

# University Sustainability Efforts Annual Report



## Board of Trustees Administration & Finance Committee



**September 10, 2014**



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## Executive Summary & University Efforts

The University of Massachusetts which includes five campuses in Amherst, Boston, Dartmouth, Lowell and the Medical School in Worcester has made a collective commitment to be “good stewards of resources” including responsibly managing our fiscal resources, increasing external support, investing in our capital assets and continuing our commitment to being environmentally responsible. Each of the University’s campuses conducts a wide variety of sustainable programs and services many of which are unique to its campus population but all of which serve to make UMass as a whole better stewards of our environmental resources. The efforts and achievements of each of the campuses demonstrates the strong responsibility felt by members of the University community to our role as stewards of environmental resources.



At the Amherst campus there is an incredible amount of opportunity for students, faculty, and staff to learn about sustainability, to practice sustainable living in a collaborative community environment, and to share, teach, and highlight our stand-out knowledge as leaders in the field. The University recognizes its responsibility to be a leader in sustainable development and education for the community, state, and nation.



UMass Boston has a historically strong commitment to environmental sustainability. The campus' sustainability program, UMBe Green, encompasses four areas in working towards sustainability campus wide and beyond: Recycling, Sustainability, Education and Practice.



At the Dartmouth Campus, everyone has a role in the continuing story of energy conservation. Students know that for energy conservation to work, everyone needs to do their part. By adopting 4 energy saving behaviors and students pledge to conserve slash the trash, be bold be cold, strive for five and reduce the juice.



UMass Lowell is committed to climate neutrality as an institution, and as a leader in sustainable education, research and innovation. Currently, the Climate Action Plan Steering Committee and respective Subcommittees serve as the primary managing bodies for sustainability initiatives on campus and is comprised of top-level leaders from across the University. Major themes discussed are greenhouse gas reduction strategies; the perpetuation of academic and research programs focused on climate change concepts; renewable energy engineering; sustainability; campus engagement and behavior change education.



The Medical School is committed to sustainability throughout its campus operations, as well as by encouraging sustainable practices among its students, faculty and staff. As programs in research, education, public service and clinical care expand, the community is working cooperatively on a multi-layered program to reduce energy consumption, reduce greenhouse gas emissions, and expand recycling and other measures that collectively will limit the center's carbon footprint.

In 2007, the University President and all five campus Chancellors signed the American College and University Presidents Climate Commitment (ACUPCC). In so doing, the University committed to developing a plan for achieving carbon neutrality, taking concrete initial steps to achieve that, and publishing annual progress reports. In the years since, the University has succeeded in reducing its carbon emissions by 18% when compared to baseline. Strategic investments in energy efficiency, recycling, building improvements and others have the campuses on course to meet their goals.



During that same year, Governor Patrick filed Executive Order 484 on April 18<sup>th</sup> which established aggressive targets for state agencies including reducing greenhouse gas emissions 25% by 2012, 40% by 2020, and 80% by 2050 and reducing energy consumption 20% by 2012 from 2002 levels and 35% by 2020. It requires state agencies to reach targets through obtaining 15% of electricity from clean sources by 2012 and 35% by 2020 and reducing potable water use 10% by 2012 from 2006 levels and 15% by 2020. State universities are a key component of the state's efforts to reduce energy use and greenhouse gas emissions as stewards of over 25 million square feet of property across the entire Commonwealth.

In October 2009, the Governor signed Executive Order 515 known as the Environmental Purchasing Policy. As part of the Commonwealth's overall goals of conserving natural resources, reducing waste, protecting public health and the environment, and promoting the use of clean technologies, recycled materials, and less toxic products, this policy committed to reducing State Agency impact on the environment and enhancing public health by procuring Environmentally Preferable Products and services (EPPs) whenever such products and services are readily available.

In an effort to gain traction on sustainability efforts, each campus has dedicated staff focused on environmental responsibility. The UMass Sustainability Committee, comprised of the campus Sustainability/Energy Managers and President's Office Budget Staff has been meeting regularly to discuss Sustainability/Energy Management topics ranging from clean energy and efficiency, to the reduction of greenhouse gas emissions as well as: waste reduction, water conservation, green buildings, alternative fuels, efficient transportation, and recycling. The group uses this collaboration to determine other areas where the University can work together to be more sustainable and determines areas where collaboration will create a more sustainable University.

In August 2014, the Sustainability Committee partnered with the Procurement Council for its first ever brainstorming session to determine areas where the University can employ procurement practices that will help to support the University's sustainability mission. It was determined at that meeting that although some campuses currently strive to follow green guidelines, each are employing different standards and are experiencing varying levels of success. As a mechanism to launch a more cohesive and measurable effort in the procurement area, the group decided to work on two specific commodities that would have significant impact: paper and toner cartridges. While several campuses currently utilize 30% recycled paper, it was agreed that a system-wide effort would improve compliance, and that immediate steps should be taken to formalize the recycled paper program at a system level. With regard to toner cartridges, the Boston campus is initiating a pilot program with a Massachusetts based, Minority owned, manufacturer of recycled toner cartridges. Based on a successful pilot program, the goal is to roll that program out university-wide. In addition, the group discussed that standards exist through the Sustainability Tracking, Assessment and Rating System (STARS) which may guide our procurement practices in the future. The meeting is just the first of many where these two groups can share ideas and best practices and work together to develop programs that support the University's sustainability goals.



In addition to collaboration on internal initiatives, the Sustainability Committee has partnered to represent the University at the ACUPCC Conference that is scheduled for this October in Boston. As previously described, the University has been a member of the ACUPCC since 2007. This year the annual conference of the organization is for the first time being held in Boston allowing the University to participate on the host committee. Since April, the campus Sustainability Directors/Managers have been regularly meeting to discuss the University's participation and also have been working with the overall conference host committee to ensure that UMass is represented at the conference. There are several areas where the University is being represented at the Conference including:

- **Boston Campus Tour** – The group will tour UMass Boston's new Integrated Sciences Complex (ISC) which is slated to open in September 2014 and is a 220,000-square-foot, \$182-million steel-and-glass facility. The group will also tour the UMass Boston Campus and Conference Center which opened in 2004 and were featured in the NESEA Green Buildings Tour.
- **Amherst 2014 Climate Leadership Award Presentation** - The awards are presented annually to the signatory institutions of the ACUPCC that demonstrate innovative and advanced leadership in education for sustainability and climate mitigation and adaptation. The University's nomination for the Climate Leadership Award was based in part on the in-depth climate-related research taking part on the campus and the University's efforts to infuse sustainability across its curriculum, encourage student-led sustainability projects and investigations, and build partnerships that foster sustainability in its community. UMass Amherst has confirmed Deputy Chancellor, Robert Feldman will accept the award.
- **World Climate Simulation** - Developed by the Lowell campus, the *World Climate* simulation role-playing game, is where participants take on the roles of delegates to the United Nations climate change negotiations and work together to reach a global accord to address climate change.
- **UMass Booth Display** – In addition to specific programming, the University will have an area during the conference in the form of a booth display to be able to represent certain programs or initiatives including University / Campus awards, Innovative Sustainability Projects and Carbon Reduction Planning & Initiatives. The booth will be represented with both campus and President's Office staff to answer questions and discuss projects.
- **Sustainability Showcase** – This new presentation showcase was just added to the conference which is a public portfolio of interesting and notable sustainability initiatives and ideas that will take place in a 2 hour exhibition format.
  - **MGHPCC** - The Massachusetts Green High Performance Computing Center (MGHPCC) is a government, industry and university collaboration to build a data center dedicated to supporting the growing research computing needs of five (BU, Harvard, MIT, Northeastern, and UMass) of the most research-intensive universities in Massachusetts while serving as a regional economic catalyst. The facility is designed to minimize cost and environmental footprint. It achieved LEED Platinum certification. The facility is the first university data-center in the U.S. to be LEED Platinum certified.
  - **Dartmouth – Go-Gen** - Completion of the design and build of a \$33.9 million guaranteed savings agreement between Noresco and the Commonwealth. The project



- includes installation and performance term services. Phase 1 contained 18 energy conservation measures to address energy and water savings opportunities and critical heating, ventilation and air conditioning (HVAC) infrastructure improvements. Phase 2 contains the largest and most complex energy conservation measure - a new gas turbine combined heat and power (CHP) system to replace UMD's old, inefficient heating plant boilers.
- **Dartmouth - Living Classroom** - The Living Classroom is a space and a philosophy that transcends our campus culture, curriculum, and operations. The goal of the Living Classroom is to integrate the physical campus and university operations into our curriculum through projects that are beneficial to both. The centerpiece of the Living Classroom is the 350-acre forest on campus, one of the largest tracts of undeveloped woodlands in Southeastern Massachusetts. By integrating activities such as forest mapping, land use management, and nature interpretation into classes across the curriculum, students learn about ecology, land use policy, climate change, and the artistic interpretation of nature, while in turn contributing to the development of the university's land use policies, a growing network of self-guided nature trails, and the integration of artistic exhibitions into the natural and built environment.
  - **Dartmouth – Residential Halls** - In the Fall of 2010 and Spring of 2011, the University initiated two different methodologies to changing energy consumption behavior within our student community. The first approach provided incentives for students to sign up and participate in energy saving programs and initiatives. The second approach relied on educational programs to facilitate positive behavioral change from an environmental stewardship perspective. These two initiatives established base lines for measuring energy reduction effectiveness. Other campaigns included testing different marketing slogans to determine the effectiveness within a specific residential community.
  - **Amherst – Sustainability Curriculum Initiative** - A faculty mini-grant program that provides support for teaching sustainability courses across a wide range of disciplines. The cornerstone of the SCI is the pairing of each faculty member with their department's subject librarian. Together they design assignments which integrate library resources, refine students' research skills, deepen sustainability understanding and improve papers and projects.

In addition to the efforts of the Sustainability group, in FY13, the Strategic Energy Committee was created to leverage system-wide volume for energy procurements, share and implement best practices and develop standard metrics to measure building efficiency and implement energy reduction strategies. This effort completed a Solar Net Metering project which reduces the cost of power to our campuses and eventually the region. In addition, this effort is projected to save millions for the University and created internships at several companies to support the UMass student experience.

UMass entered into 15 separate solar net excess generation contracts with 10 different solar developers totaling 50.2 MW (DC) of new solar capacity in Massachusetts. When all of these projects are fully operational they are expected to generate roughly 59 million kWh over the first 12 months and roughly 1.123 billion kWh over the first 20 years of their life. These solar



projects supported by the University of Massachusetts will help the Massachusetts electric grid avoid<sup>1</sup> a total of 28,532 metric tons of CO<sub>2</sub> in the first full year the solar installations are operational. Over the 20 year NEGC commitment, this will amount to a total of 544,327 metric tons of CO<sub>2</sub> offset through projects supported by UMass. The 28,532 metric tons equate to about 10%<sup>2</sup> of the 293,426 metric tons of GHG emissions created by the University of Massachusetts system for the FY2013 time frame.

The following pages have been reported through each of the campuses Sustainability teams to provide updates on relevant topics, success and efforts that have been undertaken under the course of the last year. Topics include:

- 1. UMass Climate Commitment – Reduced Carbon Emissions Notable Energy efficiency and renewable energy projects**
- 2. Green Building Certifications/Sustainable building practices**
- 3. Notable Energy efficiency and renewable energy projects**
- 4. Behavior Change and Student and Community Engagement**
- 5. Notable Waste Reduction/composting/recycling programs**
- 6. Academic programming (courses, majors, certificates, masters programs, etc)**
- 7. Clean Energy Research**
- 8. Public Recognition of Efforts**
- 9. Future planned projects**
- 10. “Help Needed Section”**

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<sup>1</sup> As discussed previously the solar developers keep the REC's and thus the environmental attributes that can be publicly claimed. UMass through their participation helped to facilitate the creation and financing of these projects and were integral in these projects coming to fruition.

<sup>2</sup> The 10% is used only as a reference point for comparison. UMass can't claim these reductions from their GHG inventory.

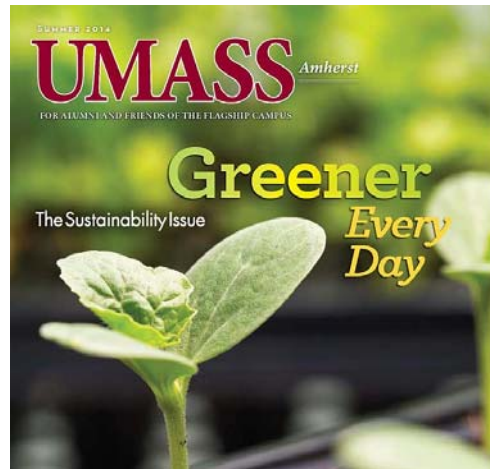
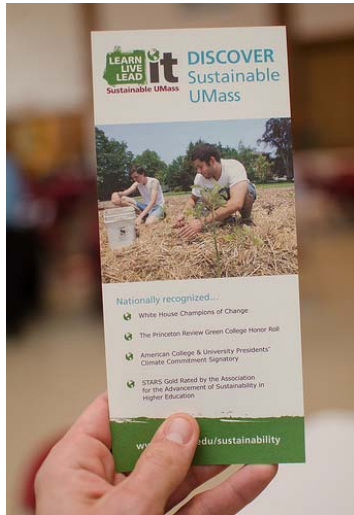




# University of Massachusetts

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## Amherst Campus



## 1. UMass Climate Commitment

Despite the total square footage growth of 16% at UMass Amherst since 2002, the campus has been able to reduce total GHG emissions by 27% and the building energy use intensity (EUI) by 3%.

In 2013, Green Building Researchers developed an innovative methodology for calculating Scope III emissions (University air travel and student & employee commuting) of the campus and for the first time included these emissions in the ACUPCC GHG Report.

The Climate Action Plan v2.0 was published in 2012 and included a matrix of three major areas of sustainability objectives with strategies and metrics for meeting these goals and tracking progress. The major areas were education and engagement, energy and emissions, and funding and investments. The Campus Sustainability Manager is proud to report that a number of projects have been successfully implemented, initiated, and completed and are highlighted throughout this report.

## 2. Green Building Certifications/Sustainable building practices

**Green Dining in Every Way:** UMass Amherst now has one of the greenest Dining Commons in the world. The Hampshire Dining Common was certified LEED Gold in July, 2014. UMass Amherst mandates that all new construction and major renovations meet LEED Silver minimum. Four buildings have reached LEED Gold Certification (George Parks Marching Band Building, Police Station, CNS Research Greenhouses, and most recently the Hampshire Dining Commons). Pending as LEED Registered includes the Life Science Laboratories, the new Integrated Learning Center, and the Commonwealth Honors Residential Complex.

**Green Building Guidelines:** The UMA Green Building Committee has embarked on an ambitious project to update the UMA Green Building Guidelines document for the upcoming LEED v4 rating system coming online in June 2015. This document is used as a consulting tool for all new construction and major renovation projects over 20,000 SF on the Amherst campus. Teams of students, faculty, and staff have partnered into working teams to set priority and level of difficulty for each credit within each LEED system, including New Construction & Major Renovations and Existing Buildings Operations & Maintenance (LEED EBOM). This project is a huge campus-wide effort and should be completed by the end of the 2014 calendar year.

## 3. Notable Energy efficiency and renewable energy projects

**Energy Master Plan:** The University of Massachusetts Amherst is currently conducting a Comprehensive Campus Energy Master Plan. This effort will develop a plan for the reliable delivery of energy on campus over the next 10 years and to define and prioritize categories of projects to achieve the most transformative effect on current and future energy consumption at the minimum cost and with the highest measure of greenhouse gas emission reduction. One of the major components of this plan is renewable energy production, conservation measures, and the understanding of the economics and decision making process for the conservation, purchase, and distribution of energy on campus in the future.

**E+ Program:** Since 2010, the campus has invested in approximately \$3,700,000 per year in energy cost reduction. This energy reduction work has included building lighting & HVAC occupancy control installations, steam distribution line replacements, LED traffic lights conversions, chilled water line installations, high efficiency electric motor replacements, and building controls retro-commissioning. The result has significantly reduced energy usage and GHG emissions on campus and increased the reliability of the campus's utility systems. See the "Future Planned Projects" section for FY15 E+ Projects.

**WMECO Partnership:** The University of Massachusetts Amherst and WMECo/Northeast Utilities formally signed a memorandum of understanding on Thursday, May 22 setting specific goals for their continuing partnership, including the reduction of energy consumption on campus by 3 million kWh per year. WMECo's assistance under the special partnership includes energy efficiency incentive funding, technical assistance, and outreach/education programs on campus. Under the agreement, plans are being developed to reduce campus energy consumption by more than 2 percent annually for the next three years.

#### 4. Behavior Change and Student and Community Engagement

**Largest in nation to sign Real Food Challenge:** On October 23, 2013, Sustainable UMass celebrated with the Chancellor the 3rd Annual Campus Sustainability Day. Campus Sustainability Manager organized a Green Careers Panel for students with speakers throughout the state of Massachusetts working in the sustainability field. The Chancellor and the Executive Director of Auxiliary Services, publically signed the Real Food Challenge, making UMass Amherst the largest campus dining program in the country to commit to making real 20% food purchases (local, organic, fair trade, or humane) by 2020.

**Sustainability Fund Established:** Sustainable UMass, in collaboration with the A&F Budget Office, launched the first ever Sustainability, Innovation & Engagement Fund in September, 2013 and received over 20 proposals from students, faculty, and staff during the fall semester. The proposals are in review and those that are approved and funded, will be implemented in 2014. Proposals ranged from innovative solutions to reduce utility consumption in campus buildings, build sustainability awareness amongst the student body, preserve wildlife on campus property, and produce renewable energy. The first phase of the Sustainability, Innovation & Engagement Fund which was launched by Sustainable UMass, in collaboration with the A&F Budget Office, has funded 7 new campus projects that either completed or in implementation stage. Projects include the New2U Reuse Tag Sale & Move-Out, the UMass Minute Riders Program (a student run bike powered compost pick-up service), the Orchard Hill Residential Area showerhead replacement program, the Paperless Campus Recreation initiative. More than \$22,000 out of the total available \$50,000 has been allocated for these projects.

**Earth Day & Diversity:** Hundreds of students and community members tabled at the annual Earth Day Festival on Goodell Lawn on April 22, 2014. This year's Earth Day theme was "Building a Diverse Movement for Environmental Justice and Sustainability." Thousands of campus and community members attended the festival and other events throughout the day across campus including a Community Forum on Sustainability and Diversity, featuring City

of Holyoke Mayor Alex Morse, former Green Party Presidential candidate and UMass Amherst PhD. Student Rosa Clemente, and other community leaders. Sustainable UMass, in an effort to build more diversity and inclusivity around sustainability initiatives, partnered with the Faculty Advisor for Diversity and Excellence, Dr. Amalcar Shabazz, to bring Dr. Robert Bullard, father of the environmental justice movement, to campus to deliver the 2014 Earth Day keynote address in April, 2014.

**Revisioning Sustainability Food and Permaculture Conference:** As part of its national leadership role in campus sustainability, local and sustainable food, and permaculture programs, UMass Amherst hosted its third annual hands-on, skill-building food sustainability conference called “Revisioning Sustainability” from June 22-25. Over 200 people attended from across North America.

**Growing Staff & Faculty Engagement:** The Green Office Program now has 58 certified offices participating on the UMass Amherst campus. This program aims to alter daily office practices by recruiting Office Eco-Leader staff members to take a positive leadership role in reducing everyday office waste and energy consumption through behavior change. Campus Sustainability Initiative student Fellows trained in the program act as sustainability consultants to these staff Eco-Leaders by providing resources and in return receive academic credit. Every department under Facilities & Campus Services has become certified under the guidance of the Campus Sustainability Manager housed in the Physical Plant. The entire UMass Libraries system has become certified in addition to most of the College of Natural Resources department offices. Many of these certified offices are now composting with the help of the new student run, bike powered Minute Riders Compost Program.

## 5. Notable Waste Reduction/composting/recycling programs

**Student Leadership:** Two exciting student led, Sustainability Fund supported projects have been launched on campus in the spring of 2014: The Minute Riders program and New 2U Reuse Tag Sale and Sustainable Move-Out Program. The Minute Riders Program is a compost pick-up service providing student-run, bike powered waste management solutions for green offices who want to compost their food scraps in their kitchens and break room areas. Over 12 offices are now participating and students are using a tandem bike with a trailer to pick-up and haul the compost to central composting areas at the dining commons. The New2U Reuse Tag Sale launched in the spring of 2014 when Sustainable UMass teamed up with Residential Life and the Office of Waste Management to collect thousands of items during move-out in Southwest Residential Area. The items were stored and cleaned during the summer and will be sold back to incoming students providing new students and families the opportunity to purchase gently used, discounted school and dorm supplies. Revenue from the tag sale will be returned to the Sustainability Fund and will provide new funding for future sustainability projects, helping to establish the Sustainability Fund as a Green Revolving Fund (GRF). Sustainable UMass became a member organization of the Post Landfill Action Network (PLAN) to receive assistance in planning the move-out collection and tag sale in the fall.

**National and Statewide Awards:** UMA received the MassRecycle – University Recycling Award and also received two awards from the Environmental Protection Agency (EPA) Food Recovery Challenge Program, for “Innovation” and the “Colleges and Universities” Award for most tonnage of food composted among all schools nationwide.

## 6. Academic programming (courses, majors, certificates, masters programs, etc)

**Continued Growth and Stellar Academic Breadth:** The UMass Amherst campus is continuing to promote and grow its extensive green academic offerings with over three hundred sustainability-related courses and over a third of all majors on campus focused on sustainability-related subject areas to date.

The success of our green academic programs and of our faculty, staff, students, and green alums was featured in this year’s summer 2014 sustainability-focused UMass Magazine issue. <http://umassmag.com/2014/Summer-2014/index.html>

**Sustainability Curriculum Initiative:** Sustainability plays an increasingly prominent role in the curriculum at UMass Amherst, with sustainability courses that address interconnections between economy, society, and environment. To foster these connections, the University Libraries, the Provost’s Office, and the Center for Teaching and Faculty Development is offering a second round of this faculty incentive program for courses taught in fall 2014 and spring 2015.

This initiative is an innovative program at UMass Amherst that supports teaching faculty interested in revising existing courses to include or augment sustainability topics. The UMass Amherst Libraries have awarded Sustainability Curriculum Initiative grants of \$1,000 each to nine faculty members thus far to support revising existing courses to include or augment sustainability topics. Liaison librarians work with each of these faculty members to integrate library resources and information literacy into their revised courses.

To learn more about the Initiative, and to see a site that provides details on how our faculty can participate, visit <http://guides.library.umass.edu/sustainabilitycurriculuminitiative>

## 7. Clean Energy Research

**Energy Extension Grant Program Launched:** On May 1, 2014, former Massachusetts Energy and Environmental Affairs (EEA) Secretary and current Chief of Staff to Governor Patrick, Rick Sullivan attended the announced a four-year, \$6 million grant to form a new UMass Amherst Energy Extension Initiative. It will serve as a resource on renewable and clean energy options for cities and towns, industry, hospitals, colleges and universities, nonprofits and other organizations across the Commonwealth. Sullivan made the announcement during a day-long conference held at UMass Amherst, "Helping Communities with Renewable Energy and Energy Efficiency," for city and town energy managers, mayors, other officials, businesses and planners.

## 8. Public Recognition of Efforts –

**Prestigious Sustainability Award from Second Nature:** The University of Massachusetts Amherst has been selected to receive the **2014 Climate Leadership Award** by Second Nature, a national nonprofit that works to create a healthy, just and sustainable society by transforming higher education. This award is considered one of the most prestigious sustainability awards in higher education. The awards are presented annually to the signatory institutions of the American College & University Presidents' Climate Commitment (ACUPCC) that demonstrate innovative and advanced leadership in education for sustainability and climate mitigation and adaptation. Deputy Chancellor Robert Feldman is slated to join Campus Sustainability Manager Ezra Small and Sustainability Communications and Marketing Manager Victoria Rosen to accept the award in early October at the annual Second Nature Climate Leadership Summit being held in Boston.

**New Sustainable UMass Branding and Website Launch:** Led by the Sustainability Communications and Marketing Manager in University Relations, Victoria Rosen has helped rebrand sustainability at UMass Amherst. The Campus Sustainability Initiative is now seen as campus-wide campaign and collaborative effort called Sustainable UMass. The new comprehensive website located at [www.umass.edu/sustainability](http://www.umass.edu/sustainability) features the new slogan “Learn It, Live It, Lead It” which embodies the campuses sustainability mission of recruiting and training sustainability leaders who can create a sustainable campus community that can be replicated across the Commonwealth and beyond. The new Sustainable UMass Video has been viewed over 56,000 times to date and can be watched at [www.umass.edu/sustainability/about](http://www.umass.edu/sustainability/about).

**Regional Energy Efficiency Award:** The University of Massachusetts Amherst has been named state champion in the 2014 Northeast Business Leaders for Energy Efficiency Recognition Program. The award, given by Northeast Energy Efficiency Partnerships (NEEP), honors one institutional energy customer from each state in the Northeast for its commitment to sustainable innovation and for contributions in keeping the region a national leader in accelerating energy efficiency. Associate Vice Chancellor of Facilities & Campus Services Juanita Holler accepted the award in Newport, RI on June 3, 2014.

**Growing government relations efforts:** During the 2013/2014 academic year, multiple elected officials visited UMA campus to learn about the sustainability efforts taking place and engage with campus leadership in campus tours. Amongst those who visited campus were Congressmen Jim McGovern, State Senator Jamie Eldridge, MA DOER Commissioner Mark Sylvia, and MA Commissioner of Agriculture Greg Watson.

## 9. Future planned projects –

**Solar Thermal:** Sustainable UMass and the Physical Plant have been awarded a \$75,000 MA Department of Energy Resources Leading by Example Clean Energy Grant for the installation of the first commercial scale solar thermal project on the campus will be installed at the UMass Central Heating Plant in October 2014. The project will pre-heat the make-up water at the plant to help reduce fossil fuel consumption for steam production.

**Solar PV:** The first Solar Photovoltaic (PV) project proposed in the Sustainable UMass solar energy plan for the UMass Amherst campus is slated for installation in 2015 and has been approved to be funded by the Alternative Portfolio Standard revenue. The project being managed by the Physical Plant and Design & Construction Management departments will represent the University's sustainability commitment by being a highly visible solar PV project at the Robsham Memorial Visitor Center and will be the first parking lot canopy solar project on campus. The project will help peak energy demand, avoid electricity costs, provide rainwater management solutions, and will provide power for the visitor center, electric vehicle charging stations, and outdoor lighting on Haigis Mall. The Physical Plant sustainability staff will be pursuing a new MA DOER Leading by Example Clean Energy Grant of \$150,000 to help subsidize the cost of the system. This project will help Governor Patrick achieve his new goal of producing 1600 MW of solar energy by 2020 throughout the Commonwealth.

**E+ Program FY15:** A large portfolio of energy conservation measures are being planned for the UMA campus once again. The project will consist of \$2,800,000 in building infrastructure upgrades such as lighting, retro-commissioning, and HVAC measures across campus and over \$1,750,000 in steam-line replacements for a total cost of almost \$4,000,000 and will create over \$1,150,000 in electricity and steam/fuel savings and will have a combined payback of just over 3 years.

## 10. Help Needed

UMass Amherst has now become one of the top 10 sustainable state universities in the nation and is becoming a destination of choice in part due to the success of its sustainability programs. In order for sustainability efforts to continue to progress and help the Chancellor carry out his strategic goals for the University, Sustainable UMass has begun to undertake a major 3-5 year strategic planning process as part of its Administrative Quality Assessment & Development Review (ADQUAD) process. Sustainable UMass has rebranded and is now renewing the mission statement, and key objectives for advancing a sustainable campus and community at UMA and beyond.

In order to carry out this new mission, Sustainable UMass seeks to gain an agreement from the senior leadership of our campus and system administration for a bold new future:

- **Elevating Sustainability:** Sustainable UMass would like to investigate options and design a highly efficient organizational structure for sustainability on the Amherst campus and at the system level within the President's Office. This could include establishing a new Director of Sustainability reporting to the Chancellor or within the Chancellor's office and a System Sustainability Manager reporting to the President, which could help coordinate efforts across the five campuses and help us optimize our collective system-wide purchasing power and regional influence.
- **Energy & Emissions Reduction Planning:** Sustainable UMass seeks to design a succinct and compelling business case for sustainability advancement and carbon emissions reduction with data and metrics at the system level. This could include

hiring a consultant firm to help us with comprehensive emissions reduction planning to identify a set of strategies and costs associated with carrying out the goals mandated by Executive Order 484 and the Presidents Climate Commitment of reducing carbon emissions and producing clean, renewable electricity. UMass Amherst has begun this planning process through an Energy Master Planning process (see section #3).

- **Education and Engagement:** Sustainable UMass needs support in continuing to design and offer innovative forward thinking curriculum and academic programs that develop leaders and change-makers grounded in sustainability. This could include the establishment of a sustainability general education requirement, development of a Sustainability PhD Program (in addition to our already existing Sustainability Science Master's Program), and an undergraduate sustainability science and leadership degree program.
- **Replicating Sustainable Change in Communities:** And finally Sustainable UMass would like to transform the communities we touch in Massachusetts that can be replicated in communities worldwide. We can create the sustainable leaders of the 21<sup>st</sup> century who can have a tremendous impact as students but also take their leadership into our local communities and create positive sustainable change throughout the world. In order to do this, we need support in developing a vision for an "Academy for Sustainable Communities" at UMass Amherst which would establish our Amherst campus as a resource for coordinating sustainability efforts across Western Massachusetts communities and eventually statewide, nationally, and globally.

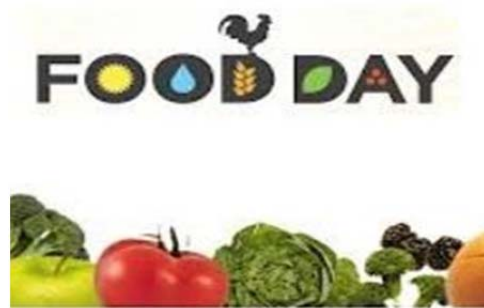




# University of Massachusetts

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## Boston Campus



## 1. UMass Climate Commitment – Reduced Carbon Emissions

UMass Boston tracks and shares its energy, carbon emissions and other sustainability metrics with numerous city, state, federal and higher education sustainability organizations including:

- Annual Energy Tracking reports to the MA State Leading By Example (LBE) Program
- American College and University President’s Climate Commitment (ACUPCC) Greenhouse Gas Inventories and Campus Progress reports and the UMB Climate Action Plan
- UMass President’s office annual Board of Trustees sustainability reports
- MA Department of Environmental Protection (DEP) Rideshare and environmental reports
- The Environmental Protection Agency
- 2014 NEASC Accreditation review process, including a sustainability section.

UMass Boston recently installed synchronous Firehawk Industries boiler controls on its 4 Central Utility Plant boilers. Four natural gas boilers were retrofitted with Programmable Logic Controllers to allow precise fuel-to-air ratio control as well as O<sub>2</sub> trim and variable speed drive fan control. These new boiler controls are projected to allow the campus to achieve natural gas savings of 60,000 therms per year.

At the UMass Boston Salt Water Pump House, four saltwater circulating pumps (three 300hp and one 150hp) are being replaced with variable speed drive motors. The variable speed drives will allow lower circulating rates which will equate to lower electricity usage.

UMass Boston data was reported vis-a-vis other UMass campuses as part of a 10 year annual carbon and emissions metrics tracking by MA Department of Energy Resources’ Leading By Example (LBE) Program across state agencies, since annual reporting energy, fuel and carbon emissions metrics was commenced in 2002-4.

UMass Boston is engaged in the field of climate resilience, an important issue for the harbor campus and for Boston in general and UMass Boston faculty are building capacity and expertise in this field.

UMass Boston is a member of Higher Education Working Group (comprised of Harvard University, Massachusetts Institute of Technology, Northeastern University, Boston University and UMass Boston) at the Green Ribbon Commission, where Boston’s leading business, civic, and institutional leaders share best practices, fight climate change, and support the City of Boston’s climate plan.

Over the last two years, the Center for Sustainable Enterprise and Regional Competitiveness (SERC) at the College of Management has participated in the Global Warming Solutions Project (GWSP), a collaborative network of stakeholders committed to addressing climate change and ensuring that Massachusetts achieves the objectives of the Global Warming Solutions Act. The GWSP was a project of the Environmental League of Massachusetts and the Barr Foundation. The GWSP has developed a Scorecard to evaluate the State’s progress

in reaching its goals and to recommend additional steps. Overall, the report indicates that while Massachusetts is a leader in energy efficiency, renewable energy and climate protection, more needs to be done to meet the ambitious goals set for 2020 and 2050.

## 2. Green Building Certifications/Sustainable building practices

Two buildings under construction – the Integrated Sciences Complex and the General Academic Building No. 1 -- were designed to achieve LEED Silver certification from the United States Green Building Council. Programming is underway for the new General Academic Building No. 2 and it, too, will be designed to achieve LEED Silver certification.

UMass Boston has also signed onto the City of Boston’s Building Energy Reporting and Disclosure Ordinance (BERDO) and has been designated a Pacesetter in the Renew Boston program, part of the City of Boston Climate Action Plan.

## 3. Notable Energy efficiency and renewable energy projects

The University of Massachusetts system’s energy consultants, CES, are working with UMass Boston on the design of a new Energy Producing Facility being planned on the UMass Boston campus.

UMass Boston installed its first solar photo-voltaic installation on the roof of the Wheatley building, a 74 kW capacity installation with 350 panels, which was connected to the grid in late 2011. It was funded by the American Recovery and Reinvestment Act of 2009 (ARRA) through agreements with DCAMM and DOER. In FY14, this PV array generated 89,763 kWh. A real-time readout in Wheatley lobby informs viewers of the energy generated and is the campus’s first renewable energy installation.

[http://www.umb.edu/in\\_the\\_community/sustainability/green\\_operations/energy\\_conservation\\_renewables](http://www.umb.edu/in_the_community/sustainability/green_operations/energy_conservation_renewables)

## 4. Behavior Change and Student and Community Engagement

UMass Boston’s offers a number sustainability internships, professional Greek organizations such a Sigma Gamma Epsilon, on campus environmental groups including Net Impact, Enactus, Food harvesting and food waste reduction organizations like Campus Kitchens, MASSPIRG, individual student efforts.

### GREEN ECONOMY

UMass Boston, UMass Dartmouth and UMass Lowell collaboration “Developing the University of Massachusetts as a Leader in Growing the Green Economy” was recognized among other winners of the past 6 years at the 2013 celebration of the UMass President’s Creative Economy Initiatives Fund Celebration.

David Levy, DBA, Associate Dean for Graduate Programs and Research Professor of Management, Director of the Center for Sustainable Enterprise and Regional Competitiveness (SERC) and Vesela Veleva, ScD, Lecturer in Management, Co-Director

SERC are leading a number of sustainable business initiatives within SERC. One of them is the “Sustainable Business Academy” to crystallize the Boston-area regional community of educators, business owners and social change leaders to support the emerging New Economy. Aspirations for the New Economy encompass a range of businesses and grassroots organizations that encourage sustainability in the broadest sense, including local sourcing, environmental and social policies, small and locally-owned businesses, hybrid and B corporations, social entrepreneurs, more inclusive governance structures, and alternative and ‘slow’ capital.

#### GREEN COMMENCEMENT SPEAKERS, TALKS, EVENTS, CONFERENCES

Commencement speakers at UMass Boston have increasingly featured sustainability champions such as James Gustave Speth, (2013) co-founder of Natural Resources Defense Council and the World Resources Institute and Dr. Christiana Figueres, (2014) Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC).

Students have opportunities to participate in sustainability related energy capstone projects. Green job and clean energy internship websites, green career workshops, Earth Day, America Recycles Day celebrations, talks, seminars, and conferences related to sustainability. Campus outreach is done through events, announcements, emails, brochures and orientations.

UMass Boston College of Management’s Sustainable Enterprise and Global Competitiveness Center (SERC) organized a forum on advancing the stalled "Bottle Bill" to increase beverage container recycling. This debate weighed the pros and cons of expanding the Massachusetts Bottle Bill, which will likely be a ballot question in the November Massachusetts election in Massachusetts, featuring speakers from the MA Food Association, Massachusetts Sierra Club Bottle Bill Campaign, Massachusetts Department of Environmental Protection. It also organized several well attended events, including one on hydraulic fracking and the water-energy nexus, the annual Green Careers Forum, and an event on the role of the financial industry co-hosted with the UMass Boston Economics Department.

Many of UMass Boston sustainability team staff and faculty are active with professional organizations, committees and memberships in councils related to environment and sustainability and in recent months have attended Green Labs symposium at Harvard, Climate Resilience Seminars by A Better City, Green Revolving loan funds seminars and more.

#### GREEN TRANSIT OPTIONS AND HUBWAY

UMass NuRide rideshare program and ZIPCAR cars-on demand programs are available on campus and increasingly used, while the free campus shuttle bus fleet that carries close to half the campus community from the nearest JFK T station to the campus. A variety of green transit options can be found here:

[http://www.umb.edu/in\\_the\\_community/sustainability/green\\_transit](http://www.umb.edu/in_the_community/sustainability/green_transit)

Since 2012, UMass Boston joined the bike sharing program HUBWAY leading to the expansion of green transit options available at UMass Boston. This also expands the network

of Hubway stations beyond institutions in the downtown Boston-Cambridge area and allows UMB and the community to share bike along the beautiful Columbia Point Harborwalk. UMass Boston has a 19-dock solar-powered Hubway station UMass Boston with an additional kiosk at the JFK/UMass train station.

#### FOOD DAY AND SUSTAINABLE SEAFOOD

The University Health Services celebrated its first Food day at UMass Boston celebrating food, health and wellness involving a number of non-profits, community groups, and campus sustainability and more while UMass Boston dining held an education seminar on sustainable seafood and supporting local fisheries as featured in Food Management magazine:

<http://food-management.com/seafood/sustainable-seafood-menu-umass-boston>

#### HYDRATION STATIONS, STUDENT RESOLUTIONS TO DECREASE PLASTIC POLLUTION

Student Governance at UMass Boston passed a resolution in Feb 2012 to limit the use of disposable bottles and hydration stations and currently the campus has installed hydration stations in every building to help reduce plastic pollution to the tune of 400,000 bottles/yr.

#### RENEWABLE ENERGY FEE

Led by student Sustainability Club, there is an OPT-IN Renewable Energy Student fee at the UMass Boston campus.

#### GREEN GAMING WEBSITE

UMass Boston is in the process of introducing a green games interactive website in Fall 2014 for students and staff, developed by a UMass Boston alum, [www.juniperks.com](http://www.juniperks.com).

#### STUDENT AWARDS

UMass Boston sustainability interns and students working in sustainability related fields have been awarded Beacons Unsung Hero scholarship, Chancellor's scholarships and more.

#### MARINE EDUCATIONAL/RESEARCH/RECREATIONAL VESSELS

UMass Boston division of Marine Operations supports marine environmental research, educational and recreational activities of faculty, staff, students and the community with sailing and kayaking courses, research vessels, educational and charter cruises to the nearby picturesque Boston harbor islands and has a full service boat shop.

#### SERVICE LEARNING PROJECTS: ORGANIC FARMS

UMass Boston students visited organic farms abroad and other service learning projects as part of Beacon Voyages for service, student leadership and community outreach offerings.

### **5. Notable Waste Reduction/composting/recycling programs**

UMass Food Service has one the earliest leading zero-waste cafeterias offering compostable foodware since 2004, composting more than 30,000 lbs. of food prep and post-consumer food and dinnerware waste per year.

UMass Boston Dining Club is another more upscale venue offering a zero-waste, washable dishware and cutlery for faculty, graduate students, visitors etc.

UMass Boston recycles more than 450,000 lbs. of paper, cardboard, bottles and cans, pallets, bulk recycling, e-waste, toner and ink jet cartridges and pre- and post-consumer compost a year.

Hydration stations were installed to support a student resolution to minimize plastic bottle waste, available in most campus buildings and has saved more than 400,000 bottles/yr from reaching the landfills.

UMass Boston is the one of the Boston's designated drop off point for Hazardous and Household waste recycling for Boston residents.

Campus e-waste program "Don't just Recycle – E-cycle!" has recycled more than 1500 lbs. of e-waste and small office electronic recyclables since 2005.

Campus Kitchens, a national Food Leftover Harvesting and distribution program works with Campus Dining to avoid food waste and avoid hunger in economically-compromised students.

UMB Campus dining offers a reusable cup discount at all food venues on campus, encouraging re-use and reduce the use of disposables.

UMass Boston bookstore vendor has a made number of pre-consumer sustainable operations commitments including using post-consumer recycled materials, energy conservation etc., while the bookstore features many Fair Trade, Recycled content supplies, cruelty-free products and book donation programs.

## **6. Academic programming (courses, majors, certificates, masters programs, etc.)**

The UMass Boston School for the Environment, formerly known as the Environmental, Earth, and Ocean Sciences Department is UMass Boston's premier interdisciplinary environmental school. SFE integrates the natural and social sciences to generate and apply new knowledge about the quality of our environment and the sustainable use of its resources. A list of its variety degrees and collaborations can be found at this link.  
<http://www.umb.edu/academics/environment>.

UMass Boston has many outstanding faculty and programs in Environmental Sciences, GIS, Clean Energy, Green Chemistry, Sustainable management, Biology, Living Labs and Biomimicry, Environmental Economics, Coastal, Harbors and Oceans - offering a wide variety of courses, degrees, immersions and expertise in sustainability and environmental academic programming some of which are highlighted here;  
[www.umb.edu/in\\_the\\_community/sustainability/green\\_campus/curriculum](http://www.umb.edu/in_the_community/sustainability/green_campus/curriculum)

In March 2014, New England Aquarium and UMass Boston signed new and unique partnership agreement to enhance the understanding of ocean ecosystems from [Lubec, Maine](#), to [Nantucket](#), and a greater sharing of resources, environment problem-solving, exchange teaching resources and create internship pipelines between the two institutions. This was featured in the Boston Globe, [www.bostonglobe.com/metro/2014/03/04/aquarium-umass-boston-join-forces-for-marine-research-teaching/tFKFy7oG8AasxOwbvcglgK/story.html](http://www.bostonglobe.com/metro/2014/03/04/aquarium-umass-boston-join-forces-for-marine-research-teaching/tFKFy7oG8AasxOwbvcglgK/story.html)

The UMass Boston Center for Sustainable Enterprise and Regional Competitiveness (SERC) has identified and posted over 120 environmental internships and jobs in New England area. Updated on weekly basis these range from positions at companies, government agencies, academic institutions, and NGOs and are updated on weekly basis. The program is open to all UMass Boston students, but is particularly appropriate for students enrolled in the Clean Energy and Sustainability Programs, including the certificate and the MBA Environmental Management specialization. Some of the available summer internships include: Product Stewardship Institute Summer Project Intern, Union of Concerned Scientists Climate Accountability Intern, The Green Bean Home Energy Auditing Marketing Intern, UMass Boston Recycling/Sustainability Intern, Consortium for Energy Efficiency Graduate Summer Intern, as well as Massachusetts Clean Energy Center Summer Internships.

#### Summer Course in Sustainable Facility Management

In a collaboration with the College of Professional and Advanced Studies (CAPS) and the International Facility Management Association (IFMA), SERC is organizing a 7-week summer course in Sustainable Facility Management to better prepare a variety of professionals – facility managers and coordinators, architects, designers, consultants, and LEED-certified professionals – for more efficient management of buildings and other facilities. Participants will gain access to guest speakers, leading practitioners, and be updated on regulations, financing and available technical assistance. They will tackle real problems and learn how to achieve cost savings and other financial benefits.

The Certificate program covers three main areas:

- Strategy and Alignment for Sustainable Facility Management
- Management of Sustainable Facilities
- Operation of Sustainable Facilities

## 7. Clean Energy Research

In 2013, UMass Boston received a \$3.1 million, five year Integrative Graduate Education and Research Traineeship grant from the NSF to train PhDs who will apply innovative solutions to environmental problems across disciplines and geographies. The grant will fund the new IGERT Fellows program starting in Fall 2014 entitled “Coasts and Communities: Natural and Human Systems in Urbanizing Environments.” Fellows

will study urban coastal management across disciplines—and across nations—with a special focus on the Horn of Africa.

In 2014 SERC was awarded \$8,000 grant by Pfizer, Inc. to conduct research and develop a teaching case on the business and environmental benefits of green chemistry. The research will assess the current and emerging drivers for green chemistry, outline the milestones in Pfizer's 12-year journey, identify the main benefits of green chemistry and existing barriers to greater adoption by other pharmaceutical companies. Developed teaching case will be incorporated in the curriculum of the Clean Energy and Sustainability Programs in academic year 2014/2015.

UMass Boston's SERC partnered with the Sustainable Business Network (SBN) of Massachusetts to support its annual conference in May 2014 at UMass Boston. The theme of the conference is Sustainable Entrepreneurs Take the Lead: Partnerships & Collaborations that Build a Strong Local Economy. The conference attracts many of New England's successful entrepreneurs, business and nonprofit leaders, government officials, local funders, and academics with the purpose of developing new partnerships and collaborations that build a local green, and fair economy of the future.

Professor David Timmons, of the Economics Dept/School for the Environment published an educational module on renewable energy economics in association with Tufts Global Development and Environment Institute (available for free download at [http://www.ase.tufts.edu/gdae/education\\_materials/modules.html#energy](http://www.ase.tufts.edu/gdae/education_materials/modules.html#energy)).

His student projects in Econ/EEOS 345, 349, and 675 focused on UMB sustainability issues. Notable examples include campus wind energy assessment, central campus heat-pump feasibility study, benefit-cost analysis of switching food court to washable dishes rather than single use, estimate of campus paper use reduction with expansion of double-sided printing, and feasibility of power-generating exercise equipment in gymnasium.

He also established a database of student research projects on UMB sustainability so that future student projects build on results of previous work.

## **8. Public Recognition of Efforts**

UMass Boston was chosen by Princeton Review as one of the 332 most environmentally responsible colleges in the U.S. and Canada, according to The Princeton Review in 2014. UMass Boston was also recognized by Princeton Review in 2013, 2012, 2011 and 2010 as one of the country's leading green campuses.

Rob Franek, Senior VP/Publisher, The Princeton Review noted "Among 10,116 college applicants who participated in our 2014 'College Hopes & Worries Survey,' 61% said having information about a school's commitment to the environment would influence their decision to apply to or attend the school.



UMass Boston was awarded the [Excellence in Commuter Options \(ECO\) Leadership Award](#) in 2014. It also earned this recognition from 2013, 2012 and 2011.

UMass Boston was also featured in BostInno, as one of the greenest colleges in Massachusetts on Earth Day 2014. <http://bostinno.streetwise.co/2014/04/22/2014-princeton-review-ranking-of-the-greenest-colleges-earth-day-2014/>.

BostInno is the fastest growing news property in New England, made up of an editorial team as well as guest contributors via BostInno's community publishing platform, which seeks to build and connect a community that engages its audience in discussion about the latest innovations in Boston.

UMass Boston was recognized as a "transportation trailblazer" along with Harvard University in 2014 by MassPIRG for its many green transit options. <http://masspirgedfund.org/news/maf/new-report-university-campuses-harvard-and-umass-boston-are-transportation-trailblazers-2>

Sustainability office student intern was awarded the Unsung Hero award from the Office of Student Leadership's 2014 Beacon Awards.

UMass Boston Biology professor Kamal Bawa, was awarded the first ever sustainability "Nobel" the International Gunnerus award for Sustainability in 2012.

Gina McCarthy, a UMass Boston graduate, was appointed administrator of the United States Environmental Protection Agency in July 2013

Professor Maria Ivanova, co-director of the Center for Governance and Sustainability and director of the Global Environmental Governance Project at the McCormack Graduate School of Policy and Global Studies was appointed one of 26 members of the new Scientific Advisory Board of the UN Secretary-General in Sep 2013.

## 9. Future planned projects

Maintain and expand existing sustainability programs as the campus expands and with the ongoing and new construction.

Sustainability is one of guiding principles for the UMass Boston master planning.

The first phase of the campus's 25 year master plans is underway in design and construction with the [Integrated Sciences Complex, General Academic Building No. 1, McCormack Hall and Wheatley Hall Renovations, Utility Corridor and Roadway Relocation, HarborWalk Improvements and Shoreline Stabilization](#).

Projects in the near term include planning for:

- The second General Academic Building No. 2
- A parking garage,



- A residence hall,
- Energy Producing Facility
- The demolition of the former [Bayside Expo Center](#),
- Renovations to the university's facilities on Nantucket,
- Planning for the re-use of the historic Calf Pasture Pumping Station
- Demolition of the Science Center and substructure.

## 10. "Help Needed Section"

Sustainability marketing and campus-wide engagement resources/expertise

Encouraging green purchasing

Climate resilience

AASHE and STARS funding



## Dartmouth Campus



**1. UMass Climate Commitment – Reduced Carbon Emissions Notable Energy efficiency and renewable energy projects**

This year at UMass Dartmouth has been a good year for us regarding our energy efficiency projects. The initial phase of the program we started with NORESO has been implemented and we are now seeing the benefits of the lighting upgrades offsetting the additional fan motors brought on line. We have also seen a decrease in our water and sewer bills due to the water savings initiatives. In terms of our GHG emissions, we have reduced them by 15% over our FY'07 amount.

Our renewable energy projects are still in the commissioning phase. The wind turbine in FY'14 continued to have a number of malfunctions that DCAM is working to address. The good news is that of the writing of this report, we have been operational for 8 days with this project (on our way to the 30 day test period), so we remain optimistic. The same is true for our new co-generation facility. While initial commissioning took place in September, there have been a number of permitting and operational issues, which have delayed the official launch of this project. As of the writing of this report, we hope to be officially on line within the fall semester.

**2. Green Building Certifications/Sustainable building practices**

We are still working on determining the LEED level of the Claire T. Carney Library project, which will hopefully be settled this fall. Per UMass building standards, the new Science building, the refresh of the SMAST complex and the new Charlton College of Business Classroom are all planned on meeting LEED minimum standards.

**3. Notable Energy efficiency and renewable energy projects**

These include the Wind turbine and Co-Generation facility listed above. Both are optimistic to be fully operational this year.

In addition, the Dartmouth campus is fortunate to have 2 solar net metering relationships in our area. Between both of these projects, approximately \$450K in energy off-sets will be realized by our campus alone.

**4. Behavior Change and Student and Community Engagement**

This year, the students at the Dartmouth campus added an opt-out Green Fee to their bills. This generated close to \$77,000 that a committee of students voted to fund 7 different projects including an alternative spring break experience and additional water bottle filling stations.

In addition, working through the NORESO Energy Saving through Behavior Change group, we saw a number of important successes. First, students showed a marked increase in using cold water to wash their clothes. This clearly helps to reduce our heating bill for the University. Second, students also showed increased participation in reducing the number of showers they took per week. For the fall semester, dropped from an average of 8.1 to 6.8, thus reducing the amount of water and heat required to warm up that water. When multiplied

by the 4,300 students living on campus, this represents a significant savings for the University.

#### 5. **Notable Waste Reduction/composting/recycling programs**

The University made two strides forward this year. First, we switched our recycling staff over to a student-based team (with one member of the maintenance staff). This group of 50 students collected recyclable materials from around campus, sorted it into 8 different ‘commodities’ and even went so far as to bring the redeemable plastic, cans and glass containers back for the 5 cent redemption. Although that part of the program started after Spring Break, it raised over \$600 in revenue for the program. We anxiously await a full year’s operation to see the impact that will make.

The second win this year is with the actual rate of recycling. We were able to increase the amount of recycling on campus from 8.7% up to 27%. We attribute the increase to many factors, including having only the student staff involved in the collection process, an increase in peer to peer communication about recycling, the involvement of NORESKO and their “Slash the Trash” marketing efforts, and the simple act of insuring that EVERY trash can also had recycling bins co-located with them.

#### 6. **Academic programming (courses, majors, certificates, masters programs, etc)**

**Green Innovation Day:** The University held a Green Innovation Day showcasing the projects of the campus Green Fee, the student projects from two different academic courses, the presentation of our campus Green Awards and concluded with a presentation from the Corporate Social Responsibility Director from CVS Pharmacy discussing their recent decision to ban the sale of all tobacco.

**Courses, minor and masters program:** We continue to offer a minor in Sustainability, a Liberal Arts Major with a concentration in Sustainability and a Masters in Business Administration with a concentration in Sustainable Management and a Masters in Public Policy with a concentration in Sustainable Development. We are also building out a new undergraduate major in Environmental Science and Sustainability, which we hope to launch for Fall 2015.

#### 7. **Clean Energy Research:**

[Dr. Daniel G. MacDonald](#), Principal Investigator, pursues research in a variety of areas related to coastal physics and engineering. Basic and applied research encompasses the areas of stratified hydrodynamics, turbulence and frontal dynamics—with specific emphasis on estuarine flows, river plumes, and industrial discharges. A significant research focus also lies in the area of marine renewable energy, including wave energy and the development of nearshore wave energy converters (WECs), and the hydrodynamic aspects of other marine renewable technologies.

Dr. Christopher Brigham, Sustainable, bio-based chemicals and materials are becoming highly sought after in many spheres of human activity. Many compounds that were originally produced by industrial chemical methods can now be produced by microorganisms. The

discipline of metabolic engineering allows us to construct metabolic pathways to synthesize value added products from surplus or waste carbon feedstocks. Using the bacterium *Ralstonia eutropha* (a.k.a *Cupriavidus necator*) and other industrially relevant species, we produce materials like bioplastics from plant oils and carbon-containing waste streams, and we can design metabolic pathways that allow the bacterium to produce compounds like biofuels and fine chemicals. We can then use bioengineering to scale up synthesis of these compounds and develop a production process and measure its productivity. Also, the understanding of the metabolism of organisms like *R. eutropha* in nature can help us rationally design a production strain with high productivity in mind.

Dr. Walaal Mogawer and Dr. Heather Miller: Researchers in the Civil and Environmental Engineering Department received over \$400,000 in grant awards by the New England Transportation Research Consortium (NETC). The grants were administered through the Vermont Agency of Transportation (VTTrans) for projects to further study and develop innovative technologies in the area of pavement material construction and sustainability.

Professor Walaal Mogawer, Director of the UMass Dartmouth Highway Sustainability Research Center (HSRC), received a total of \$393,067 for two projects, one on pavement preventative maintenance strategies and another on reclaimed asphalt pavement (RAP) mixtures. Professor Heather Miller also received funding in the amount of \$26,900 for a project to study pavement recycling methods and materials.

The focus of the pavement preventative maintenance project is to research existing best practices and adapt them to the unique variety of road conditions in New England (different traffic volumes, pavement materials, and northern climates). Additionally this research will attempt to outline pavement maintenance techniques and the inter-relationship with the timing of their application in New England.

The RAP project will investigate the potential of using higher contents of readily available recyclable materials, like Reclaimed Asphalt Pavement (RAP), to address the continuous price increases of Hot Mix Asphalt (HMA). RAP has been used successfully in surface HMA mixtures since the 1970's at percentages generally around 20%. The concern associated with the use of higher RAP contents is that the resulting mixture might be unworkable and too stiff. However, new technologies have been introduced that may help improve the workability and performance of mixtures incorporating larger amounts of RAP and concurrently make them more environmentally friendly. These technologies permit production and placement of HMA mixtures at lower temperatures than conventional mixtures, producing more environmentally friendly mixtures since plant and field emissions are reduced. The lower production temperatures may also decrease the amount of mixture aging.

"This funding will allow us to further explore how we can improve the roads, bridges, and highways we drive on every day," said Professor Mogawer. "The future of pavement construction must be attained through sustainable, eco-friendly, and economical means. The work of HSRC is committed to that future."

Dr. Mogawer brings more than 20 years of experience in pavement design, maintenance, and rehabilitation to the lab alongside numerous students from the Civil and Environmental Engineering program. In addition, the lab is equipped with the latest asphalt and pavement testing equipment and technology. Established in 2001, the lab has helped establish a working partnership with local and state agencies, and private companies.

#### **8. Public Recognition of Efforts**

We did receive some recognition for our Green Move Out program. We diverted approximately 4,000 pounds of clothing, household items and food to local, charitable organizations. Previously, much of this material was simply thrown into the landfill. Now, they helped to feed, clothe and provide a livable home to countless people within our region.

#### **9. Future planned projects**

We are working on Bike Storage at our Residence Halls, Skateboard docks at our Academic Buildings, additional solar compacting garbage cans, additional recycling stations, and committing to using 30% recycled paper across campus. We also intend to actively work on getting electric charging stations on campus for students, faculty/staff, and administrative vehicles. This will hopefully spur the transition of our fleet over to 100% alternative fuel vehicles over the next 10 years.

#### **10. “Help Needed Section”**

- Green Revolving Fund
- Expectation from the President’s Office to report through STARS
- Assistance in negotiating memberships fees (ACUPCC, STARS, AASHE) as a system
- Support for the Big Belly Solar Compacting Garbage Cans from the system level



## Lowell Campus





**1. UMass Climate Commitment – Reduced Carbon Emissions**

**Climate Action Plan (CAP)**

The Climate Action Plan is being implemented by the CAP Steering Committee, a hired consultant, and seven subcommittees. Refer to the CAP Organizational chart below for all the names of the subcommittees.



**Reduced Carbon Emissions**

Part of the Energy Conservation and Projects Subcommittee involvement includes keeping track of reduced emissions.

*Note:* Emissions are in MTCO<sub>2</sub>E: Metric Tons of CO<sub>2</sub> (carbon dioxide) equivalent, abbreviated MT. Area is in SF: Square Feet. Enrollment is in FTE: Full Time Equivalent

- **Total FY 11-13 Greenhouse Gas Emissions (GHG) reduction is over 8,300 MT**
  - **Internal Energy Projects:** reduced annual emissions by **3,700 MT** during FY 12 -13 (A list of these projects is in section 3).
  - **Green Buildings:** about **4,600 MT** is the estimated annual emissions reductions of the LEED buildings listed in section 2. Over 1,400 MT were reduced from designing to meet LEED Silver requirements rather than minimum code requirements. About 3,200 MT were reduced by demolishing old buildings that occupied the same space. GHG reductions attributed to ETIC and University Crossing alone are over 1,200 MT and 2,400 MT respectively. (Calculations were done using ASHRAE baseline)
- **Total GHG Reduction in MTCO<sub>2</sub>E from FY 13 CAP Interim Report:**
  - From FY 11 to FY 13
    - Overall reduction of 920 MT: From 51.1K to 50.2K MT
    - Scope 1+2 decreased by 439 MT
    - Scope 3 decreased by 481 MT

- Student commuting increased by 790 MT, Air travel reduced by 1226 MT, Reduced emissions from paper and T&D loss by 176 MT
- **Reduction relative to campus size – GHG emissions per square foot**
  - From FY 07 to FY 13
    - There was a 23% reduction in MT/1000 SF
    - Campus area increased by over 37%: from 2.64 MSF to 3.64 MSF
  - From FY 11 to FY 13
    - There was a 7.8% reduction in MT/1000 SF
    - Stationary heating plant dropped 576 MT, Purchased electricity dropped 254 MT
    - Refrigerant emissions increased by 280 MT: proportional to all HVAC construction
- **Reduction relative to size of student population -- GHG emissions per student**
  - From FY 07 to FY 13
    - There was a 34% reduction in MT/FTE
    - Enrollment increased by 4,654 FTE: a 60% increase. (From 7,723 to 12,377 FTE)
  - From FY 11 to FY 13
    - There was a 11.4% reduction in MT/FTE: Reduced by 0.19 MT/FTE

## 2. Green Building Certifications/Sustainable building practices

### Green Building Certifications

All new construction must be a minimum certified LEED Silver for new construction, meet all IECC 2009 standards and must exceed MA Stretch Energy Code by 20% (780 CMR 115.AA). The University has a list of ongoing new construction all of which meets the above criteria: Emerging Technologies and Innovations Center (ETIC) was certified Gold; Health and Social Sciences Building (HSSB), University Suites, and University Crossing are still in the certification process; and the Pulichino Tong Business Center has not been built yet.

### Sustainable Building and Operation Practices

**Design Standards:** UMass Lowell continues to update its Design Standards that incorporate Sustainable Requirements within the MEP sections of the standards. (Last updated in FY 14).  
**Utility Incentive Account:** The Administration and Finance and the Energy Conservation and Projects Subcommittee created a Parent Energy Project account that will be funded by third party incentive programs. The University was approved for almost \$1.6 Million from National Grid in incentive funds; about \$1 Million of which have been received. A balance of over \$800,000 is currently in the account. This is a sustainable building practice as this program and account have been and will continue to fund energy efficiency projects in many old, new, and future buildings.

## 3. Notable Energy efficiency and Renewable Energy projects

**Internal Energy Projects:** completed during FY 12 - 13 include: Replacements of Steam Traps, Chillers, Hot Water Generators, and a few Air Handling Units; Upgrades of both Power Plants and of campus lighting; Installations of Solar Arrays and BAS. An example of one of our best projects is the North Power Plant Upgrades: <http://www.uml.edu/News/stories/2011-12/A-Greener-Warmth.aspx>.



**Cost Reduction:** Estimated annual cost avoidance and revenue that was enabled by different FY 12 - 13 energy initiatives is \$1,774,000. These initiatives include internal energy projects, energy procurement, utility incentives, solar net metering credits, solar array revenue, etc.

**Virtual Net Metering:** The University has increased its commitment to net metering credits to 9.6MW DC as host and 6.3 MW DC as non-host. Combined, this will reduce our annual cost of electricity by approx. \$850,000 for the next 20 years starting June 24, 2014 as all systems have been completed and are operating.

### Transportation GHG Reduction Initiatives:

- **Shuttle Buses:** The River Hawk Roadster, an efficient and flexible shuttle bus system, has helped knit our urban campus together. The system serves an average of 7,000 riders per day.
- **Park Once Policy:** Aids the University’s goal of reducing GHG emissions, while also lessening congestion pressures on the City of Lowell’s transportation infrastructure.
- **Comprehensive Transportation Demand Management (TDM) program:** started in 2012, managed by a full time professional employee – has seen notable progress in FY 14.
- **SmartTrips:** is the University’s sustainable transportation program. In FY 14, it demonstrated a continual commitment to providing sustainable and economical commuting options for students and employees to, from and around the University. Notably:
  - **The Carpool Program** has achieved significant growth since its inception in 2012:
    - In its first year, a total of 40 Carpool Groups, comprised of 83 individual users, operated at UMass Lowell. In 2013, this number grew to 57 carpool groups, with a total of 117 individual users. This represents a 42% growth in active carpoolers.
  - **The University’s Bike Share Program, Freewheelers,** offers 30 bikes to students, staff and faculty at no cost. Bike repair facilities are also available to the campus community.
  - The On-campus **Zipcar Program** continues to grow. Currently, four cars are available. Plans are set to expand this fleet as the University continues to grow.
    - FY15 goal: ensure all campus Zipcars are EPA SmartWay Certified at a minimum.
  - Employees may purchase **transit passes** for the Lowell Regional Transit Authority (LRTA), the Merrimack Valley Regional Transit Authority (MVRTA) and the Massachusetts Bay Transit Authority (MBTA) on a pre-tax basis.
  - Expansion of **educational campaigns** on alternative transportation options including: utilizing bulletin boards, holding awareness events and being present at new student and employee events.
- As a result of these efforts, the University has realized a **reduction in parking permits** purchased by students as well as faculty and staff, which also reflects a decrease in single occupancy vehicles (SOV) brought to campus as the campus grows:

Date	FTE Enrollment		Total Staff		Students Living on Campus		Parking Permit Sales	
10/1/12	12,377		1,852		3,128		7,610	
10/1/13	12,884	+4.1%	1,974	+6.6%	3,513	+12.3%	7,526	-1.1%

#### 4. Behavior Change and Student and Community Engagement

The Climate Action Plan sub-committees “Student Life”, “Sustainability”, “Academics” and “Energy Conservation and Projects” all work on behavior change and student/community engagement. They run programs that educate, increase awareness, and promote energy and GHG reduction practices.

Some of the campaigns and programs held include:

- Redesign and administration of Student Life’s **Climate Action Survey** to all students. The results from all 1,596 participants indicated that students need more information about: Recycling items other than cans and bottles, green laundry usage and products, and the bike share program.
- Review and redesign of the Office of Residence Life’s “Suggested items to bring and not to bring to campus” list. The Office of Residence Life’s statement of “Commitment to the Environment” was added to show students that the office also supports the mission of the University for sustainability and climate action initiatives. The new list also suggests to students and parents that they purchase and use Energy Star rated appliances.
- Exploration of proposal submission to the League of American Bicyclists to make UMass Lowell bicycle friendly. According to the LoAB’s website, “**The Bicycle Friendly University<sup>SM</sup>** (BFU<sup>SM</sup>) program recognizes institutions of higher education for promoting and providing a more bike-friendly campus for students, staff and visitors. The BFU program provides the roadmap and technical assistance to create great campuses for cycling.” (<https://www.bikeleague.org/content/universities>).
- **Continual review, updating and replenishment of climate action marketing including:**
  - Reprinting the laundry signs to be posted inside the residence halls.
  - Door hangers to hang on every door inside the residence halls. One side will concentrate on the bike share program offered through Campus Recreation and the other side will focus on recycling/laundry efforts.
  - Park your car once signs at the entrance to each parking lot encouraging students to use alternate transportation to get around campus.
- Some **Earth Week events** were organized by the Sustainability and Energy Conservation and Projects Subcommittees:
  - Residence Hall Electrical Challenge - the winning location had an impressive energy reduction of 20% from the previous week.
  - Energy Projects Tour of LEED Gold ETIC Building and North Campus Steam Plant
  - Sustainable Initiatives Tour which featured among others our Solar Panels, integration of the natural world into a city campus (we have been a Tree Campus USA school for three years and feature a tree walk on campus), composting initiatives, and green buildings; among others
- The Academic Subcommittee’s **Climate Change Initiative (CCI)** continues to be a strong contributor to the task of increasing understanding, awareness, and engagement through:
  - Research in diverse fields ranging from modeling climate change to ecological impacts, clean energy, sustainability, education, and others
  - Outreach to the broader community to increase public understanding



- Campus events on climate change like the CCI Teach-In, where prominent speakers address Students, Faculty, and Staff as well as regional high schools. See past CCI events: <http://www.uml.edu/Research/Climate-Change/events/past-events.aspx>

## 5. Notable Waste Reduction/composting/recycling programs

UMass Lowell began to greatly expand our sustainability efforts in the beginning of February 2014. The following are some highlights from that period onward:

- Participated in the 30-day, national **RecycleMania competition: Placed 9<sup>th</sup> of 68 universities/colleges** for electronics recycling – recycled **30,137 pounds** of electronics.
- Established a successful **campus-wide small electronics and battery recycling** program with collection bins in high-traffic areas
- **Food Waste Composting:** Implemented and rapidly expanded a food waste composting program for all Residential Dining Halls and Catering operations.
  - From the start of the program in Sept. 2013 to May 2014, we have **diverted over 184,000 pounds of food waste** from landfills.
    - Food Waste is also at an all-time low, less than 0.3 pounds of food waste is generated per diner at all locations. This is **considered very good, according to the EPA**, for a university dining services operation.
  - Composting will be 100% campus-wide at all residential, retail and catering dining operations to comply with DEP's October 1, 2014 Waste Ban.
- **Implemented Earth Week programs** during the week of Earth day, that included:
  - Waste Diversion Donation Drives: Food, Clothes, Linens, and Bottles/Cans for redemption were collected and donated to local organizations
  - Community Garden Launch; a community planting event was held to mark the University-wide opening of the Community Garden
- **Community Garden** grew, now features over 40 varieties of plants and 10 sponsored plots.
- **Donated 3,347 pounds of goods** to various local organizations: collections were made during Earth Week and move out in May. Some highlights from donations include:
  - **Lowell Humane Society** received just under 85 lbs. of linens and bedding which is used in the animals cages
  - **House of Hope Lowell** received nearly 600 lbs. of food for homeless families.
  - **The Wish Project Lowell** received over 1,600 lbs. of clothing, shoes, household goods and small electronics. All these items help families meet some basic needs.
- **Procurement has contracted 30% recycled paper** for printing and reproduction of the Duplication Dept. serving Academic needs.

## 6. Academic programming (courses, majors, certificates, masters programs, etc.)

The CAP Academic Subcommittee's mission is to encourage strong research, education, and outreach programs to educate students, faculty, their broader communities, our elected officials, and other stakeholders about climate change mitigation and adaptation. With support from the University leadership and in dialog with the Climate Change Initiative (CCI) our goals are: to integrate climate change as a recurring and emphasized theme across the curriculum; to strengthen faculty capacity for climate change education and research; to expand climate change-

related collaborations with other UMass campuses and with regional needs; and to leverage synergies between the University's emissions reductions activities and its academic mission.

### **Degree programs:**

UMass Lowell offers 120 fully-accredited academic programs in six colleges. The following is a list of degree programs that are related to climate change and sustainability:

- College of Engineering: M.S & Ph.D. Energy Engineering; Graduate Certificate Energy Conversion, Energy Engineering Minor
- College of Sciences: B.S. & M.S. Environmental Science: Concentrations in Environmental Studies and in Atmospheric Science; B.S. Biological Science: Ecology Concentration
- School of Health & Environment: B.S. & M.S. Work Environment Policy, B.S. Environmental Health; M.S. & Ph.D. Cleaner Production & Pollution Prevention
- College of Fine Arts, Humanities, & Social Sciences: B.A. Liberal Arts: Environment & Society Concentration

Two new minors for Fall 2014: Both are adding new courses and building on existing ones:

- Environment and Society
- Climate Change and Sustainability \*(in final stages of approval by UMass President's office).

### **Courses:**

Many courses related to climate change and sustainability are currently available at UMass Lowell. For a full list of these courses, please visit <http://www.uml.edu/Research/Climate-Change/Academic-Programs.aspx>. (Please note that: New academic programs in climate change and sustainability are also currently under development)

## **7. Clean Energy Research**

- **The Center for Electric Car and Energy Conversion (EC&EC)**
  - The Center for Electric Car and Energy Conversion (EC&EC) in the James B. Francis College of Engineering includes professors and researchers from the departments of Electrical Engineering and Mechanical Engineering. The Center is composed of five laboratories: Renewable Energy Lab, Electric Car Lab, Battery Evaluation Lab, Power Electronics Lab, and Advanced Composite Materials and Textile Research Lab.
- **The UMass Lowell Center for Sustainable Energy**
  - The UMass Lowell Center for Sustainable Energy develops systems to provide energy for various end uses in an environmentally and economically sustainable manner.
- **WindSTAR\***
  - A new wind energy research center headed by UMass Lowell received funding from the National Science Foundation (NSF) to help foster long-term collaborations among industry, academia and government that will make wind energy more cost-effective and develop an innovative and competitive workforce. The research efforts will be led by UMass Lowell Center for Wind Energy (formerly the Wind Energy Research Group or WERG). The [NSF Industry/University Cooperative Research Center \(I/UCRC\) for Wind Energy, Science, Technology and Research \(WindSTAR\)](#) will train undergraduate and graduate students who will support and eventually spearhead the design, manufacture, operation and maintenance of wind-energy systems. It will also provide a forum in which wind-turbine manufacturers, component and equipment

suppliers, service companies and project developers can work together to solve problems that are of mutual concern. The Center has unique expertise and capabilities to conduct research in the advancement of wind turbine science and systems. The group consists of thirteen interdisciplinary faculty members whose research focuses on wind turbine manufacturing, reliability, energy storage, and design.

## 8. Public Recognition of Efforts

### Awards

- Leading by Example Award – Public Higher Education – 2012
  - for outstanding environmental and energy achievement
- Leading by Example Award – Individual Achievement – 2013
  - for outstanding environmental and energy leadership
- Massachusetts ECO Awards –
  - 2012 – Leadership Award – Excellence in Commuter Options
  - 2013 – Leadership Award – Commuter Options, Carpool
  - 2013 and 2014 – Pinnacle Award – Excellence in Commuter Options
- Tree Campus USA – 2011, 2012, 2013
- GreenGuard Certification. – First New England College to earn certification

### Grants

- Non-Academic
  - \$1.8 Million DCAMM Grant for Weed Infrastructure Improvements (Chillers/Cooling Towers), North Campus Electrical Improvements, Olsen and Olney Cooling Towers.
- Academic\*
  - \$1.6 Million grant to research climate change-carbon cycle feedbacks related to methane emissions from Arctic ecosystems
  - \$434,000 on atmospheric composition of multiple planets
  - \$2.2 Million grant to study how informal learning impacts the public’s understanding of climate change science (ScienceToGo.org).
  - \$3 Million for artificial photosynthesis research
  - \$614,691 grant for climate education in an age of media (the CAM Project)
  - \$200,000 grant for developing simulation-based role-playing games as transformative climate change education, communication, and decision-support tools
  - \$1.9 Million grant for developing next-generation wind-turbine blades.
  - \$124,070 grant for a study of glaciers in the Antarctica and climate fluctuations
  - \$400,000 award to study renewable plastics made from agricultural sugars and byproducts

\*This is by no means a comprehensive list of academic grants

### Major acknowledgements

- Associate Professor Mathew Barlow served as a contributing author to the Intergovernmental Panel on Climate Change Fifth Assessment Report
- Professor Robert Gamache was named one of the “World’s Most Influential Scientific Minds” for 2014 by Thomson Reuters

## 9. Future planned projects

- **University Sustainability Website** will be going live August, 2014.  
[www.uml.edu/sustainability](http://www.uml.edu/sustainability)
- **The STARS program** is being reviewed for initiation to attain certification.
- **Accelerated Energy Program – Comprehensive:** The University, in collaboration with an established DCAM program, has committed to participating in an AEP that:
  - Completed energy conservation assessment audits for all buildings and infrastructures. About 130 projects were chosen: many of the simpler projects were executed by UML.
  - Will upgrade and improve HVAC, BAS, energy recovery, efficiency, fuel switches, plumbing, electric, etc. for greenhouse gas reduction.
  - Will significantly increase energy and resource conservation programs on campus.
  - Design innovative renewable technologies programs such as solar thermal domestic hot water systems; Solar PV for parking canopy installations on South Campus.
  - AEP low interest financing: The University was awarded about \$5 Million: a one-time contribution from the state toward the completion of a \$25 Million project.
- The AEP design build bids were received in July 2014, and bid analysis completion is scheduled for mid-September 2014. Estimated project completion is set for spring of 2017.
- **Over 50 internal energy projects** are currently underway or are planned to FY 16. Some of these projects include: upgrades of Steam Traps, lighting, and control systems; Retro-commissioning of Weed, Upgrade of Bourgeois, Leitch, and McGauvran; ETIC lab efficiency improvements; sewer abatements; and more extensive application and use of the Enterprise Energy Management System (EEMS).
- **Future goals for the CAP Transportation Subcommittee/TDM Program include:**
  - Establish a Transportation Policy Advisory Committee to focus on sustainable transportation issues with University staff and local, regional and statewide partners.
  - Establish a Bike User Group in partnership with Campus Recreation Center.
  - Develop and promote a comprehensive UMass Lowell Commuter Club to promote and improve the University's TDM initiatives to all students, staff and faculty.
  - Working with local, regional and state partners, target specific infrastructure improvements that will assist in the development of viable transportation options for the University and its constituents.
  - Obtain national recognition and an elite designation for UMass Lowell as a Best Workplace for Commuters for offering outstanding commuter benefits.
  - The University plans to explore opportunities to expand its Electric Vehicle infrastructure. This involves both charging facilities and the potential acquisition of electric vehicles to replace existing fleet where applicable. Engagement with the Massachusetts Clean Cities Coalition is a targeted early approach for this initiative

## 10. “Help Needed Section” - climate preparedness

- Funding for electrical vehicle infrastructure on campus.
- Grants for the acquisition of energy efficient/low-emissions transportation vehicles.
- Clean Energy Grant for acquisition of Canopy Solar Field on South and East Garages as part of new AEP.

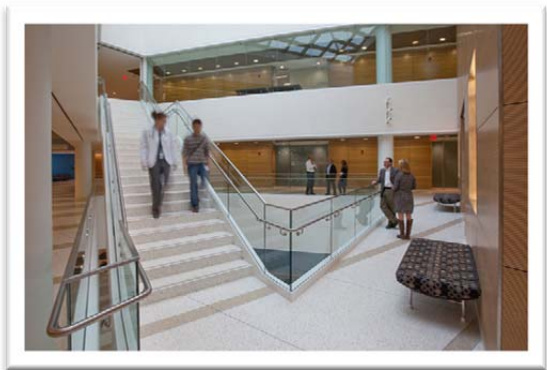




- DCAMM grant for Solar Thermal Heating Systems for Boathouse and Inn and Conference Center.
- Further integration of EEMS into on-campus operations; and analytical sessions of how to better integrate it in our day-to-day operations.
- Investigate Green Fund, a source of funding where a percentage of our energy savings is reinvested in new energy projects.
- Grants for further integration of BAS system to 100% of campus buildings.
- Funding to continue updating MEP systems after DCAMM's AEP concludes.
- Funding Alternative Energy options: biofuels, cogeneration, geothermal heat, hydro power.



## Medical School



**GROWING GREEN**  
Sustaining the UMass Academic Health Sciences Center





## **1. UMass Climate Commitment – Reduced Carbon Emissions Notable Energy efficiency and renewable energy projects**

The University of Massachusetts Medical School (UMMS) prioritizes energy efficiency and sustainability in its mission to advance the health and well-being of people through pioneering education, research and health care delivery with its partner UMass Memorial Healthcare (UMMHC). This effort is broad-based, with participation from students, faculty and staff. UMMS continues to partner with UMMHC on campus, sharing its committees, coordinating events and education of its staff.

In FY 2014, UMMS made significant strides to reduce building consumption with the expansion of the onsite power plant. Despite the addition of new buildings in 2010 and 2013, UMMS kBtu per square foot went down **12%** in Fiscal Year 2013 from the baseline year FY 2002-2004. It went down another **1.5%** in Fiscal year 2014 making a total of **13.5%** decrease of kBtu per square foot since the baseline year.

As a part of the UMMS strategy to reduce greenhouse gases, oil usage has reduced by 94% since 2007, replaced with cleaner natural gas for the power plant.

Through the President's Office, UMMS is participating in three solar net metering contracts with the support of Competitive Energy Services. The 2.5MW array Palmer Solar, LLC site in Palmer, MA went on line in December 2013 and the 5MW array First Wind facility went on line in May 2014. The net carbon offset is over 5000 Tons.

UMass Medical School continues to work closely with the various state agencies such as MassRide as well as the non-for-profit company Nurides. Nurides is the nation's largest reward program for commuters who take green trips. It doesn't cost anything and connects people to enhance carpooling while providing an economic incentive with coupons and rewards. UMMS has over 100 employees using NuRides. In addition the campus encourages carpooling through:

- Carpool passes allow students and employees to share parking passes and allow them to park in preferred parking spaces.
- Bus Pass Program: employees who live within a quarter mile/fifteen minute walk of a WRTA Bus Route have the opportunity to obtain a 100% subsidized/free WRTA monthly bus pass when they trade in their parking pass.
- Preferred parking spaces for green vehicles in the new parking garage

UMMS also received a \$45,000 Department of Energy Resources (DOER) Mass EVIP (Electrical Vehicle Incentive Program) grant. This grant will allow UMMS to construct and operate additional charging stations as well as fund 5 electrical vehicles for the campus. In addition to this grant, UMMS placed on line 4 Level 1 and level 2 electrical vehicle charging stations to support over 50 employees who use electrical vehicles.

## **2. Green Building Certifications/Sustainable building practices**

### ***Ambulatory Care Center (ACC) achieves LEED Silver Certification***

The newly-completed Ambulatory Care Center (ACC) was the first UMMS building designed with sustainability in mind; the ACC includes a mix of clinical, educational and dry research



departments.

### ***Albert Sherman Center achieves LEED Gold Certification***

In 2013, the Albert Sherman Center, an interdisciplinary, state-of-the-art research and education facility that will encourage interaction and collaboration among researchers and promote innovation and synergies across disciplines opened its doors. The Albert Sherman Center and supporting infrastructure will attract researchers, physicians, faculty, students and industry partners and enhance the UMMS position as a leader in medical research and education. A video on the energy efficient components of the Sherman Center is on the web here:

<http://www.youtube.com/watch?v=RuUSFN7YZMI&feature=edu&list=PLCAD76D0A7EF5BD4A>.

### **3. Notable Energy efficiency and renewable energy projects**

UMMS has embraced energy efficiency on campus as a way to reduce greenhouse gas emissions and costs. Several key projects have been completed that will drastically improve the efficiency of the campus. These projects are listed below, along with estimated electricity savings. With these projects UMMS was able to partner with National Grid and leverage incentives to help offset the cost of investment.

<b>Energy Projects</b>	<b>Electric Savings (kWh)</b>	<b>Metric tons of CO2</b>	<b>Leveraged Incentives</b>	<b>Simple Payback</b>
<b>Combined Heat &amp; Power Plant Expansion</b>	58,123,243	40,079	\$5,625,000	2.4 years
<b>Electric Chiller</b>	3,002,858	2,071	\$750,000	3.1 years
<b>LED Parking Garage Lighting</b>	617,581	426	\$162,240	2.3 years
<b>Medical Equipment</b>	483,556	333	\$175,621	6.4 years
<b>Sherman Center</b>	4,127,556	2,912	\$1,590,547	1.2 years
<b>TOTAL</b>	<b>66,354,794 kWh</b>	<b>45,821 tons</b>	<b>\$8,303,408</b>	

### ***Combined Heat and Power Plant Expansion and Electric Chiller***

UMMS has shown its commitment to energy efficiency through the recent expansion of its combined heat and power central plant. The current plant, which serves the Worcester campus with steam, chilled water and electricity, was expanded to accommodate growth on campus, with the addition of a 7.5-megawatt, gas-fired combustion turbine. This system, including the chiller turbine, duct burner and Heat Recovery Steam Generator (HRSG) will increase the generating capacity of the power plant, in part to support the new 512,000 square foot Albert Sherman Center research and education facility which opened in 2013.

With the new cogeneration system in place, UMMS will increase its maximum electric output from 10 to 17.5 megawatts, allowing it to meet most of the electrical demand of the campus and provide all the steam and chilled water needed for heating and cooling. The new gas turbines replaces one of the plant's original gas and oil-fired steam boilers, which are now on reserve as an emergency back-up. Since natural gas burns cleaner than oil, and the new jet turbine is highly efficient, the expanded power plant will actually have lower green-house gas emissions, despite

its added energy capacity. The Medical School will maintain a connection to the external utility grid to handle peak demand and for a backup resource.

In 2012, UMMS received recognition from the Northeast Energy Efficiency Partnerships and National Grid as a Massachusetts State Champion for energy efficiency for the power plant project and its Sustainability Initiatives. See this video for more on the project and the award <http://neep.org/neep-summit/summit-history/business-recognition-archive-2012/umms>

### *Projects*

- **LED Lighting in Parking Garage:** The lighting in the patient/visitor garage was upgraded in 2011/2012 to LED lighting, with an annual savings of 617,581 kWh per year. In the six months since the installation was complete, there has been a significantly reduced number of maintenance visits required and positive feedback on the quality of light in the naturally dark garage environment.
- **Lighting upgrade and controls at the loading dock:** The Medical School's loading dock lighting was updated in 2012 with new fixtures and a new schedule was implemented to reflect the operating hours of the dock. The lighting had previously been operating continuously, 7 days a week, 24 hours a day.
- **Institutional Review Board (IRB) Offices LED lighting:** In combination with new lighting controls, the LED fixtures installed in the research offices are expected to be 30 to 50 percent more energy efficient, and last up to seven years longer than the fluorescent lamps used elsewhere on campus. The LED fixtures are also dimmable, so each person can adjust the light in their office to their liking. This office renovation is expected to become a model for the Facilities Engineering and Construction group for future renovation projects.
- **Laboratory Ventilation Optimization** in the Lazare Research Building. This large scale retro-commissioning project is underway was completed in FY 2014. The project includes testing and balancing of the building automation system; upgrading all fume hoods to high efficiency; and installation of the Aircurity demand ventilation system in the laboratory spaces.
- **Chiller Retrofit Project.** UMMS completed the refrigerant conversion of R-500 to R-134a in two 40 year old 2500Ton chillers. The environmental friendly conversion was completed in the spring of 2014.

### *Training*

Several key employees of the UMMS Facilities department successfully completed the Building Operator Certification (BOC) training through the Massachusetts Facilities Managers Association. The training was comprised of eight different courses including, energy conservation techniques, O&M for Sustainable Buildings and others.

## **4. Behavior Change and Student and Community Engagement**

Growing Green continues to gain traction on campus since it was launched in 2009, to educate and motivate the campus to become part of the UMMS sustainability efforts. Growing Green includes a web site, signage, electronic newsletter, and various outreach campaigns.



Last year the [Growing Green web site](#) was revamped to include more information on the campus sustainability efforts and align with the look and feel of the newsletters. In addition, specific campaigns have been created for targeted messaging.

## *Doing my Part for Growing Green Campaign*



### [Take the Pledge Now!](#)

The *Doing my Part for Growing Green* campaign launched in 2012 to encourage faculty, staff and students to recycle, turn off electronics and lights and other behaviors that have an impact on the campus energy usage and

waste reduction efforts. This multifaceted campaign included:

- **Doing my Part Pledge** which encourages staff to take five actions including recycling and taking part in energy reductions. Faculty, staff and students can take the pledge electronically through a web site and receive a printed pledge card (see below) to remind them in their workspace. To-date, nearly 400 have taken this pledge.
- **Video series** which features various staff discussing how they “do their part” here at UMMS and at home. The first video in the series is posted here: <http://www.youtube.com/watch?v=Ql7wvzvdz5Y&feature=plcp>
- **Updated Growing Green signage** that references several of the actions in the Doing my Part pledge (see attached) has been posted in the main School Building.



### *in the bin*

In 2013 with the launch of the new single stream recycling

program, UMMS and UMMHC rebranded the effort to be called “in the bin”, with new signage, posters and stickers helping to educate the campus on the potential recyclable items.



### *Newsletter*

The Growing Green electronic newsletter continues to be the primary communication tool for sustainability and energy efficiency information for the campus, sent out to a distribution list of over 10,000 bimonthly. See the attached document for examples of the Growing Green newsletter. Articles from the newsletters

are also available on the Growing Green web site here: [www.umassmed.edu/GrowingGreen](http://www.umassmed.edu/GrowingGreen). Growing Green also has launched a Facebook site in 2012, linked to here: <http://www.facebook.com/pages/UMass-Medical-School-Sustainability/155692801216385>.

### ***Green Reps***

A new working group was formed in 2012 to further expand the reach of the Sustainability Committee. The goal is to have representatives from departments to communicate directly with their colleagues about various sustainability initiatives and events as well as to provide feedback to the Sustainability Committee. The new group continues to meet quarterly.



### ***Commitment to Local Food Options***

UMMS has a commitment to bringing local food options to campus. A farmers market is held weekly from June through October on the campus green. In addition, UMMS is now a host site for the Massachusetts Local Foods Cooperative at UMMS ([www.masslocalfood.org](http://www.masslocalfood.org)). Both of these activities help to bring awareness to the value of food grown locally, including the reduced transportation emissions.

### ***Earth Day Education Event***

More than 1,000 people from all corners of the University Campus and members of the public walked through the Earth Day event on April 24, 2014 where more than 40 local organizations and campus departments offered products, services and information to the community. Attendees had the opportunity to sign-up for carpooling with MassRIDES, learn about home energy audits and solar panels and view fuel efficient vehicles. A video of the 2012 Earth Day Event is online here: <http://www.youtube.com/watch?v=6bOcw5489xY>

### **Links/videos:**

- Sherman Center: <http://www.youtube.com/watch?v=RuUSFN7YZMI&feature=edu&list=PLCAD76D0A7EF5BD4A>.
- Doing My Part <http://www.youtube.com/watch?v=Ql7wvzvdz5Y&feature=plcp> and <http://www.umassmed.edu/news/2012/community/doing-their-part-for-sustainability-part-ii.aspx>
- 2012 Earth Day <http://www.youtube.com/watch?v=6bOcw5489xY>
- Business Leaders State Champion: <http://www.youtube.com/watch?v=YfO5EyQOKN0>
- Growing Green newsletters: [www.umassmed.edu/GrowingGreen](http://www.umassmed.edu/GrowingGreen).
- Growing Green Facebook: <http://www.facebook.com/pages/UMass-Medical-School-Sustainability/155692801216385>.

### **5. Notable Waste Reduction/composting/recycling programs**

**Resource Management Contract (2013)** UMass Medical School (UMMS) and UMass Memorial Healthcare (UMMHC) have partnered on a new Resource Management contract with E.L. Harvey of Westborough. This contract is a change from the previous contract for waste and recycling and encourages the vendor to partner with UMMS and UMMHC and increase



recycling rates and reduce the amount of waste. In addition, in 2014, the state will be enforcing a waste ban for food, which will impact UMMS and UMMHC at the larger cafeteria sites. The contract includes all of UMMHC hospitals, UMMS, Community Health Link, UMMHC affiliate hospitals and UMMHC Realty Group for a total of 65 locations in Massachusetts.

### ***Electronics Recycling***

UMMS has a comprehensive electronics recycling program through a partnership with Northeast Material Handling. Electronics, lab equipment, furniture, batteries and other items are now collected at the loading dock and picked up by Northeast Material Handling for recycling. In the last year, **26.57 tons** of electronics have been collected for recycling by Northeast from school operations.



**E-Recycling events** are now held twice a year at different locations for employees to recycle their personal items.

**Construction Recycling:** throughout the construction of the Sherman Center, approximately 90% of the waste generated has been recycled.

### ***Dining Operations Waste Reductions***

In addition to recycling both in the kitchen, food waste from the Lazare Research Building Cafeteria operations is donated to a local farmer. Tyde Brook Farm (Holden, Massachusetts) picks up the food waste each week and processes it for animal feed. Approximately 100 gallons of food waste is donated each week or approximately 10,000 gallons a year.

**SWAP Web site for Surplus:** at the Medical School there are a variety of items that become “surplus”, and are no longer needed. The Surplus with a Purpose (SWAP) internal web site offers a venue for the UMMS community to share furniture, office supplies and lab equipment and other various items to keep them out of the landfill while saving money.

## **6. Academic programming (courses, majors, certificates, masters programs, etc)**

N/A

## **7. Clean Energy Research**

N/A

## **8. Public Recognition of Efforts**

### **Awards**

- Second Nature Climate Leadership Awards Finalist (2013)
- Northeast Energy Efficiency Partnerships State Champion for Energy Efficiency (2012)
- Leading By Example, MA DOER 2011, 2010



## 9. Future planned projects

**Lab Ventilation Study at Biotech Park.** An energy study of the 5 Biotech buildings totaling over 500,000sf of research space which was started in the summer of 2013. This Rapid Energy and Lab Safety Assessment, partially funded by NStar and NGrid and performed by ECT, Inc. of Cary, NC will provide a list of energy conservation opportunities. We expect a large majority of these ECOs to receive incentive payments by the two utility companies.

UMMS Accelerated Energy Program Study - The Division of Capital Asset Management & Maintenance (DCAMM) has contracted with B2Q Associates, Inc. to perform a comprehensive energy audit on the campus. B2Q will develop energy baselines and analyze relevant existing conditions, resulting in recommendations for energy conservation projects. The scope of the project will cover approximately 2.6 million square feet and will include the original medical school and hospital, Lakeside Addition, Benedict, ACC, Lazare and the Power Plant. Expected completion date for the study is this Fall.

## 10. “Help Needed Section” - climate preparedness

UMMS has several efforts to minimize disruption due to natural disasters including:

- Increased capacity of the Combined Heat and Power Plant with multi-fuel capability
- Backup generators on several buildings
- Received matching funding from DCAMM to install a separate 13.8kV electrical feeder to the LRB therefore reducing the risk of electrical outages in both the LRB and Sherman Center.
- UMMS continues to work closely with NGrid, our electrical service provider, as they modernize the local area distribution grid with the construction of the new Quinsigamond Bridge and the refurbishment of several main substations. We are working through NGrid to have at least one of the main feeders replaced and the automatic transfer protocol adjusted to assure timely transfer to our secondary feeder.
- UMMS received a grant allocated by the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR) and funded by the Federal Emergency Management Agency (FEMA). This Campus Hazard Mitigation Plan was intended to build upon existing hazard mitigation planning efforts that have been completed on the campus. Completion of the grant not only identifies vulnerabilities but will prioritize capital projects to reduce risk and potential position the campus for future state and federal assistance to mitigate the risks.