality. To that end, the goals of the UMass Continuous Commissioning Plan are energy cost savings, occupant comfort, and reductions in GHG emissions. Initial estimates suggest that the payback for implementing the UMass Retro-Commissioning Plan will be approximately 2.5 years.

Renewable Energy Projects
UMA is actively pursuing clean, renewable energies. One of the ACUPCC’s tangible actions to reduce greenhouse gases is to begin purchasing or producing at least 15% of our institution’s electricity consumption from renewable sources. At the time, the campus chose to focus on other tangible goals including green building policies and participation in waste reduction competitions. However, multiple renewable energy projects are currently progressing and being considered, positioning the University to renew the ACUPCC goal and aim for 15% renewable energy by 2015. The following clean and renewable energy projects will help the campus achieve this ambitious goal:

COMPLETED & IN PROGRESS: The Central Heating Plant

Increased Power Generation-Steam Turbines
The dedication of the award-winning Central Heating Plant replaced a coal burning power plant dating back to 1918 and has helped reduce the campus’ greenhouse gas emissions by approximately 30%. Since the publication of the CAP the University has installed the recommended 2 MW steam turbine in partnership with the MA Department of Energy Resources (DOER) Clean Energy and Industrial Efficiency Program, which helps the campus use the steam produced for district heating to co-produce an additional 6.5 MW of on-site electric power rather than purchasing from the utility grid. This system increases the production of reliable power generation throughout the year and saves the University approximately $1 million per year in avoided electrical costs as well as a reduction of campus peak electrical demand by 2 MW. In 2011, The Environmental Protection Agency (EPA) presented UMA with the 2011 Combined Heat and Power Energy Star Award in an effort to recognize the reduced emissions and increased efficiency of the plant.

Increased Power Generation-Inlet Cooling System
The University is an active member of the Massachusetts Leading by Example Program (LBE). The LBE Program has up to $2 million in grant funding available for renewable and clean energy generating projects at state facilities. The University is seeking funding from this grant to install parts of an inlet cooling system on the 1 MW combustion turbine (CTG) located in the central heating plant. From May
through September this air intake cooling will result in approximately 1 MW of additional electric
generation. This increased onsite generation capacity will add to the campus electric system reliability
during the warm weather season and will help the University score higher on the AASHE STARS rating
system, Operations credit-08, which rewards campus electricity generated with co-generation
technology using non-renewable fuel sources.

IN PROGRESS: Fuel Oil Replacement
The 10 MW gas turbine at the central heating plant is essentially a large jet engine that predominantly
burns natural gas (80% of the time) but is capable of switching to fuel oil when gas is not available. The
campus central heating plant currently uses approximately 2-3 million gallons of fuel oil per year when
natural gas is not available. The Commonwealth of Massachusetts spends $22 billion on energy per year
and 80% of that money leaves the state to import gas, oil, and coal to the U.S. gulf coast, Canada,
Venezuela, Columbia, and the Middle East (figure 10).

$18B Energy Dollars Flow Out of MA
We spend $22B per year on energy; 80% leaves MA

As the largest state entity which relies mostly on fossil fuels to power and heat the campus, the
University is determined to completely wean the campus’ electricity generation off oil in an
economically feasible way. The Office of Administration & Finance is planning to replace 1.5 million
gallons of fuel oil with Liquid Natural Gas (LNG) and possibly the remaining 500,000 gallons with
sustainable wood fuel energy. Switching to LNG will save the University approximately $2 million per
year. This fuel switch is in progress and is planned for completion by fall of 2012. Campus faculty from
the Department of Environmental Conservation and Physical Plant Utilities staff are currently assessing
the potential for biomass campus energy as well as building partnerships to assist the University in

Figure 10: Massachusetts Energy Expenditures
realizing our renewable energy goals through sustainable, locally harvested wood fuel supplies. Switching to LNG and wood would reduce carbon emissions by an estimated 3,000 MTCO₂e per year.¹⁴

IN PROGRESS: Solar Energy

South Deerfield Research Farm

The University currently owns and operates only one solar photovoltaic (PV) array on University property located on the UMass Research Farm in South Deerfield, Massachusetts. The 106 panel, 16.45 kW project (figure 11) was installed in the spring of 2010 and represents a larger research program led by the Center for Agriculture. The project examines and documents the results of implementing ground-mounted solar energy technology on farm land while simultaneously producing crops. It also is designed to produce an electric power source to offset power usage at the research farm. Finally, the project will demonstrate how this type of PV can be implemented by a farm cost effectively. The real time power generation can be viewed on the project’s online dashboard.¹⁵

![Figure 11: Dr. Stephen Hebert, Director of the Center for Agriculture at the Research Farm](image)

Hadley Farm

Expanding solar energy and bringing it closer to the center of campus is crucial in demonstrating the University commitment to renewable energy. The 131-acre Hadley Farm, home to UMass equine, sheep, swine and goat programs, will offer up more than 30 acres to continue the agriculture and solar power dual-use research on a larger scale field laboratory to examine dual use of land for pasture and other horticultural crops. It is designed to demonstrate potential benefits to the farmer and to the energy industry as an alternative to ground placement of PV panels that inadvertently removes the land from future agricultural use. This array will be 2 MW in size and will provide clean, renewable power to the utility grid, displacing other non-renewable grid-delivered power. Additional planning and implementation in the future will be required for direct use of this energy on campus.

Solar Thermal Project at CHP

The University sustainability and utilities staff are currently working on a solar hot water project for pre-heating the make-up water of the central heating plant. Partners include Massachusetts Clean Energy

¹⁴ Craig Ruberti, Power Plant EH&S Manager
Center and Beam Engineering. This project would be part of the state-wide effort to increase solar hot water systems and could save the University over $100,000 per year by heating the water with 20,000 square feet of solar collectors, thus saving on natural gas costs. Funding for this project would need to come from the Massachusetts Clean Energy Center, federal solar investment tax credits, and assistance from a state clean energy grant. This $1.8 million project would yield annual energy savings of 97,000 therms per year and lifetime savings cost of over $5 million for the campus (figure 12). This project, if funded by third party partners will be included in the aforementioned UMass E+ Program for fiscal year 2012.

![Cumulative Savings](image)

Figure 12: Proposed UMass Makeup Water Preheating Project Savings

Robsham Visitor’s Center Solar Canopy
The proposed 60 to 100kW system consists of solar panels that will be raised above a parking lot, allowing for the area under the panels to remain a fully functional lot for parking. The parking lot next to the UMA Visitor’s Center is the desired location for the array. The Visitor’s Center uses approximately 30kW of energy per hour and the solar canopy would generate at least double the amount of electricity needed to run the building, essentially taking it off the grid while feeding the rest of the generated electricity back into the grid. The placement of the canopy will assist in showcasing UMA’s commitment to sustainability, as it is the starting location of all University tours for prospective students and their families. Adding to the allure of the project, students will be able to view the electricity generated by the panels through an interactive energy dashboard that will be located inside the Visitor’s Center. The system will save the University approximately $70,000 in electricity each year while promoting sustainability to future students. Previously, UMA housed a 5kW solar array on the Knowles engineering building, but the hidden panels were destroyed after a severe storm. Instead of replacing the structure, the University opted to investigate the proposed larger, more visible solar carport. The University is also considering developing future power purchasing agreements to install large scale photovoltaic arrays over more than 80 acres of parking lots on the campus property.

Rooftop Solar
In 2010 UMA Campus Planning conducted a rooftop solar analysis to identify and rank the most suitable

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16 Savings figures courtesy of BEAM Engineering: http://www.beamgrp.com
locations for solar panel installations (figure 13). The project used models, solar analyst tools and imagery to review existing rooftops and determine what portions of rooftops could be used for solar energy generation. The study concluded that the campus has five buildings with more than 200,000 square feet of roof space that could be utilized to harvest solar energy. The top five buildings ranked in order were the Fine Arts Center, Boyden Gymnasium, the Recreation Center, the Mullins Center, and the Parking Garage.

![Global Sun Radiation Map of UMass Amherst](image)

**Figure 13: Global Sun Radiation Map of UMass Amherst**

DOWN THE ROAD: **Biogas and Wind Energy**

**Anaerobic Digestion**
The University of Massachusetts is interested in partnering with other agencies to participate in the Commonwealth Organics-to-Energy pilot program. Organics-to-Energy targets technologies that convert organic materials such as pre- or post-consumer food waste, yard waste, and cow manure into electricity or useful heat by means other than direct combustion. A prime example of an organics-to-energy technology is anaerobic digestion, in which microorganisms break down organic material in the absence of oxygen to produce biogas. The biogas, which contains a high percentage of methane, can then be used to generate heat or electricity. Depending on the type of system, additional useful outputs may be produced, such as liquid fertilizer or compost. Beyond the diversion of organic waste from landfills or incinerators and the generation of renewable energy, the benefits of organics-to-energy facilities can include reduced water pollution, reduced burden on sewage treatment plants, reduced odors, displacement of fossil fuels, and manufacture of materials that can improve soil health or productivity.\(^{17}\) Anaerobic digestion is a great opportunity for the University to increase renewable energy, reduce greenhouse gas emissions, as well as provide regional waste solution services to surrounding communities and municipalities.

**Small Scale Wind**
College of Engineering students have recently met with the Physical Plant Director to discuss a research project involving the placement of anemometers to measure wind speed on the campus’ tallest buildings, including the Du Bois Library and the Lederle Graduate Research Center. This study has been approved and these devices will be installed during the fall of 2012. The students are also designing

\(^{17}\) Massachusetts Clean Energy Center: [http://www.masscec.com/index.cfm/pid/11150/cdid/12916](http://www.masscec.com/index.cfm/pid/11150/cdid/12916)
their own unique small scale, low impact wind turbines which may be considered for energy production on those buildings following the analysis of wind data.
c. Green Building Subcommittee
In 2008, Governor Deval Patrick signed Executive Order 484 which included the provision that all state buildings be certified under the LEED rating system. At the same time, UMA made the commitment to achieve LEED-Silver or better for all new construction and major renovations. In 2010, EPAC created the Green Building Subcommittee to focus efforts on sustainable design and building on campus.

In the spring of 2010, the subcommittee decided to focus its efforts on the development of guidelines that could aid UMA in navigating the LEED rating system for New Construction and Major Renovations. As the committee began working through the system credit by credit, additional research was needed and so recommended that Facilities Planning hire a graduate student to support the creation of Green Building Guidelines.

In June of 2010, the Director of Facilities Planning and Chair of the subcommittee, hired two graduate researchers and one undergraduate researcher. This substantial investment in the work of the committee has allowed it to produce a variety of events and products and respond to the changing needs of the campus.

The agenda has been set by its members who include faculty from Architecture + Design and Building Construction Technology, staff from the Physical Plant, Facilities Planning, and Campus Planning, and students from Landscape Architecture, Architecture + Design, and Building Construction Technology. Since its publication, the committee has gone above and beyond the scope of the CAP.

This following is intended to summarize the work that the Green Building Committee has accomplished over the past two years and to lay the groundwork for future projects.

COMPLETED: CNS Research & Education Greenhouse
By renovating the existing greenhouse and constructing more than 15,700 square feet of additional laboratory and greenhouse space (figure 14) this project provided much needed teaching and research facilities for the College of Natural Sciences. The project was completed during the fall of 2011 and is pursuing LEED Silver Certification.

Sustainable features include:

- Reuse of the existing site
- Close proximity to bus stops
- On-site bicycle storage
- Gravel stormwater retention system
- High efficiency HVAC systems and plumbing fixtures
- Use of salvaged materials and high recycled content materials
• Daylight level sensors and multi-level switched control lighting

Figure 14: CNS Research and Education Greenhouses

COMPLETED: UMass Police Station (LEED Gold Certified)
This newly-opened 27,130 square foot complex serves as the new home of the 75-member UMass Police Department. The building is designed to operate 24 hours per day, seven days a week, providing all patrol with investigation, specialized and emergency response, as well as crime prevention and educational services at the University of Massachusetts Amherst campus. The Project was completed during the spring of 2011 and is now LEED Gold Certified (figure 15).

Sustainable features include:

• Low-flow plumbing fixtures
• Geothermal heating and cooling system
• Recycle/salvaged over 80% of the construction and demolition process
• Utilized low VOC emitting and 10% regionally manufactured materials
• 49.4% energy reduction over comparable buildings

Figure 15: UMass Amherst Police Station
COMPLETED: **George N. Parks Minuteman Marching Band Building (LEED Gold Certified)**
This new facility is now the single home for the “Power and Class of New England.” The building includes a large indoor practice and performance space that can contain the entire 300-person marching band, and two smaller group practice spaces. The project was completed during the summer of 2011 and is the first LEED Certified building on UMass Amherst campus (LEED Gold) (figure 16).

Sustainable features include:

- Reuse of the existing Grinnell Hall site
- Close proximity to campus bus stops and on-site bicycle storage
- Drought resistant landscaping and high efficiency plumbing fixtures
- Use of building materials with high recycled content
- Aggressive window glazing, increased insulation and high efficiency HVAC systems

![Figure 16: UMass Amherst Marching Band Building](image)

COMPLETED: **Southwest Concourse**
The Southwest Concourse replacement project is a comprehensive revitalization of the pedestrian core of the 5,000-student Southwest Residential Area. The design strategy observes both the campus and the region to understand the broader project context. Water, topography and native planting are key design elements that connect the site to the region. This project was completed during the summer of 2011 (figure 17).

Sustainable features include:

- Creating 60% pervious hardscape (old concourse = 30% pervious)
- On-site stormwater management
- Recycling granite stones
- Diverse palette of native shrubs and grasses
IN PROGRESS: Life Science Laboratories I & II

The Life Science Laboratories (LSL) were developed to provide state-of-the-art research laboratory space for interdisciplinary research clusters. Today's scientific research requires modern facilities with properly sized floor plates, adequate floor-to-floor heights, and energy-efficient building systems and building envelopes. Since the future course of scientific research cannot be predicted with exact certainty, it is critical that new facilities create large, flexible and adaptable systems that can easily accommodate growth and changing paradigms.

The site planning for the LSL capitalizes upon and seeks to engage the beautiful natural setting at the western edge of Orchard Hill Residential Area while celebrating the work within. The building is designed to link with adjacent buildings and to the pedestrian and infrastructure network in a way that creates both civic space and enhances accessibility.

The building will contain flexible open research labs with equipment alcoves, enclosed support labs, shared platform labs and faculty offices, conference rooms, colloquia, and food serving areas. Accommodation is made in the plan for a future rooftop greenhouse. This project is scheduled for completion during the spring of 2013 (figure 18).
IN PROGRESS: Commonwealth Honors College Residential Complex

Priscilla M. Clarkson, Dean of Commonwealth Honors College, said this new complex will improve an already excellent program. "Commonwealth Honors College is the premier honors college in New England serving the greatest number of students in the largest number of majors," Clarkson said. "This new complex will serve as a visible representation of the commitment of this campus to academic excellence and will help attract even more students to the program." This project is scheduled for completion during the summer of 2013.

![Commonwealth Honors College Construction](image)

IN PROGRESS: New Academic Classroom Building

The New Academic Classroom Building (NACB) is the result of a plan developed over the last two years and will provide new state-of-the-art classroom and academic space for the UMass Amherst Campus. This new building will be sited in the center of campus in proximity to the Lincoln Campus Center and Student Union. Its location in the center of campus will not only provide students with convenient access to classrooms, but will also create a hub of student activity and enhance other student activity space nearby in the Campus Center and Student Union.

Within the walls of the four story 150,000 square foot structure, the NACB will provide nearly 2,000 seats of new classroom space as well as space for several academic programs including Communications, Journalism and Linguistics.

A large portion (15,000SF) of the NACB roof is available for planting hardy native plants. This green roof will provide an educational opportunity to the campus community, reduce the heat island effect, create a pleasing view for the surrounding buildings, absorb CO₂, reduce glare and retain 1,825 CF of storm water. Additionally, a green roof will protect the roof membrane from the elements, including UV light, extending the life expectancy of the membrane and leading to lower life cycle costs.

Stantec is the designer for the project and was the first design team to use the UMass Green Building Guidelines. The exchange with the Stantec team helped shape the Guidelines and is a case study for
successful implementation. The University anticipates that the new building will be completed in the spring of 2014 (figure 20).

Figure 20: UMass Amherst NACB Rendering

**COMPLETED: Green Building Guidelines**\(^{18}\)

Published in the summer of 2011 and prepared by the Green Building Committee, the green building guidelines were written to provide a framework for all future construction and major renovation projects at UMA. Through careful review of the many LEED requirements, the guidelines established priority and feasibility levels for each requirement based on the environmental realities and the mission of UMass Amherst.

**IN PROGRESS: Continuous Commissioning Plan**

The UMass Amherst Continuous Commissioning Plan outlines an approach for improving the efficiency of existing buildings on campus. The goal of this plan is to reduce unnecessary use of energy in various buildings by adjusting their controls and systems to perform at optimum efficiency. In addition to reducing energy usage, this plan will reduce the carbon footprint of existing buildings and improve occupant comfort and indoor air quality. Estimated avoided carbon emissions associated with continuous commissioning work within the first five years and twenty facilities have been approximated at more than 13,146 MTCO\(_2\), and an average of 2,629 MTCO\(_2\) per year (figure 21). Not factoring in campus growth, this plan would reduce total campus emissions by 10% at the end of just five years.

IN PROGRESS: **Sustainability Explorer**¹⁹

The Sustainability Viewer--soon to be renamed the Sustainability Explorer--is an interactive map of UMass Amherst’s sustainability projects and initiatives. The Viewer currently includes 11 existing or recently completed Capital Projects, two gardens (permaculture and rain), and a link to the Green Building Guidelines. This program effectively displays the various ways the UMass Amherst is implementing sustainable projects. The list of projects continuously grows as the University further generates projects.

Currently, the sustainability viewer only displays buildings and areas that promote sustainable features (figure 22). In this upgrade, the sustainability viewer will include Energy Conservation, Food Systems, Green Building, Recycling & Waste Reduction, Renewable Energy, and Transportation. Phase II of the Viewer will move beyond Capital Construction to include initiatives from every area of campus will provide a more comprehensive look at the sustainable projects UMass Amherst is undertaking.

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DOWN THE ROAD:

**LEED EBOM Pilot Project**

In addition to establishing green building goals for new construction on campus, LEED can be used to establish criteria to keep buildings maintained in a sustainable way. LEED for Existing Buildings Operations and Maintenance (EBOM) certifies buildings once they have been in operation for 12 months, focusing on purchasing policies, recycling, whole building cleaning, air quality, energy and water use. Currently very few of our campus buildings meet the LEED EBOM energy efficiency requirement (one reason for the Continuous Commissioning Plan), but we plan to use one of our new LEED certified buildings to pilot the LEED EBOM certification system.

**Western Mass Electric (WMECo) Incentive Program**

The Western Massachusetts Electric Company (WMECo) offers a New Construction Program for commercial and industrial businesses who build new facilities or undergo major renovations of existing facilities. UMass Amherst is currently one of the leading organizations constructing new buildings and renovating existing structures in Western Massachusetts. With assistance from WMECo in developing and evaluating energy-saving upgrades, UMass Amherst can significantly reduce the capital and operating costs associated with current and future construction projects.

**Creating Educational Space in Campus Center Concourse**

The campus center is one of the busiest buildings that students, faculty, and guests visit on a daily basis. The Concourse is a perfect location to educate the campus community through innovative installations.

**Building User Manuals**

Controlling and using campus buildings requires a basic understanding of how the building systems work. Creating User Manuals will help educate building users about how the lighting, heating and cooling, waste and recycling, space allocation, and maintenance systems, etc. function.
Campus-Wide Use of Local Materials
Mandating local sourcing of materials is an important goal for UMass Amherst. Using local sources eliminates expensive shipping costs and boosts the local economy. Achieving this goal will require significant policy changes at both the University and Commonwealth level but will significantly cut campus emissions related to transportation.

End of Building Life Plan
UMass Amherst currently has hundreds of existing buildings spread across its nearly 1,500 acres of land. Each one will eventually reach the end of its life. With two large demolition projects on the horizon, it is critical to begin researching reuse/recycle plans. All future construction projects should include an end of building life plan to cut costs and emissions of new construction.

Bicycle Racks with Roof Coverings
Bicycles are an increasingly popular, zero-emissions transportation option at UMass Amherst. There are currently hundreds of bicycle racks located all over campus which makes it convenient to secure a bike close to destinations. During times of inclement weather, however, bikes stored in these bicycle racks are exposed. To prevent this, users will often bring their bikes inside which takes up space and damages buildings. The installation of covered bicycle racks (figure 23) will prevent damages to the bicycles and will eliminate the need to bring them inside buildings. This could be an excellent opportunity for collaboration between student designers and builders.

Figure 23: The Student Union Bike Rack includes a Roof Covering and Bike Share Sign
**d. Education & Research Subcommittee**

The University is emerging as a national leader in sustainability education and research. The University offers a growing number of co-curricular activities, peer-to-peer sustainability outreach and education programs, innovative research, and academic programs that address sustainability issues which help equip our students to be leaders in the green economy.

Multiple groups of faculty and staff have been meeting regularly on campus to share practices, development opportunities, curriculum and training resources, and to discuss integrating sustainability into the curriculum. These efforts have been led by the Dean of the College of Natural Sciences (CNS) and Library staff. In September 2011, CNS appointed a Director of Academic Sustainability Programs and since then that position has chaired the Education & Research Subcommittee of EPAC. After just two semesters, the subcommittee has grown to more than 30 members representing a diverse range of academic departments including Management, Economics, History, Architecture, Nutrition, Geology, Anthropology, and Environmental Conservation.

**COMPLETED: 2011-2012 Subcommittee Accomplishments**

*Opportunities for Students and Professionals*

UMass Amherst scored very well in the Education & Research area of STARS, receiving a 66.15 out of 100 possible points. This coming academic year, there are many new and exciting opportunities for students, including:

- Three new graduate programs have been created since 2009: MS in Sustainability Science, MS in Environmental Conservation, and the forthcoming MS in Design and Historic Conservation with a Green Building Concentration.
- A growing number of academic departments, 25 of 60, now offer courses in sustainability and fifteen undergraduate majors include sustainability coursework as part of their requirements.
- Six undergraduate degrees currently include core requirements in sustainability, and both a Five College Undergraduate Certificate in Sustainability and a Management certificate in Sustainable Business Practices are on schedule to be approved in fall 2012.
- Three agricultural-related academic tracks have been elevated into majors under the College of Natural Sciences, providing more opportunities for students to engage in sustainability coursework and research activities. Students can now receive degrees in Sustainable Horticulture, Turfgrass Science and Management, and Sustainable Food and Farming. The Sustainable Food and Farming concentration, previously part of the Plant, Soils and Insect Sciences major, is merging with the Stockbridge School of Agriculture in response to growing student demand and emerging work opportunities. Restructuring this program will help affirm the commitment of UMass Amherst to the agricultural mission of the Commonwealth's land grant university. The Sustainable Food and Farming program has grown from 5 to over 60 students in the major over the past 8 years and...
continues to attract students interested in careers with small, organic and community farms, food and farming related non-profit advocacy and policy agencies, government organizations, and educational institutions.

- The University successfully proposed to the U.S. Department of the Interior the establishment of the Northeast Climate Science Center (NECSC). The NECSC is part of a federal network of eight Climate Science Centers created to provide scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife and cultural resources can use to anticipate, monitor, and adapt to climate change.20

- The University of Massachusetts Amherst’s Wind Energy Center is launching the first wind energy graduate certificate program in the U.S. This 15 credit, 5 course certificate program offers a unique opportunity for students or professionals to obtain in-depth knowledge of all aspects of wind energy at the preeminent academic wind energy program in the U.S.A. The IGERT Fellowship (Integrative Graduate Education and Research Traineeship) has been established within the UMass Offshore Wind Energy Program. IGERT is the National Science Foundation’s flagship interdisciplinary training program, educating U.S. Ph.D. scientists and engineers by building on the foundations of their disciplinary knowledge with interdisciplinary training.

- The Food Science, Nutrition, the Stockbridge School of Agriculture, and several departments working with the Center for Public Policy and Administration have proposed a new certificate program in food studies. The proposed Food Studies Certificate is designed as an interdisciplinary program for matriculated undergraduates interested in sociocultural, historical, health, nutritional and policy aspects of food production and consumption. The Center for Public Policy and Administration (CPPA) will serve as the program’s academic “home,” and will be guided by a steering committee comprised of faculty representatives from departments that span the College of Social and Behavioral Sciences, the College of Natural Sciences, and the College of Humanities and Fine Arts.

- The Student Farming Enterprise class, currently in the Department of Plant, Soils and Insect Sciences and slated to move to the Stockbridge School of Agriculture, has expanded its mission to allow more students to learn to farm year round. Spring semester is devoted to planning, market development, growing seedlings and planting in the field. Students are employed to maintain the student farm during the summer months and a 55 member Community Supported Agriculture market, along with a weekly farmers market is managed by the students in the fall semester. Students earn up to 10 credits for participating in this practical experiential learning class.

- In response to student interest in permaculture and national recognition of the UMass Permaculture Project, several new courses have been added to the Sustainable Food and Farming program including; Introduction to Permaculture, Permaculture in the Pioneer Valley, Permaculture Practicum, Forest Gardening CSA, and a Permaculture Design Certificate. The Stockbridge School of Agriculture is currently working on developing an undergraduate concentration in Permaculture for Sustainable Food and Farming majors and an undergraduate minor in Permaculture for non-majors.

20 NECSC Website: http://necsc.umass.edu/about-us
Communicating Sustainability

Prospective students and current students now look to UMass as the leading research institution in the region and throughout the country to study sustainability. In addition to receiving STARS Gold, which positions the University within the top 10% nationally of all research institutions, the University is engaged in developing communication tools that help attract prospective students who are interested in these fields as well as guide current students through their academic experiences in academics and a sustainable campus life.

- Members of the Subcommittee have partnered with University Relations, the College of Natural Sciences and the Center for Agriculture to create a new position on campus: The Sustainability Communications and Marketing Manager. This position will lead communication and marketing (C&M) efforts to advance the University's reputation as a global leader in sustainability. The manager will be responsible for the implementation of the UMass Amherst Green Visibility Campaign, a three-year effort to demonstrate the University as a national leader in sustainable-related teaching, research and campus life.

- The subcommittee created the STARS overview document, “Benchmarking Our Progress on Sustainability” that demonstrates our accomplishments, and is used across campus by the Chancellor and central administration, and has been distributed to members of the state legislature.

- Along with Communications student interns, staff and faculty successfully created and launched the web site for Campus Sustainability Initiative. This website is used by the entire campus community to find information about student led events and programs, the Green Office Program, the projects of EPAC, profiles of the people involved on campus, and other sustainability tools like the Sustainability Viewer and the Green Games Scoreboard.

- The subcommittee and sustainability staff has worked with the Office of the University Registrar to develop a SPIRE designation for sustainability courses. Over 70 courses will be tagged with a sustainability icon for fall 2012 semester.

DOWN THE ROAD: Subcommittee Goals

Raise visibility of sustainability academic programs

The committee will identify and create a comprehensive inventory of programs and courses for the 2012-2013 academic year. The STARS reporting process has helped the University and the committee establish a methodology for creating an inventory of courses. Due to the shifting nature of sustainability issues and the continual adaptation of the curriculum across colleges and majors, this inventory must be constantly updated. Global and institutional definitions for sustainability are used to designate sustainability related or focused courses. In 2011, the first canvass of every department head of the University was completed. They were each asked to identify courses in their programs that fit the sustainability definitions. The results were compiled into a master database.

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22 UMA Campus Sustainability Initiative Website: http://www.umass.edu/livesustainably/
23 UMA Green Course List 2011: http://www.umass.edu/green/Sustainability%20Course%20List.pdf
Increase number of sustainability-related courses and learning outcomes

Identifying courses is important to draw student interest, but it’s equally important to work with faculty to develop more sustainability courses and learning outcomes. In the STARS Report, UMass Amherst did not excel in the percentage of sustainability-related courses offered (Credit ER-7), receiving 0.71 out of 10 possible credits. UMass has over 4,650 courses and about 100 courses (~2%) were considered sustainability-related. The committee will work to increase this number to 7.5% to 15% of all courses in order to receive 2.5 to 5 points for this credit by 2013. It is important that the institution’s students graduate from programs that include sustainability as a required learning outcome or include multiple learning outcomes during some point in their academic experience. UMass Amherst scored very low in this area of the STARS report (Credit ER-9)24, receiving 1.48 points out of 10. Twenty eight degree programs have these learning outcomes, covering 1,000 of more than 6,400 total UMass graduates in 2011. It will be crucial to expand the involvement of faculty in the programs not yet identified in order to have sustainable learning outcomes to score higher on the STARS Report and more importantly the guarantee of reaching more students before they graduate.

Reporting to Campus Leadership

The committee is responsible for communicating with the Chancellor and Provost by reporting education goals and progress via the annual CAP Update report and EPAC reports to the Chancellors Leadership Committee (CLC). Future reports will make recommendations regarding sustainability curriculum and research, benchmarking data that illustrates the excellence of our academic programs, and collateral from the campus Green campaign which will be launching in October 2012.

Professional Development

The committee has formed a task force to develop opportunities for incentives and faculty development around sustainability-related research. The task force will seek innovative and creative development opportunities for faculty in multiple disciplines to develop new courses and/or incorporate sustainability into existing frameworks. Creating incentives may also include helping faculty find release time for training and funding for professional development. The same task force will also look at growing sustainable research by finding new fellowships, financial support, and faculty development workshops.

Increase academic options in sustainability

This work entails developing new energy-related courses, exploring options within the General Education framework, developing infrastructure that supports and encourages undergrad certificates (including those forthcoming from the Five Colleges and Isenberg School of Management), encouraging experimental courses to get regular course status, investigate opportunities and interest for new programs, dual degrees, 5th year masters programs, and interdisciplinary options.

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e. Food & Permaculture Subcommittee
Since publishing the Climate Action Plan in 2010, the sustainable food and farming movement on campus has helped catapult the University into the national spotlight, built a community of dedicated students, supported local businesses, and has been at the center of a cultural transformation on campus. With the help of the Food Subcommittee of EPAC, Dining Services has made tremendous headway towards achieving the goals we set for ourselves in the CAP, accomplishing almost every strategy recommended.

**COMPLETED: Dining Services Accomplishments**

- Instituted reusable bags for customers in the grab-n-go markets
- Expanded the Permaculture gardens on campus to include three total and more planned
- Purchasing more produce from the Student Farming Enterprise
- Implemented 100% biodegradable, compostable flatware, bowls, and utensils at all retail locations.
- Purchasing 30% local products
- Installed purified water coolers in all Dining Commons and grab-n-go locations
- Trained staff and student outreach programs on sustainability
- Improved composting in retail locations such as the Blue Wall Cafeteria by purchasing three new custom made compost/recycling/trash units and signage

Now we find ourselves in a position to think about achieving big, institutional-wide goals, such as reaching carbon neutrality in our food system. Where better than the Pioneer Valley to demonstrate that local food systems can work cooperatively between the campus and local communities to minimize our emissions, support a local economy, and most importantly to create paradigm shifts which “change the way we think, to create the world we want.”

What we want is a carbon neutral food system which nourishes and supports people, protects and regenerates the environment, and promotes equality, fairness, and empowerment. To achieve this goal, our vision is three-fold:

1. Foster a culture shift in which we educate about local food systems and implement food sourcing.
2. Create a net-zero food supply in which we eliminate waste and emissions in all aspects of our food system.

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25 “Eco Mind: Changing the Way we Think, to Create the World we Want” by Francis Moore Lappé
3. Build a local economy around food sustainability and wellness by sourcing 100% of our food locally so as to stimulate the local economy while we improve our environment and feed our communities.

This is a lofty vision, but by educating, building relationships, and thinking outside of the box, we believe that these goals are within our reach.

The Food committee has identified some key strategies to achieve these goals:

**IN PROGRESS: UMass Permaculture Initiative**

The UMass Permaculture Initiative is a unique and cutting edge sustainability program that converts unproductive grass lawns on campus into ecological, socially responsible, and financially sustainable permaculture landscapes that are easy to replicate. The success of this initiative has been made possible by the collaboration between campus students, staff, faculty, and administration, as well as local and community volunteers.

The Permaculture Gardens on campus demonstrate community-based agricultural production which also improves the quality of the environment. The gardens are designed to mimic ecological systems, increase biotic life on the site, and require no fossil fuels, chemicals, or artificial fertilizers on site. Our first permaculture garden produced 1,000 lbs of fresh organic foods in its first harvest. That number will increase with time as our (now three) permaculture gardens mature and as we continue to build more edible gardens and landscapes on underutilized campus grounds.

Permaculture gardens are already demonstrating ways to close the “food loop” by sourcing many of our resources on campus such as our mulch and cardboard. Compost used on our sites is sourced from UMass Dining’s wet food waste, composted at the New England Small Farms Institute in Belchertown, Massachusetts and then used in our permaculture gardens.

The UMass Permaculture Initiative won the White House’s 2012 Campus Champions of Change Challenge, a national award hosted by the White House. More than 1,400 schools applied for this award and UMass Permaculture was chosen as one of only 15 finalists. They received almost 60,000 votes in just one week to win the Challenge, visit the White House and meet President Obama. As winners, the Permaculture Initiative was launched into the limelight locally and around the region, generating more student excitement around the Initiative and growing the sustainability awareness on campus (figure 24).
Permaculture Opportunities by 2020

- 12 On-Campus Gardens: Our campus is committed to building one new permaculture garden on campus every year, as well as contributing to permaculture projects in surrounding communities. By 2020 we aim to have about 12 gardens which produce 10,000 lbs of organic food on campus each year.
- Academic Program: Our academic program will teach permaculture (ideally, offered as a major, minor/concentration, and elective) and incorporate our on-campus gardens as service-learning opportunities. This program opens the door for senior capstone projects, independent research, internships, and formalized training in permaculture methods.
- Center for Permaculture: The Center for Permaculture

Permaculture Opportunities by 2050

- On roughly 300 acres of UMass land, we can supply roughly 1.5 million pounds of produce, supplying UMass Dining’s produce supply through permaculture techniques.

IN PROGRESS: UMass Dining Self-Audit
One of the vital steps to making gains towards carbon neutrality is to benchmark the starting-point for your organization, and define what can be considered “progress” towards achieving carbon neutrality.

UMass Dining has already committed to calculating what percentage of our food budget is sourced locally. We also have data available detailing the emissions produced in each of the dining commons. This data is also organized to calculate how many emissions are produced per meal served in the dining commons, as a more appropriate metric for food service emissions.

Opportunities by 2020
• Perform a more detailed audit of UMass Dining: the audit should measure carbon emissions from procurement (our supply chain); our buildings and operations; and waste management in order to reflect the true scope of our carbon footprint.

• Define what counts as “progress” towards our carbon neutrality goal: Use baseline data from UMass Dining’s detailed self-audit to compare to all future emissions.

• Reduce overall carbon footprint 5% every two years: Look for opportunities in the audit report to identify major emitters of carbon dioxide within UMass Dining.

IN PROGRESS: UMass Closed Loop Food System

The term "food system" is used to describe all the activities involved in producing, processing, transporting, storing, selling, and eating food. It also includes waste management activities like composting or landfiling food scraps. In order to achieve carbon neutrality, it is important that all these sectors of the food system be contained within UMass-owned land or within local proximity. UMass Amherst can achieve a closed loop food system if all the processes involved are done locally or on campus grounds:

• Production: 100% locally-grown, sustainable foods
• Processing: On-campus or local processing
• Distribution: Local or on-campus foods delivered using carbon-neutral vehicles and any food storage done on-campus or locally
• Consumption / Retail: Local foods prepared on-campus or locally using carbon-neutral energy
• Waste Management / Resource Recovery: Collected and composted on-campus or locally, leading to 100% waste diversion.

Currently, UMass Dining has achieved 72% waste diversion in its operations. This relatively high diversion rate can be attributed to the fact that UMass Dining composes all wet food waste and recycles packaging through the Office of Waste Management on campus.

Opportunities by 2050

• Define “local” for UMass Amherst: Base this number on what distance from campus will allow UMass Amherst to support the local economy, achieve carbon neutrality, improve the quality of the environment, and support our campus and local communities.

• Designate UMass land to growing UMass Amherst food: Converting about 300 acres of land could grow roughly 100% of UMass Amherst Dining’s produce demands.

• Local Cooperatives: Building partnerships with local farms may increase our opportunities to source food locally; by coordinating local cooperatives with small farmers (perhaps with the help of third party local food organizations like CISA), local farms can overcome the obstacles of supplying for UMass Amherst Dining, such as meeting high demand, high minimum insurance requirements, flexibility with payment, and crowded loading docks.

• Achieve 90% waste diversion from landfill or incineration: Reach out to members of the Office of Waste Management to look for collaborative steps that can help achieve this goal on campus.
• On-Campus Composting: Install composters anywhere that there may be food scraps or yard clippings including academic buildings, residential halls, administrative and office buildings, all on-campus gardens, etc. Make it second-nature for students and visitors to divert food waste.
f. Waste Reduction Subcommittee
The University continues to be a leader in recycling and waste reduction among state agencies, communities, and in higher education. The University currently finds recycling streams for 54% of the total waste, recycling almost 4,000 tons of solid waste compared to just under 2,800 tons of refuse. This recycling rate places the University within the top ten when compared to communities of equal size across the state of Massachusetts. However, efforts are underway to increase this rate and to engage students, faculty, and staff by improving the systems and participating in waste reduction awareness events throughout the year on campus.

The Waste Reduction Subcommittee was formed in 2011 due to the growing need for campus collaboration among Environmental Health & Safety staff, Physical Plant and Office of Waste Management staff, Procurement staff, and student leadership. Since launching, the committee has met regularly and has taken on an ambitious list of projects in hazardous waste reduction, energy savings, recycling and composting, as well as supported student led initiatives in the residence halls and campus events. The committee uses helpful tools to evaluate the respective areas include the following:

Substitution or Product Reformulation
Is there a different product or chemical that can be used that is less hazardous or better for the environment (e.g. paper with recycled content; alcohol verses mercury thermometers; compostable vs. plastic utensils; purchase “Energy Star” rated appliances)

Process Improvement of Operations and Maintenance
Can we change the process so less waste is produced (e.g. Use micro chemistry techniques in teaching labs – smaller experiments use less chemicals; Run steam condensate through a heat exchanger to use the heat value – use less energy to boil water; send electric documents instead of paper; Meter janitorial supplies to prevent overuse; use an approved drum crusher locally for fluorescent lamps to prevent breakage, print documents on both sides of a paper)

Reuse or Recycling
Can anything be used or recycled in some other way (e.g. composting of food; recycling of paper, concrete; use of treatment plant effluent, rain water for boiler water make up, irrigation or chilled water).

The following projects have been initiated throughout campus to reduce waste and hazardous materials:

COMPLETED: Projects in Place
• Furniture and Mattress Reuse: The Office of Waste Management manages the Surplus Property Barn (SPB) which allows any state agency or University department to obtain surplus property for work purposes. Items that have remained in the SPB for 30 days are considered to be unwanted and are therefore eligible for donation to non-profit organizations.

• EPA Gameday Challenge: In November 2011, the Campus Sustainability Initiative (CSI) participated and excelled in the EPA’s Game Day Challenge (figure 24). The challenge was to reduce waste at a football game in five areas: waste minimization, diversion rates, greenhouse gas reduction, recycling, and organics diversion. On November 19th, over 50 volunteers comprised of CSI interns, Eco-Reps, and other willing students/community members gathered to take on the task of educating and assisting football game attendees in properly disposing of their waste. At the end of the day, compost and recycling bins were overflowing and trash bins were nearly empty. More than 580lbs of compost were diverted from landfills and the university placed in the top 8 in all 5 categories, including finishing 4th in the nation in organics diversion category. There were 75 participating schools. The CSI was successful in this program due to the partnerships between UMass Physical Plant, Athletics, Auxiliary Services, and nonprofit organizations such as Keep America Beautiful.

Figure 25: Student volunteers at the EPA Gameday Challenge

• Sustainable Move-Out: The Campus Sustainability Initiative student interns, and Eco-Rep coordinators partnered with Physical Plant and Residential Life staff once again at the end of the semester this year to collect nonperishable food, clothing, school supplies and returned dining hall items during the weeks of campus move-out. Waste data is currently being analyzed by the Office of Waste Management.

• Fluorescent Lamp Crusher: The Office of Waste Management recycling facility purchased a “bulb eater” to crush bulbs in a safe manner.

• Composting: The Office of Waste Management comports leaves, stumps and farm animal bedding that is then reused on campus by the Landscape Services Department. As mentioned in the Food Subcommittee report under Dining Service accomplishments, Auxiliary Services has purchased new bins in the Blue Wall Cafeteria (figure 26) to increase composting rates by 15%. Numbers for the year are currently being analyzed by the Blue Wall management staff.
• Chemical Inventory System: This system includes bar coding of laboratory hazardous materials.
• Lab Coat Laundering: A pilot program with the Chemistry Department in Conte and the LGRT buildings safely launders lab coats instead of having researchers take coats home or wear soiled lab coats. This project should be expanded into multiple departments and laboratories but will require funding, space logistics, and resolution of billing issues before expanding.

IN PROGRESS: Current Projects

Single Stream Recycling
The University is beginning to implement a single stream recycling system for all education and administration buildings as well as all residence halls. Single-stream recycling is a system in which all recyclable materials – fiber (newspaper, cardboard, mixed paper, catalogs, magazines) and containers (glass, steel, aluminum and plastic) – are placed, unsorted, in one recycling bin and sorted by state-of-the-art processing equipment at a regional recycling center. This system will save the Office of Waste Management in the Physical Plant operating costs and will also increase recycling rates by eliminating the need to sort recyclables, and making recycling more convenient for student residents, faculty and staff. Full implementation of the new single stream system is expected by the end of the summer in August 2012.

Green Cleaning
The Governor’s Executive Order 515 mandates that all state agencies in the Commonwealth of Massachusetts reduce their impact on the environment and enhance public health by procuring Environmentally Preferable Products and services (EPPs) whenever available. Environmentally Preferable Products (EPPs) are products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose, and may include recycled content, less toxicity, more energy efficiency, or may be biodegradable, conserve water or more durable. The goal of the committee is to comply with EOS15 by working with units across campus to institute more uniform and sustainable green cleaning chemicals and practices. Procurement and Waste Management staff will be working with Residential Life and Auxiliary Services janitorial staff to ensure their systems comply with EOS15, and to help transition systems into compliance.

DOWN THE ROAD: **Future Projects**

*Water Savings in Labs*

Rotary Evaporators are used every day in the research science laboratories to purify solvents. These units use thousands of gallons of water for vacuum and cooling and could instead use a vacuum pump and chiller. Currently these units use about 100 gallons of water per hour, cost about a dollar per hour to run, and about $3,000 per year. Investing in chillers and vacuum pumps through the E+ Energy Efficiency Program (see Energy Subcommittee), would create equipment and utility savings while also addressing resource conservation due to low solvent and noise emissions and the low energy consumption.

*Water Savings in Residence Halls*

The Eco-Rep Program and participants in the Green Games Competition recently surveyed campus residents regarding their shower usage in a typical week. Over 2,000 students were surveyed by their peers. From this data, Campus Sustainability Initiative staff was able to accurately estimate the amount of water being used in the residence halls for showering purposes. Comparing these results with the actual water meter readings from the utilities department, we were able to draw a strong correlation that ensures the accuracy of our estimations. The study found that campus uses an estimated 7.4 million cubic feet of water for showering per academic year. Using this information and the knowledge that the showerheads in the residence halls were not retrofitted during our Johnson Controls energy performance contract, our former Energy Intern and current Green Games Coordinator proposed that they should now be replaced with ultra-low flow fixtures that use 1.5 gpm (gallons per minute) instead of the current 2.5 gpm. This retrofit in the showers of the residence halls would save almost 3 million cubic feet of water per year and an estimated $185,000 per year with a return on investment of only a few months.

The committee and Campus Sustainability Initiative plans to partner with Residence Life to couple the new showerheads with handing out in-shower timers at the New Student Orientation (NSO) in September 2012, which would greatly reduce the amount of water being used in the residence halls for showering purposes, create a fun challenge for students, and increase awareness of resource consumption among the student body.
g. Transportation Subcommittee

The University is positioned to take a leadership role as a centerpiece of the progressive Pioneer Valley transportation system and culture. With increasing numbers of biking commuters, existing infrastructure of bike paths and the Pioneer Valley Transit Authority (PVTA) public transportation system, UMass Amherst can work with the surrounding communities to increase ridership, carpooling, and to encourage smart growth by being involved in the planning process of the surrounding communities in order to implement sustainable transportation features into our own planning process in the future.

The campus Master Plan includes a number of projects that would make the campus transportation system more sustainable, including plans for a transportation center and restructuring our roadways to create complete streets.

Thanks to student leadership and partnerships with many campus departments, the EPAC committee has made significant progress in developing new programs and incentives. At the forefront of these efforts are the student-run Bike Share Program, new hybrid buses, and an alternative fuel vehicle study, which is currently underway.

Recent accomplishments on campus relating to sustainable transportation include:

- **Campus Fleet reduction of 84 vehicles**, resulting in a 20% reduction.
- **Hybrid Buses**: In October of 2010 the Pioneer Valley Transportation Authority of Springfield received a federal grant of 6.2 million dollars to purchase 10 state-of-the-art electric hybrid buses. These new buses have diesel-fueled engines with electric motors and double the fuel efficiency of the ten older busses they will be replacing. Five of these buses are being used on the UMass Amherst campus.
- **UMass Amherst Rideshare Program**: This program offers an alternative to single occupancy vehicles by assisting UMass employees and off-campus students in forming carpools.
- **Van Pool Program**: The UMass Amherst Commuter Options Program (COP) has partnered with MassRides in facilitating the formation of vanpools to the University.
- **Clean Vehicle Permits**: UMass Amherst is now offering discounted parking permits for "clean" vehicles (EPA Smartway Elite Vehicles). This discount is intended to encourage the use of “clean” vehicles and reward those commuters already doing their part to reduce the environmental impact of the automobile. A Clean Vehicle Permit provides a two year discount of 20% off your annual parking permit fees. The Clean Vehicle Permit discount cannot be combined with other discounted programs including Occasional Parker Permits and Carpool permits.27

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27 UMA Parking Services Clean Vehicle Permits: http://parking.umass.edu/index.php/permits/cleanvehicle
• Car Sharing: The We Car program is a car sharing plan run by Enterprise Rent-A-Car that now allows individuals to rent cars by the hour right on the UMass Amherst campus. Students, faculty, staff, and even local Amherst residents can take advantage of this new program. Cars are available from the Campus Center Garage.

• NuRide: This is an alternative transportation incentive program hosted by the Massachusetts Department of Transportation (MASSDOT). Student, faculty, and staff have the ability to track their trips and awarded coupons to local businesses based on their sustainable transportation choices and frequency of use.

**COMPLETED: Bike Share Program**

Created to encourage alternative transportation, this program seeks to provide students, faculty, and staff (anyone with a UCard) with free and convenient bike transportation. Funded by a gift from the class of 2010 and supported by the Student Government Association and the Campus Sustainability Initiative, the UMass Amherst campus bike share program was launched during the beginning of the 2011-2012 academic year.

Bikes were purchased from Worksman Cycles, a company based in New York that has been producing handcrafted bikes in the US for over 100 years. In addition to domestic production, Worksman Cycles has incorporated alternative energy sources into their business plan, as 25% of the energy the factory uses now comes from a large solar array on their roof. The bikes came in pieces and were assembled by the Bike Co-Op in the Student Union. UMass purchased 25 bikes from Worksman and is refurbishing an additional ten bikes that were abandoned by students and rededicated for community use.

In the program's first semester, 150 students took out bikes and reported back with enthusiastic satisfaction. There was a large waiting list for bikes throughout the Spring semester. The program's future goals consist of adapting paperless sign-out sheets online and expansion to satellite locations. Ultimately, they want to set up stations outside residential halls for added accessibility to students.

![Bike Share bikes Parked Under Student Union Bike Rack](image)

**IN PROGRESS: Alternative Fuel Vehicles**

The UMass Amherst Vehicle Review Board (VRB) makes recommendations to departments looking to
update or purchase new vehicles. The VRB recommends vehicles with improved fuel efficiency and that use alternative fuels. The VRB and staff from UMass Transportation Services have been successful in reducing the fleet as well as procuring alternative fuel vehicles, such as electric cars where they can be most appropriately used. In May, 2012 the University was awarded a $10,000 Alternative Fuel Feasibility Study by the American Fueling Systems (AFS) Cooperative Agreement Program. UMass Amherst stands to gain significant financial and environmental benefits from alternative fueling solutions. This study, which is currently underway, will analyze the current campus fleet of about 500 vehicles, their use patterns, and provide UMass Amherst with a comprehensive and in-depth feasibility study that clearly reveals its potential for financial savings and increased carbon emissions reductions. Campus Sustainability Initiative student interns wrote the narrative for the American Fueling systems (AFS) Alternative Fuel Fleet Study and completed the application for this exciting grant. The suggestions from this feasibility study will be brought to the UMass Amherst Administration and the VRB for consideration and implementation going forward.

IN PROGRESS: Bike Commuter Program
The University has implemented bike lanes, a bike share program, and campus wide bike racks to cater to the increased ridership mostly among students. However, the University can do more to encourage biking and decrease single occupancy vehicle use on campus. In order to make recommendations for how UMass Amherst can do this, we must first understand where we rate in this area nationally among other higher education institutions. In April, 2012 student interns entered the University into the League of American Bicyclists Bicycle Friendly University Program (BFU). This program recognizes institutions of higher education for promoting and providing a more bicycle-friendly campus for students, staff and visitors. The BFU program provides the roadmap and technical assistance to create great campuses for cycling. Each application to the Bicycle Friendly America program is reviewed by a panel of national bicycle experts and several local reviewers are consulted to share their on the ground perspective of the applicant. 28 UMass Amherst will hopefully be announced in the fourth round of Bicycle Friendly Universities in September, 2012.

28 League of American Bicyclists:
http://www.bikeleague.org/programs/bicyclefriendlyamerica/bicyclefriendlyuniversity/
5. Cross-Campus Sustainability: Blue Sky Initiative

During the months of January and February of 2012, the Five Colleges (Amherst, Hampshire, Mount Holyoke, and Smith Colleges, and UMass Amherst) facilitated 14 on-campus meetings with their respective communities to envision sustainability on each campus, across the Five College campuses, and collaboratively with surrounding towns and communities. Nearly 500 ideas were submitted at the meetings and online. UMass Amherst held two meetings that were well attended despite challenging weather conditions. The ideas ranged from a few sentences to fully developed proposals. Each sustainability coordinator from each campus submitted a summary report detailing the events and ideas generated from their campus. See Appendix III for the UMass Blue Sky report. Ideas were sorted into topic areas which included academics, energy, food, green buildings, land use/land conservation, transportation, waste reduction, water, and other. The Five College Sustainability Programs Coordinator published a full report which sorted all 500 ideas into different categories of “High Impact, Low Cost,” “High Impact, High Cost”, “Low Impact, Low Cost”, and “Low Impact, High Cost.”

The President of Hampshire College has convened the Blue Sky Committee—a group of sustainability coordinators from the respective Five Colleges—to screen, rate, and group the 500 ideas to choose the 30 best cross-campus proposals based on environmental footprint, financial savings relative to cost of implementation, and learning opportunities for students. All ideas that pertain to a specific campus will be handled individually. The group of 30 proposals will then be narrowed once more to the top 1-8 projects by a Five College Working Group consisting of students, faculty, and staff.

Summer 2012

- Convene experts and leaders group to screen proposals. This group would include one representative with knowledge and experience in project evaluation and implementation from each campus, one faculty or staff leader of the effort from each campus, and one student participant from each campus. This group will refer single-campus proposals to that campus and identify a short list of 5 to 10 leading proposals for discussion using the forgoing criteria.
- Assign teams to determine top proposals by the end of the summer; developing a preliminary estimate of costs, benefits, and teaching value.
- Identify projects from the secondary set that might be reviewed by students in courses in fall 2012. Interested faculty members have already identified courses they teach that might effectively take on this task.

Fall 2012

• Convene Five College working groups for Saturday meetings in September on each of the major themes of the top proposals. The goal is to identify 1-8 top projects rated most highly by the end of October.
• Share the list of top proposals (and the apparent Return on Investment for each one) with Five College Business Officers for their meeting in November 2012.
• Present a list of top proposals for the Five College Board of Directors to adopt some or all of them at the December 2012 meeting.

*UMass Amherst Adoption of Blue Sky Ideas*

The Chancellor of UMass Amherst sits on the Five College Board of Directors. UMass Amherst recommends that the Chancellor be present for the December 2012 Board meeting in order to participate in the process for deciding which proposals should be adopted by the Five Colleges.
6. The Solution

The University of Massachusetts Amherst can rise to the challenges that lie ahead. Implementing the Climate Action Plan Update and advancing the sustainability goals (below) will help the University achieve long term excellence by positioning the University as a regional and national leader. Bright, passionate students who are interested in studying sustainability will attend the University. Approximately 69 percent of students consider a school’s sustainability initiatives when making their decision about where to attend college. The environmental challenges of growing the campus will be answered by the positive outcomes of achieving our sustainability objectives.

Mission

In order to make this a reality, the campus community must decide on a common mission and a set of specific goals to achieve in the short term. The mission of the Campus Sustainability Initiative provides a great starting point:

- Explore and communicate ways to improve upon current university practices by fostering innovative ideas and technologies both within the campus community and beyond;
- Educate the campus community to create a healthier and more responsible environment;
- Develop progressive solutions to reduce negative environmental impacts in ways that are economically beneficial.

Goals and Metrics

Achieving sustainability goals will require a set of specific strategies and setting performance metrics for each strategy:

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**GOAL 1.** EDUCATION/ENGAGEMENT: Integrate and expand sustainability into all aspects of the curriculum and campus life

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<th>Strategy</th>
<th>Metrics</th>
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| Extend sustainability learning outcome requirements to a majority of majors and degrees. | 2011: 14% of students  
2015: 30% goal  
2020: 50-60% goal                                                       |
| Offer more sustainability focused and related academic courses.          | 2011: 2%  
2015: 4%  
2020: 6%                                                               |
| Conduct assessments of sustainability literacy of all students focusing on knowledge of topics, not values or beliefs | First assessment completed by 2014                                      |
| Increase student engagement in residence halls and campus activities and increase faculty and staff engagement in classroom and administrative offices | Grow Eco Reps from 35-40 to 75-100 members  
Grow Green Games to 1 Eco Leader/Res Hall  
Grow Green Office Program to every office at least Bronze certified |
| Renew the ACUPCC: Reaffirm leadership and recommit the University to the goals within the commitment text | January 2013: UMass Amherst Chancellor signs Commitment |
| Restructure and grow EPAC to include members from University Relations, Budget office, Student Affairs and Residence Life, Diversity Office, Alumni & Development, and Athletics | August 2012: New EPAC structure set in place  
September 2012: New UR Sustainability Communications & Marketing Manager Hired  
January 2013: New members invited from Diversity, Alumni, and Athletics, and join EPAC |
| Place a spotlight on research that is contributing to a just and sustainable future; begin tracking the financial commitment to sustainability related research to highlight how it can potentially offset campus emissions. | 2012: New research website launching  
2013: Sustainability Initiative highlights sustainability research in major publications and reports  
2013: Sustainability research symposium held in coordination with academic departments and provost |
**GOAL 2. ENERGY/EMISSIONS/BUILDINGS:** Reduce overall energy usage and carbon emissions, convert to renewable energy sources, green existing buildings, and grow net-zero

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| Develop a campus renewable energy plan to produce electricity from 30% renewable energy sources by 2020 (EO484), ultimately reducing campus emissions by 25-30%. | 2012: ≥1% renewable energy, develop and approve plan  
2015: 15%, Phase 1 projects completed  
2020: 30%, Phase 2 projects completed |
| Develop a Reduce Your Use Campaign, including the piloting of innovative energy management technologies, reductions in individual energy consumption through student energy competitions and green office programs, reducing energy usage and campus emissions 5-10% by 2020. | 2012-2013: Develop campaign and student pledge, complete residence hall metering, pilot energy management technology, 21-25 residence halls in Green Games competition  
2015: 30 residence halls in Green Games competition  
2020: All 45 residence halls in Green Games |
| Continuous commission existing buildings across campus to improve energy efficiency, yield an average of 16% energy costs per building, reduce energy usage and emissions 10-25% by 2020. | 2012: 2 Buildings  
2012-2017: 5 Buildings per year, Grow CCx program campus wide, 15% reductions  
2020: Continue to CCx buildings campus wide for additional 10% or more reductions |
| Develop campus wide sustainable development policy for carbon neutral growth, which recovers the costs of greening new and existing buildings through energy efficiency measures. | 2013: Policy drafted  
2014: Policy adopted  
2015: Footprint of new construction and major renovations offset by energy efficiency and renewable energy |
| Preserve the E+ Energy Efficiency Program by continuing to improve the project selection process and ultimately the effectiveness of the program. | 2012: Increased visibility of cost savings of projects  
2013: National recognition for program  
2015: Continuation of projects implemented and cost savings from projects |
GOAL 3
FUNDING/INVESTMENT: Fund sustainability advancement through student fees, revolving loan funds, and external partnerships and advocate for a more transparent UMass endowment

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<tr>
<td>Seek approval for a student green fee to help finance objectives 1 and 2 above by funding highly visible projects on campus chosen by students that improves the quality of campus life and increases the opportunities for hands-on learning for all students.</td>
<td>Fall 2013: New Proposal drafted&lt;br&gt;Spring 2013: Student Government Association ballot initiative voted yes by student body&lt;br&gt;Summer 2013: Fee approved by UMA Administration&lt;br&gt;Fall 2013: Implementation of projects</td>
</tr>
<tr>
<td>Appoint a taskforce to report on the advantages and drawbacks of establishing a revolving loan fund (RLF) to finance our energy efficiency upgrades.</td>
<td>Fall 2012: Create taskforce, hold Public Forum with Sustainable Endowments Institute&lt;br&gt;Spring 2013: Draft proposal to create RLF&lt;br&gt;Fall 2013: Fund adopted by UMA Administration</td>
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<td>Bring in sustainability funding through external partnerships and alumni support</td>
<td>Fall 2012: New material created to engage alumni and foundations in gift giving for sustainability programs</td>
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Appendices

I. Chancellor Thomas W. Cole's Letter

UNIVERSITY OF MASSACHUSETTS
AMHERST

374 Whimor Admin Building
181 Presidents Drive
Amherst, MA 01003-9313

January 25, 2008

Patrick Daly, Director
Physical Plant
Plant Building

RE: Environmental Performance Advisory Committee (EPAC)

The University recognizes that the fulfillment of its mission has a far reaching impact on the environment, including climate change. To insure that our campus is doing everything feasible to reduce its environmental footprint and become a more environmentally-responsible institution, I am establishing an Environmental Performance Advisory Committee (EPAC) and charging it with the following tasks:

- Assess and recommend ways to reduce environmental impacts of the campus in a manner which incorporates sound business practices;
- Enhance the campus' ability to gather, track, and analyze environmental performance data and related information and develop report documents;
- Develop and recommend a 5 to 10 year plan to reduce the campus' carbon footprint based upon current benchmarks;
- Devise and recommend a comprehensive and common-sense way to foster environmental stewardship across the entire organization among and within campus departments, both operational and academic; and
- Advise the Chancellor's Executive Board on all matters related to campus environmental performance including adjustments to operating policies and/or practices.

In addition to you, I have appointed the following people to membership on EPAC:

Steve Goodwin, Dean of Natural Resources & Environment
Jim Call, Director of Facilities & Campus Planning
Al Byam, Director of Transit Services
Brian Fitzpatrick, Manager of EH&S Environmental Management Services
Susanne Hale, Student Representative
Josh Stoffel, President of Students for Environmental Awareness and Action
Faculty members to be determined

I have appointed Craig Ruberti, EH&S Manager as the facilitator for this effort. I anticipate the kick-off meeting to be scheduled in early February and you will be contacted shortly to check your availability.

I want to thank you for your commitment to this very important effort.

Sincerely,

[Signature]

Dr. Thomas W. Cole, Jr.
Chancellor

cc: Joyce Hatch
Craig Ruberti
II. Chancellor Robert C. Holub’s Letter

The following letter was sent to the Campus Community via email on January 14, 2010

UNIVERSITY OF MASSACHUSETTS
AMHERST
374 Whitmore Administration Building
181 Presidents Drive
Amherst, MA 01003-9313

OFFICE OF THE CHANCELLOR
voice: 413.545.2211
text: 413.545.2328
www.umass.edu

January 14, 2010

To the Campus Community:

In the past few years, concerns of global climate change and its effects on our planet have become increasingly numerous and urgent. In response, the American College and University Presidents’ Climate Commitment (ACUPCC) was established to address global climate change by garnering institutional commitments to neutralize greenhouse gas emissions and by accelerating the research and educational efforts of higher education to equip society to re-stabilize the earth’s climate. In 2007, University of Massachusetts President Jack Wilson committed the entire UMass system to work together to fulfill this commitment.

Today, I am happy to present the campus’ Climate Action Plan, electronically at http://www.umass.edu/green or for review at the DuBois Library’s Reserves Desk. Compiled by the Environmental Performance Advisory Committee (EPAC), the Climate Action Plan describes initiatives that we have already undertaken to combat global climate change and how the campus community will work together to fulfill the goal of the ACUPCC as we move toward a more sustainable future. Even though carbon neutrality is a lofty goal, especially for an institution our size, we are dedicated to developing innovative ideas and technologies that will help us achieve this goal.

I would like to express my grateful appreciation to the many people who dedicated a great deal of time not only to produce the Climate Action Plan, but also to create the synergy necessary to vigorously address issues of campus sustainability. The Climate Action Plan was compiled through the collaborative effort of over 100 students, faculty and staff. It reflects ideas that stretch across a broad spectrum of the campus community. The Plan is a testament to what can be accomplished when we work together.

Sincerely,

[Signature]
Robert C. Holub
Chancellor

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III. Blue Sky Report

The University of Massachusetts Climate Action Plan First Annual Report to the Chancellor: Following the CAP Roadmap

Ezra Small
8/1/2012
Introduction:
The University of Massachusetts, Amherst facilitated two public Blue Sky forums during the months of January and February, 2012. Faculty, staff, and students participated in these forums offering up their ideas to create a more sustainable campus, five college system, and Pioneer Valley. The UMass Amherst Chancellors Environmental Performance Advisory Council (EPAC) members and it’s Chair, Campus Sustainability Manager, Ezra Small who facilitated, were present at these forums to offer their responses to ideas and to provide context for how the University and the committee is progressing on implementing and updating the UMass Amherst Climate Action Plan (CAP) which was published in January 2010 and will be updated and submitted to the Chancellor by June 2012.

Overview of Ideas:
We received ideas first hand at the public forums as well as via the Campus Sustainability facebook page, the Five College Sustainability website form, and finally by email. We have categorized the ideas and rated them from easy to implement, moderate, to bold. Many of the bold ideas are “big” ideas that the campus has various levels of interest in pursuing but would require wide campus support, funding, and considerable time to implement. We saw a number of reoccurring ideas proposed throughout the two months and have tried to acknowledge this in our report below by labeling them “popular.” Many of the ideas are currently being pursued or implemented by the University, EPAC or in conjunction with the Sustainability Manager, staff, and students. UMass Amherst received STARS Gold in August of 2011 because of significant accomplishments in sustainability throughout the campus operations, academics, and engagement. The Blue Sky Forum procedure was eye opening in that it made it apparent that much of the student and professional community is unaware of these accomplishments and therefore indicating we have a major challenge of educating our campus about sustainability. The University is currently in the process of hiring its first Sustainability Marketing and Outreach Manager in order to carry out a long term visibility plan for sustainability. With this new position as well as sustainability news coming out of the news office regularly, we hope to address the knowledge gap.

Bold Ideas:

- FOOD:
  Real Food Challenge: The Real Food Challenge campaign is to increase the procurement of real food on college and university campuses, with the national goal of 20% real food by 2020. By leveraging their purchasing power we can catalyze the transformation of the larger food system. The network offers a chance for students and their allies (those working on the campaign along with those who’ve yet to sign on) to make connections, learn from one another, and grow the movement. UMass Auxiliary Services Director Ken Toong is supporting this campaign and the Food EPAC Sub-Committee has voted to make this a 2012 priority and ask the Chancellor to sign on.

- GREEN BUILDING:
  Build a new LEED Certified Library Building to replace the Du Bois Library to prevent spending millions of dollars on outdated HVAC and lighting systems. Use the new library building to showcase
sustainable architecture and as the epicenter of the research community to inform people of a large-scale University commitment and investment in sustainability.

- **ENERGY:**
  Install urban wind turbines atop certain applicable buildings (Library and LGRC) as well as well suited areas. Either vertical axis turbines mounted on their sides atop buildings or the architectural urban turbines (fancy horizontal axis turbines) found in certain places. Perhaps certain lamp posts could have spire turbines attached and/or solar cells. (Popular)

- **WASTE REDUCTION:**
  Change the current recycling system from 3 stream to single stream recycling so that bottles, cans, paper, and cardboard all go in the same bin. This will make it much easier for campus community to do the right thing and will increase rates dramatically.

- **WASTE REDUCTION/ENERGY:**
  Build an anaerobic digestion/organic waste facility at UMass Amherst for entire Pioneer Valley to bring their organic waste to be processed, turned into renewable energy and electricity and a great compost product.

- **ENERGY:**
  Install solar hot water panels near Central Heating Plant to heat the make-up water that is captured from the steam lines that reused back into the steam generation system. This will save the campus millions of dollars and reduce the carbon emissions of displaced oil and gas used to heat the water.

- **EDUCATION:**
  Develop a Five College Sustainability Learning Center for all students and the community to develop grassroots organizing skills in sustainability, house the Five College Sustainability Certificate Program, and provide a learning center and incubator for regional sustainably focused businesses and entrepreneurial ideas.

- **EDUCATION:**
  Promote faculty leadership in sustainability through workshops and fellowship opportunities: Start forming long-range plans for faculty/librarian professional development around sustainability through multi-tiered approach, featuring three types of opportunities: 1) Our faculty/librarians attend a "Sustainability Across the Curriculum Leadership Workshop", 2) Our faculty/librarians apply to be a "AASHE Faculty Fellow" A new 6-month program, 3) We establish our own campus-based faculty sustainability workshops.

- **EDUCATION:**
  Greater consideration for sustainability in the general education requirements: Require that all students graduate with at least one sustainability focused or related general education course.
Moderate Ideas:

- **FOOD/GREEN BUILDING/EDUCATION:**
  Green Roofs and Living Walls on our buildings to grow food and provide a hands-on academic experience for our Plant and Soil Science or Engineering students. (Popular Idea)

- **GREEN BUILDING:**
  Use pervious pavement for our parking lots and roads, by capturing stormwater and allowing it to seep into the ground, porous concrete is instrumental in recharging groundwater, reducing stormwater runoff, and meeting U.S. Environmental Protection Agency (EPA) stormwater regulations.

- **GREEN BUILDING/EDUCATION:**
  Create collaboration between the Green Building Sub-Committee, Civil and Environmental Engineering, and student organizations from the five college area to oversee creation of a document that proposes to use sustainable building materials for all new construction, such as Earth Bags, Cob, and locally and sustainably sourced wood.

- **ENERGY:**
  Offset the massive amount of energy used each day at the Recreation Center by harnessing the power produced by running the exercise equipment (bikes, ellipticals, stair climbers). Use a new product to do this called PlugOut Fitness which allows you to plug machines into the outlet and put electricity into the grid instead of taking out. (Popular)

- **ENERGY:**
  Increase the amount of solar photovoltaic energy production on roofs and ground mounted. (Popular)

- **WATER/WASTE REDUCTION:**
  Locate "hydration stations" throughout the five college campuses. Encourage students and staff to fill reusable water bottles from these stations instead of purchasing bottled water. Track reduction in waste, possibly fostering friendly competition between campuses or a collaboration to meet a shared goal. Ban vending machines on campus and educate people about sugary soft drinks, bottled water, and the water crisis. (Popular)

- **WASTE REDUCTION:**
  Create a student swap/recycling center for student access in a central location for students to reduce waste and share items.

- **EDUCATION:**
  Expand Sustainable Living Class at UMass: Split John Gerber's Sustainable Living Course (200-300
students) into two courses: one focused on local issues and the other on international issues. This would require funding to develop the courses and to hire faculty.

- **EDUCATION:**
  Sustaining Learning and Cross Department Collaboration: In order to sustain an environment of eclectic learning that promotes sustainability, we create inter-department forums where both departments will benefit from interacting (Ex: Anthropology and English).

**Easy Ideas:**

- **TRANSPORTATION/ENERGY:**
  Work with delivery organizations to optimize driving Routes: Consider engaging companies like FedEx to look at our current delivery routes to see if there are opportunities. Others have found that they have been able to cut their fuel costs, and associated with that less carbon burden.

- **TRANSPORTATION:**
  Incentives for bike and bus transport and increased PVTA awareness and education. (The EPAC Transportation Sub-Committee is currently researching new incentives such as DeroZap and trying to raise awareness of current incentive programs such as NuRide.)

- **LAND USE:**
  Replace existing grasses with perennial grasses that could be planted that do not require routine cutting as lawns do. Consider natural landscaping with rocks, and cut down on the amount of lawn cutting, fuel, expenses for lawnmowers, and pollution.

- **ENERGY:**
  Monitor the energy use in the residence halls and lower the heating during the winter in many buildings on campus. Create educational materials and signs that help residents or classroom occupants turn down thermostats or do more retro-commissioning of our buildings to enable the controls to work more efficiently. (Popular) Note: UMass Amherst has energy meters on over 120 buildings on campus but many residence halls do not have them, making it very difficult to reward residence for reducing energy or having energy reduction competitions.

- **WASTE REDUCTION:**
  Use printer setting to use less paper: For all networked printers in the institution, make sure they are set so that they print in draft mode, and on two sides of the paper. Change all computers on campus to default double sided printing.

- **WASTE REDUCTION:**
  Make recycling fun by rewarding people to recycle such as systems like RecycleBank (City of Philadelphia).
• **WASTE REDUCTION/ENERGY/WATER/EDUCATION:**
  Sustainability and the Rec Center: Install shower time monitors in the gym, or auto light out after 5min. Mingle concept of fitness with personal sustainability. Install a gallery of global sustainability initiatives around the track and field area in the gym. Encourage students to listen to radio stations instead of watching TVs while they are on treadmills. Put pots of plants in the exercise areas to refresh the air. Encourage business-minded students to do sustainanalytics for the rec centers/gyms.

• **EDUCATION:**
  Advertise more heavily that UMass Amherst is a land grant institution using Cornell’s website as model.

• **EDUCATION:**
  Monthly Lunch and Learn: Topics on sustainability would send facilitators/presenters to departmental conference rooms across campus.