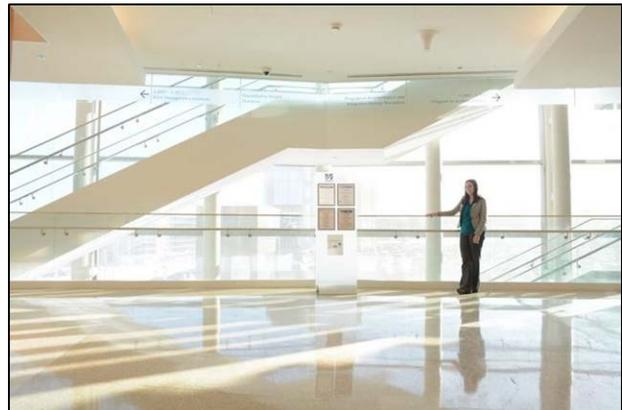


University Sustainability Efforts Annual Report



Board of Trustees Administration & Finance Committee



September 9, 2015



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Executive Summary & University Efforts

The University of Massachusetts (UMass), which includes five campuses in Amherst, Boston, Dartmouth, Lowell and the Medical School in Worcester, has made a collective commitment to be “good steward of resources” including not only fiscal resources but also a commitment to be 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. The report that follows represents the programs and achievements of our campuses during fiscal year 2015.



UMass Amherst is a sustainability leader serving as a model for communities across the country. Students learn about sustainability through courses, majors, programs, co-curricular activities, and research. The campus is a culture of sustainability and lives sustainably through efficient practices in food, energy, and waste. UMass Amherst continues to be on the forefront of research and innovation. It is a community of changemakers honored for leadership. Learn, Live, and Lead It! Sustainable UMass!



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 and collaborates with departments campus-wide to make sustainability a part of the daily experience and support the vision and mission of UMass Boston.



SUSTAINABILITY INITIATIVE

UNIVERSITY OF MASSACHUSETTS DARTMOUTH



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.”



Office of Sustainability

www.uml.edu/sustainability

UMass Lowell is committed to climate neutrality as an institution, and as a leader in sustainable education, research and innovation. The University’s first Office of Sustainability began operations in 2015 and along with the Climate Action Plan Steering Committee serves as the primary managing bodies for sustainability initiatives on campus. Our commitment to sustainability serves as a means to attract the best talent and engage the entire campus community to help our students become leaders in a changing world.

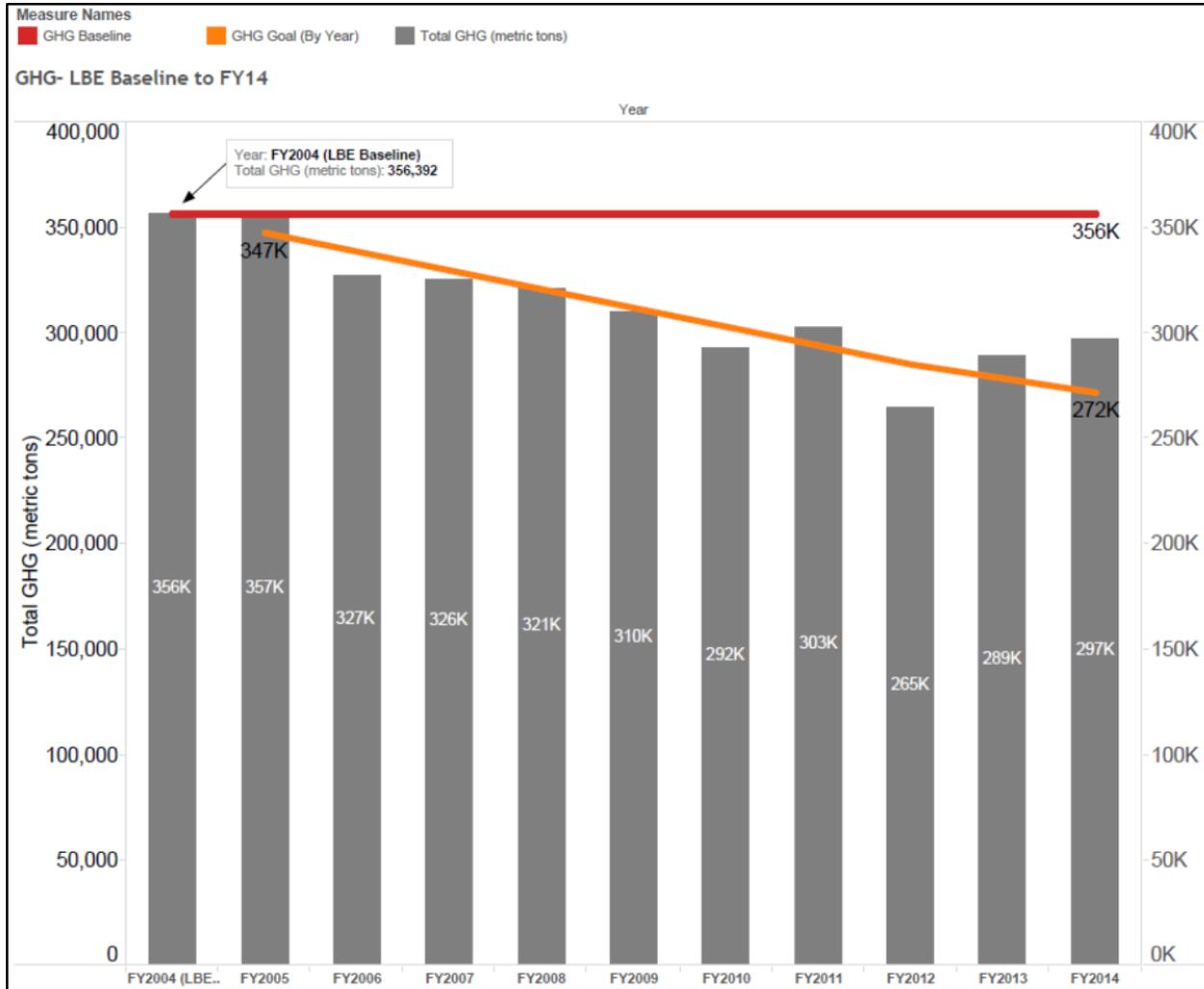
GROWING GREEN



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 campus’ carbon footprint.



In 2007, the University President and all five campus Chancellors signed the American College & University Presidents' Climate Commitment (ACUPCC). In so doing, the University committed to developing a plan for achieving carbon neutrality, taking concrete initial steps in order to achieve this goal, and publishing progress reports. In the years since, the University has succeeded in reducing its carbon emissions by 16.71% when compared to *the Leading By Example* baseline. Strategic investments in energy efficiency, recycling, building improvements and others have the campuses on course to meet their goals.



During that same year, then Governor Deval L. Patrick filed Executive Order 484 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, Governor Patrick 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.

Since taking office in January of 2015, Governor Charlie Baker has also indicated his commitment to energy and sustainability efforts with his most recent filing of legislation regarding solar net metering. In addition, he has filed legislation to bring more hydropower to the State which he notes is a critical step in reducing greenhouse gas emissions while also helping ratepayers by providing a cost effective alternative to fossil fuels like coal and oil. In just his short tenure in office, the Governor continues to make commitments like these that will give Massachusetts the tools to move forward on sustainability efforts.

Additionally, at the national level, climate change and carbon pollution have recently become more prevalent topics in the national discourse. On August 3, 2015 President Barack Obama announced a historic commitment to clean energy and reducing carbon emissions through the “Clean Power Plan.” The plan creates the first-ever carbon pollution standards for power plants and is designed to reduce carbon emissions by 32% from 2005 levels by 2030. It further sets goals for each state based on their energy production and allows them to tailor their own plans to meet the plan goals. The Clean Power Plan bolsters efforts to expand renewable energy generation, build clean energy infrastructure, and promote energy conservation practices.

In an effort to do our part, the University through 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 and recycling, water conservation, green buildings, alternative fuels, and efficient transportation. 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.

One area where the Sustainability Group has been successful is in its partnership with the University’s Procurement Council. In August 2014, the Sustainability Committee partnered with the Procurement Council to determine areas where the University can employ procurement practices that will help to support the University’s sustainability mission. It was determined at this 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. Subsequent to that meeting, Office Max was able to report that roughly 30% of total spend on paper was on some level of recycled paper.

With regard to toner cartridges, the Boston campus initiated a pilot program with a Massachusetts based, Minority owned, manufacturer of recycled toner cartridges. Based on the successful pilot program, the program was introduced university-wide using a direct substitution of Roxbury Technology toner products in the BuyWays system. The products offered by Roxbury Technology offer cost savings, on average, of up to 20%. The program supports the University's sustainability goals: 90% of product re-used or recycled and supports MA Executive Order 515 which sets a goal of the Commonwealth's agencies using 80% remanufactured toner cartridges.

In addition, the group continues to discuss standards that exist through the Sustainability Tracking, Assessment & 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 partnered to represent the University at the ACUPCC Conference held in October 2014 in Boston. As previously described, the University has been a member of the ACUPCC since 2007. This year the annual conference of the organization for the first time was held in Boston allowing the University to participate on the host committee. In preparation for the conference, the campus Sustainability Directors/Managers regularly met to discuss the University's participation and also worked with the overall conference host committee to ensure UMass was represented at the conference. There were several areas where the University was represented at the Conference including:

- Boston Campus Tour – The group toured UMass Boston's new Integrated Sciences Complex (ISC), a 220,000-square-foot, \$182-million steel-and-glass facility. The group also toured the UMass Boston Campus and Conference Center which opened in 2004 and was 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.
- World Climate Simulation - Developed by UMass Lowell, 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. The simulation was conducted on two days over the course of the conference.

- Sustainability Showcase – This showcase allowed for specific campus projects to be put on display during a 2 hour exhibition format. The University was selected to display and present on:
 - **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 UMass Dartmouth'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 (SCI)** - 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.

The conference was a tremendous success bringing college and university leaders from across the country to continue the conversation about sustainability in higher education and the opportunities for ACUPCC in the future. The UMass System was ever present in that conversation with broad representation from across the system engaged and actively participating in several key aspects of the conference.

Following the successful conference the Sustainability Committee began discussion around how to continue to collaborate as a system and elevate the University's commitment to reducing carbon emissions. At the conference, it was clear that many campuses that were successful in continuing to move sustainability efforts forward were those that enacted a Board Policy specific to sustainability. The goal of such policies reviewed is to reaffirm the University's commitment to the central tenets of the ACUPCC, bolster efforts around climate resilience, demonstrate sustainability as an institutional priority, and set the road map for achieving climate neutrality. Many colleges, universities, and systems have adopted similar policies and research to date have utilized the experience of others that have been successful to explore best practices. The Sustainability Directors and President's Office have been researching best practices, sustainability trends, and current reporting requirements in order to make informed decisions about what policy ideas should be adopted. The Sustainability Committee is preparing the draft policy for consideration by the Board during the 2015-2016 academic year.

In addition to the efforts of the Sustainability group, the Strategic Energy Committee, which 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 culminated in contracting multiple Solar Net Metering projects which reduces the cost of power to our campuses and eventually the region. In addition, this initiative 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 MW (DC) of new solar capacity in Massachusetts. As of the end of FY14 12 of the 15 projects are operational, totaling 38 MW (DC). 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 avoid¹ a total of 28,532 metric tons of CO₂ 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 CO₂ offset through projects supported by UMass.

¹ 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.

The 28,532 metric tons equate to about 10%² of the 296,829³ metric tons of GHG emissions created by the University of Massachusetts system for the FY2014 time frame.

Campus	Developer	Project Name	Expected Online Date	System Capacity (MW-DC)	System Location	Discount off Credit Value	Floor Price ⁽⁷⁾ (\$/kWh)	Projected Savings 1st 12 Months ⁽⁵⁾	Projected Savings 20 Years ⁽⁶⁾
Lowell	Mass Midstate Solar 1, LLC ⁽¹⁾	Warren A	Active	5.60	Warren	37.50%	\$0.0700	\$340,000	\$7,931,000
Lowell	Hubbardston Solar, LLC ⁽²⁾	Hubbardston	Active	2.50	Hubbardston	35.00%	\$0.0700	\$130,000	\$2,961,000
Lowell	Nexamp	Westford	Active	1.50	Westford	10% - 14%	None	\$23,000	\$660,000
Lowell	Mass Midstate Solar 3, LLC ⁽¹⁾	Warren C	Active	4.20	Warren	37.50%	\$0.0700	\$255,000	\$5,950,000
Lowell	Millbury Solar, LLC ⁽¹⁾	Millbury	Active	2.10	Millbury	37.50%	7.00%	\$127,500	\$3,000,000
Subtotal ⁽³⁾				15.90				\$875,500	\$20,502,000
Amherst	Clean Energy Collective	CEC Solar #1032, LLC	Active	1.00	Hadley	15.00%	None	\$10,000	\$250,000
Amherst	Nexamp Fairview Farms	Whatley	Active	2.40	Whatley	21.00%	None	\$46,000	\$1,101,000
Amherst	Nexamp Hadley Solar, LLC ⁽⁴⁾	Hadley	Active	1.50	Hadley	18.00%	None	\$16,000	\$400,000
Subtotal ⁽³⁾				4.90				\$72,000	\$1,751,000
Dartmouth	ConEdison	Dartmouth-II	Active	2.40	Dartmouth	30.00%	None	\$125,000	\$2,855,000
Dartmouth	Freetown Solar, LLC ⁽¹⁾	Freetown	Active	6.00	Freetown	34.25%	7.00%	\$330,000	\$7,563,000
Subtotal				8.40				\$455,000	\$10,418,000
Medical School	Palmer Solar, LLC ⁽⁸⁾	Palmer	Active	2.50	Palmer	35.00%	\$0.0700	\$130,000	\$3,000,000
Medical School	Mass Midstate Solar 2, LLC ⁽¹⁾	Warren B	Active	6.00	Warren	37.50%	\$0.0700	\$365,000	\$8,500,000
Medical School	Solar City, LLC ⁽¹¹⁾	Williamsburg	8/12/2015	2.10	Williamstown	1/0/1900	\$0.0750	\$189,288	\$3,800,515
Medical School	SolarCity	West-Brookfield	11/1/2015	1.40	West	51.00%	\$0.0750	\$126,192	\$2,533,677
Subtotal				10.60				\$684,288	\$15,300,515
Boston	Rustcraft Road Solar, LLC ⁽⁹⁾	Rustcraft Road Solar	12/1/2014	2.00	Dedham	10.00%	\$0.0800	\$73,000	\$1,690,000
Boston	EMi	East Boston	12/1/2014	1.00	Boston	10.00%	\$0.0800	\$36,500	\$845,000
Boston	Solar City ⁽¹⁰⁾	??	??	5.00	NEMA Zone	N/A	\$0.0750	\$450,685	\$9,048,845
Boston	First Wind	??	??	5.00	NEMA Zone	37.50%	\$0.0700	\$304,167	\$7,083,333
Subtotal				10.00				\$791,352	\$16,977,179
System-Wide Totals ⁽¹⁾				49.80				\$2,878,140	\$64,948,694

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. Clean Energy
2. Climate Protection
3. Green Building Design and Sustainable Building Operations
4. Sustainable Transportation
5. Environmentally Preferable Purchasing
6. Sustainable Food Services
7. Sustainable Water Systems

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

³ GHG values are based on the FY14 scope 1 & 2 emissions associated with building energy consumption.



- 8. Waste Reduction and Recycling**
- 9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc)**
- 10. Public Recognition of Efforts**



Amherst Campus



**Robsham Visitor Center Solar Canopy rendering
Center Green Roof**



Integrative Learning



**New Hydration Station – WEB Dubois Library
Composite Material**



Design Building Rendering – Wood

1. Clean Energy

UMass Amherst (UMA) is making huge strides in developing the on-campus renewable energy portfolio, offering unique integrative clean energy programs, and advancing research and development of clean energy technologies.

Solar Projects:

Multiple solar energy projects are currently underway and being constructed or installed on campus during the summer of 2015. The DOER Clean Energy Grant funded solar canopy project at the Robsham Memorial Center for Visitors parking lot will be completed late summer/early fall. This highly visible demonstration project will produce 200 kW of solar energy and will provide cover for campus visitors as well as house three electric vehicle charging stations. A dashboard displaying the real-time energy production of the system will be visible in the lobby of the visitor center. UMass Amherst received a \$164,000 grant from DOER to help fund this project and the remainder of the funds from the reallocation of Alternative Portfolio standard Credit (APS) revenue, which is generated annually from the Central Heating Co-Generation Plant (CHP). UMass Amherst will own and operate this solar canopy system that is providing a prototype for future development of more solar canopies across many campus parking lots (see next paragraph below). Payback on the project is estimated to be 9-10 years.

UMA is currently selecting solar developer(s) for campus-wide solar electric systems on parking lot canopies as well as rooftops. The focus of the RFP is to enter into a power purchase agreement (PPA) with the installer who will install, own, and operate the systems on campus. The project scope has the potential to install over 1 MW of roof-mounted solar and anywhere between 3-5 MW of solar parking lot canopies which will combine to provide the University \$4-7 million dollars in savings over a 20 year contract. Savings will come from shaving peak energy demand during summer months and locking in low electricity rates with the provider over 20 years and hedging against increases in future electricity costs. The campus will also benefit from lower parking lot maintenance costs and a visible commitment to renewable energy campus-wide.

UMA has contracted at three off-site locations for 4.9 MW of virtual net metering credits (NMCs). The NMC contracts will represent a cost reduction of over \$75,000 on our FY 15 Energy Budget. All projects came online at the beginning of the FY 14 and are expected to generate to be fully operational for the full fiscal year.

The first solar hot water (solar thermal) project is currently being installed at the Central Heating Plant. This project is also funded by a mix of a \$75,000 DOER Clean Energy Grant as well as CHP alternative portfolio standard credit revenue. The project will consist of solar hot water collectors mounted on the tank farm portion of the CHP roof which will pre-heat make-up water coming from the 250,000 gallon condensate tank. The water will be pre-heated by the solar energy, which will lower fossil fuel heating used to create steam for campus buildings.

Energy Master Plan:

The University of Massachusetts Amherst has completed and published a Comprehensive Campus Energy Master Plan. This effort developed a plan for the reliable delivery of energy on campus over the next 10 years and defined and prioritized 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.

Academics:

The University of Massachusetts Amherst received a \$3.2 million grant from the National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT) program to start an interdisciplinary graduate program in Offshore Wind Energy. The new graduate program will train 24 doctoral students over the course of five years in the technology, environmental implications, and social/economic/regulatory challenges of offshore wind farms. The interdisciplinary program will feature more than 20 faculty members from nine UMass Amherst departments in the College of Engineering, College of Natural Sciences, School of Management, and College of Social and Behavioral Science.

Research:

The University of Massachusetts Amherst has begun conducting a pilot project with the Holyoke Gas & Electric Co. that will show the utility and its customers how smart electric meters can save money and power. The data will feed several subprojects already underway, which include an automated thermostat, a web-based solar predictor, and an electrical reserve battery. The project is funded by a \$200,000 grant from the Massachusetts Department of Energy Resources.

UMA has created the UMass Amherst Energy Extension Initiative that will support community-scale test-bed projects designed to identify and mitigate financial, social, political, and technical barriers to wider deployment of energy efficient practices in the commonwealth. The initiative was funded through a \$6 million grant from Patrick Administration.

2. Climate Protection

Academics:

This fall UMass Amherst will offer a new graduate certificate in Climate Change, Hazards and Green Infrastructure. The program offers advanced training in climate informed municipal planning and regulation, and expertise in the area of what is called ‘green infrastructure’ stormwater management systems, urban heat island reductions, low fossil fuel transport systems that work with and support natural processes. The

Department of Landscape Architecture and Regional Planning has developed an expertise in both distinct fields of climate change and hazards planning and in green infrastructure, and is unusual in its ability to bring these two highly related but often differentiated areas of planning and design together. The purpose of this certificate program is to provide advanced professional knowledge and skill building around planning and design to address climate change and green infrastructure.

Research:

Since 2011, UMA has led a consortium of seven universities and hosted the Northeast Climate Science Center through a five-year, \$7.5 million federal grant. It is supported by federal, state, and other agencies providing scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife and cultural resources can use to anticipate, monitor, and adapt to climate change.

Researchers Ezra Markowitz at the University of Massachusetts Amherst, with Tien Ming Lee of Columbia University, Anthony Leiserowitz of Yale and others at Utah State University used data from the largest cross-sectional survey of climate change perceptions ever conducted to write the *Nature Climate Change* today report, the first global assessment of factors underlying climate change awareness and risk perception. The researchers analyzed data from nationally representative samples of 119 countries collected for the Gallup World Poll conducted in 2007 and 2008. They say results indicate that to be most effective, climate-related messages must be tailored to public awareness and perceptions specific to each nation. They also write that worldwide, education level is the single strongest predictor of climate change awareness and that understanding the human causes of climate change is the strongest predictor of risk perception.

3. Green Building Design and Sustainable Building Operations

Green Building Design:

UMA now has six LEED Gold Certified buildings: George Parks Marching Band Building, Police Station, CNS Research & Education Greenhouses, Hampshire Dining Commons, Life Science Laboratories, and the Football Performance Center. The new Integrated Learning Center and the Champions Center Basketball Facility are targeting for Gold certification. The Commonwealth Honors College Complex, Paige Laboratory Renovation, and the Lincoln Campus Center Renovation are targeting LEED Silver certification. Some notable features now visible on campus include the Integrative Learning Center's green roof. This 15,000 sq. ft. ILC roof is planted with hardy native plants, including many varieties of sedum, which can withstand heat and drought. This green roof provides an educational opportunity to the campus community, reduces the Heat Island Effect, creates a pleasing view from surrounding buildings, absorbs CO₂, reduces glare and retains 1,825 cu. ft. of storm water. Additionally, the vegetation will protect the roof membrane from the elements, including UV light, extending the life expectancy of the membrane and leading to lower life cycle costs.

Design Building – Sustainable Material:

The new Design Building, which will house the Building and Construction Technology programs and the departments of Architecture and Design and Landscape Architecture and Regional Planning, is now under construction and slated for September/October completion. This building will feature a glue-laminated wood, cross-laminated timber (CLT) and wood-concrete composite structure that replaces the common steel/concrete construction type that is common in the area. This structural system reduces this building's carbon footprint and maximizes the use of renewable materials. In its landscape, the building is slated to feature rainwater-control features like a partial green roof and bioswales. This innovative, sustainable approach will provide students in the programs a more advanced space for their research, and provide faculty with a hands-on environment for teaching sustainable building and sustainable environment. The Massachusetts Environmental Bond Bill has provided \$3 million to support the added costs of constructing with this innovative wood material.

Energy Efficiency:

A new wave of energy conservation measures is underway at UMA as part of the 2015 E+ Program. Measures include Retrocommissioning (RCx) of multiple buildings including the Studio Arts Building, Recreation Center, and the Fine Arts Center. RCx and lighting upgrades at the Central Heating Plant are in progress. Lighting upgrades in the Campus Center Garage are completed. These LED upgrades have estimated average payback of 3 years. This year's E+ program will save the campus annually over \$600,000, 2.4 million kWh of electricity, 18.49 million pounds of steam, and will reduce over 3,600 MTCO₂ emissions.

Master Plan Sustainability Chapter:

The Sustainability Chapter addition to the Campus Master Plan has been completed and published by a campus-wide, collaboration among students, faculty, and staff. The committee met throughout the 2014-2015 academic year to develop this new chapter of the Master Plan that addresses how the campus plans to move forward to advance sustainability within the physical campus space and facilities. The chapter covers emissions, landscapes and open space framework, circulation and parking, buildings and utilities, stormwater, and waste.

Engagement:

One of the primary initiatives of the UMA's UMass Energy Extension program is to provide energy analysis and consulting services to municipalities in the Commonwealth, with the goal of reducing energy demand and increasing the deployment of renewable energy technologies. This is mainly accomplished through site visits, consultations, and custom data analysis performed by the sole extension faculty member in the program.

Academics:

UMA offers a Sustainable Building & LEED Certification, which provides understanding of the LEED rating systems and how the rating system applies to the high-performance

design and construction of the built environments. Since 2012, more than one hundred students have been LEED certified by this program.

4. Sustainable Transportation

Public Transportation:

UMass Transit services is a provider of PVRTA in the northern tier of Pioneer Valley region provided over 3 million rides to passengers in FY15, a 15% (400,045) passenger increase over the previous fiscal year. There are 7 hybrid buses in the 35 bus fleet which reduce overall fuel consumption by 40%. A normal bus gets 4.5 mpg and the new hybrids get 7.5 mpg.

Electric Vehicle Charging:

Five new electric car chargers, including the first level three charger in Massachusetts, are now installed and available for use by Transportation Services at three locations on campus as part of the effort to achieve the campus' goal of reaching carbon neutrality by 2050. Level II Chargers are available for public use at the Visitor Center and Campus Center Garage.

Bike & Car Sharing:

UMA has programs available to the entire campus community aimed at reducing single-occupancy use vehicles (SOV's). The Student Government Association in collaboration with the Physical Plant operates a fleet of 20 bicycles in the UMass Bike Share Program. Anyone with a UCard can rent these bikes out for free for 24 hours or for weekend-long durations. The Campus Sustainability Manager is currently serving on the Pioneer Valley Feasibility Study Advisory Committee to study and procure one of the nation's first regional bike share programs which UMA will participate in. This new program will span four municipalities including Springfield, Holyoke, Northampton, Amherst and the University campus and will be fully automated and managed by a third party bike share company. The campus also has ZipCar car sharing program. Cars are available to use in three locations on campus, Lots 21, 43, and 71. Students, faculty, and staff can join the program for only \$25 per year.

Greening the Campus Fleet:

The campus fleet consists of 485 vehicles. The Fleet Manager in Transportation Services manages the entire campus fleet and regularly works to reduce the campus fleet, swap out inefficient vehicles for newer more efficient, alternative fuels if possible, and we are heading towards an increase in EV fleet on campus based on infrastructure already put in.

Academics:

The University of Massachusetts Amherst offers a Transportation Sustainability course that covers concepts of sustainable transportation management strategies and policies. It also covers the life-cycle assessment for transportation infrastructure, vehicle emission estimation models, alternative fuel vehicles, non-motorized modes, and transit preferential treatments. This years student projects included on campus electric bikes

share systems, transportation hubs, and smart phone travel surveys. The course is supported by the Sustainability Curriculum Initiative Grant from UMass Amherst Libraries and has allowed a librarian to work with faculty in order to integrate library resources and information literacy into the course's curriculum.

5. Environmentally Preferable Purchasing

Operations:

UMA last reported expenditures and percentages of environmentally preferable purchasing data for electronics, cleaning products, and office paper in February 2015 in the Sustainability, Tracking & Assessment Rating System (STARS) report. In Fiscal Year 2014, 100% of the total expenditures, over \$647,000, on desktop and laptop computers, displays, thin clients, televisions, and imaging equipment, was either EPEAT Gold or Silver registered products. EPEAT registered products meet the latest ENERGY STAR specifications and are designed to be easily recycled. For cleaning products used by Physical Plant in Administrative and Classroom buildings on campus, 99% of all products purchased were Green Seal and/or UL Environment (EcoLogo) certified cleaning and janitorial products (\$69,264 out of \$70,000). Since the Office Max contract began and procurement officers have been working with the UMass System procurement office, recycled content office paper purchasing has increased at UMA. In FY15 between July 2014 and March 2105, UMA expenditures on paper with recycled content (10%-100% content) averaged 36%. This percentage should and could improve because this means that 64% of all cut sheet paper products (copy paper, colored paper, etc) purchased was virgin paper products.

Academics:

Students in the Master of Science in Sustainability Science are working on a project that will add sustainable items to the UMass Amherst Bookstore. Over summer and fall 2015 students will review purchasing data and work with vendors to integrate sustainable apparel into the bookstore. This will help the bookstore make more sustainable purchases in the future.

6. Sustainable Food Services

UMass Dinning:

UMass Amherst spent \$3.25 million on local and sustainable products in FY15. It has prioritized the sourcing of product to be local either within Massachusetts (preferred) or within 250 miles from campus. For non-local it looks to have sustainable food that is 3rd party verified. Since fall of 2013 UMass Amherst has participated in the Real Food Challenge, which requires that 20% of the University food and beverage purchases be local / community-based, fair, ecologically sound and humane by 2020. The university is working diligently to support Food Solutions New England (FSNE)'s "50 by 60" campaign to source at least 50% local food by 2060. This initiative supports the New England region's broader goal to increase access to clean, fair, just, and affordable food to all its citizens.

In FY15 UMA has spent \$1.6 million on New England products, a 38% increase from FY14. 50+ local vendors provide produce for UMA, a 41% increase from FY14. Nearly 100% of the seafood served on campus in FY15 was certified sustainable. 100% of the eggs used on campus are from local and cage-free animals. UMA has increased its local poultry meat purchases by 38%. It increased its spend on local dairy by \$100,000 and served 100% local milk in the recently renovated Hampshire Dining Commons. Impressively, year to date, FY15 overall per plate (number of meals served compared with total food cost) increased only .1% from FY14. In our Hampshire Dining Commons – UMass Amherst’s testing site for healthy, sustainable, and delicious foods – the per plate cost actually decreased 3% over the same period.

UMass Amherst Dining Services was selected as a gold recipient for procurement practices in the 2014 Sustainability Awards given by the National Association of College and University Food Services (NACUFS). UMass Amherst was one of six schools to earn “Best Campus Food” honors in the 2015 edition of The Princeton Review, this year ranking #2. In June 2015, the UMass Dining’s Blue Wall Eatery won Best Concept Award from Food Management Magazine.

UMass Dining will be releasing a how-to-guide highlighting “best practices” for a local/sustainable food initiatives in October of 2015. This guide will help higher education campuses, K-12 schools, and health care facilities, shift to a New England based or sustainable food system using UMass Amherst as the model.

Academics:

UMA Students in Stockbridge School of Agriculture’s Sustainable Food and Farming major are prepared for to work in diverse fields such as: growing and marketing real food, farm-based educational systems, food advocacy, community development and public policy.

UMA’s Stockbridge School of Agriculture also offers a Sustainable Horticulture Bachelor of Science degree the is designed to provide students science-based education, which can be applied in a wide variety of careers in landscape plant production and use of plant materials in constructed and natural landscapes.

UMA’s UMass Student Farming Enterprise provides seasonal food to a campus Community Supported Agriculture group, Earthfoods Café in the student union, UMass Dining Services, two Big Y Supermarkets, and the UMass Student Farmers Market.

7. Sustainable Water Systems

Reclaimed Water Use

UMA recently received a permit from DEP to expand the most significant water conservation initiative on campus: reclaimed water use. The Central Heating Plant (CHP) currently utilizes the effluent from the Amherst Waste Water Treatment Plant (reclaimed water) as boiler make-up water to produce steam for the campus and for the CHP cooling towers. To increase water conservation, and to maximize the capability of

the existing Reclaimed Water Treatment Facility (RWTF), the CHP received a Class A Reclaimed Water Permit from the Massachusetts Department of Environmental Protection to use reclaimed water at the Commonwealth Honors College Residential Complex cooling towers as well. The Amherst campus currently requires about 340 million gallons of water per year and the RWTF can process approximately 200,000 gallons of reclaimed water per day. Boiler water make-up for steam production utilizes the full capacity of the RWTF during the heating season. The addition of the cooling towers at the Commonwealth Honors College will maximize the reclaimed water capacity during the cooling season. This would result in a potential reduction of potable water consumption of 73 million gallons of water per year (21%). Expansion of this program is slated for completion by fall 2015.

Bottle Filling Stations

Water bottle filling stations have been installed across campus housing and almost every single residence hall now has a new machine. These machines help save millions of water bottles every year because it incentivizes reusable water usage. In the seven Commonwealth Honors College residence halls these stations over the past two years have dispensed over 5.4 million ounces of tap water saving an estimated 455,800 water bottles. Filling stations have also been installed in student activities buildings, the library, and classroom buildings.

Research:

In fall of 2014 UMass Amherst Researcher David A. Reckhow, a professor of civil and environmental engineering, received a \$4.1 Million Grant from the U.S. EPA to create a national center for aimed at assisting small-sized drinking water systems. Under the grant UMass Amherst Water Innovation Network for Sustainable Small Systems (WINSSS) will develop and test advanced, low cost methods to reduce, control and eliminate groups of water contaminants that present challenges to communities across the U.S. and worldwide.

8. Waste Reduction and Recycling

New2U Reuse Tag Sale:

Student Leadership continues to drive waste reduction and recycling efforts at UMA. Two exciting student led, Sustainability Fund supported projects are continuing onto the second year of operation: The New2U Reuse Collection and Tag Sale and the UMass Minute Riders Program. The New2U Reuse Tag Sale generated \$8,000 in revenue and saved over 5 tons of waste from entering the landfill in the first year of operation. Sustainable UMass has once again teamed up with Residential Life and the Office of Waste Management to collect thousands of items during move-out in Southwest Residential Area and this year expanded into the Orchard Hill Residential Area. The items are being 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. Sustainable UMass continues to be an active member organization of the Post Landfill Action Network (PLAN) to receive assistance in planning the move-out collection and tag sale in the fall.

Minute Riders:

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. Minute Riders participating offices increased from 12 offices in year one to now 30 offices. Students are using a tandem bike with a trailer to pick-up and haul the compost to central composting areas at the dining commons. Hundreds of pounds of food scraps are being saved from the landfill each year, adding to the 1,400 tons of food waste that UMass composts each year.

Green Office Program Update:

The Green Office Program now has 75 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. This year the program grew extensively when all of Student Affairs and Campus Life (SACL) joined onto the program, adding 35 new offices.

Academics /Research:

PhD Student in the Department of Environmental Conservation, Jarred Starr, reviewed the factors that drive municipal solid waste recycling by reviewing 351 communities in Massachusetts over the span of 16 years. The results indicate that most programs variables have little effect on recycling rates. The findings should help municipalities determine new ways to increase recycling participation.

A team of student researchers are working on two problems relating to UMass Amherst waste system. One is whether or not it is better use an anaerobic digester or to continue composting UMass Amherst food waste. The other issue is to determine if it would be better to implement compost in the dorm halls or just increase the current Single Stream Waste System. The student research could offer a broader perspective on how UMass manages its waste.

9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc)

Academic Programming:

Sustainability is integrated into the intellectual foundation UMA's academic programs. UMass Amherst offers [300 courses](#), [25 undergraduate majors](#), [15 graduate programs](#), and 7 certificates relating to sustainability. Popular majors include: Sustainable Food &

Farming, Natural Resources Conservation, Sustainable Community Development (formerly Environmental Design), Environmental Science, Management (Concentration in Sustainable Business Practices), and Resource Economics (Major track, Environmental and Natural Resource Economics). Popular graduate programs include: Master of Science in Sustainability Science, Masters of Regional Planning (MRP), Masters of Landscape Architecture (MLA), Environmental Conservation (multiple programs), Graduate Certificate/Concentration in Wind Power Engineering, and Civil and Environmental Engineering

A hallmark to UMA's academic offerings is the MS Sustainability Science (MS3) Program. As one of the field's premiere master's programs, we offer the unique educational opportunity to pursue an advanced degree in sustainability that includes integrated systems-based approaches, cross-disciplinary foundations, and specialized expertise in one of four concentrations (Environmental Quality, Sustainable Food Systems and Agriculture, Water Sustainability, or Urban Sustainability). MS3 is entering its fifth year and has trained over 50 graduate students. It is a highly competitive program and this year only about 20% of applicants were accepted into the program. Beyond the educational training, MS3 is also providing an important service to the Commonwealth and the green workforce. Each year, MS3 students contribute nearly 4000 hours of service through internships to communities, non-profits, businesses, and research in New England and beyond. MS3 students are highly competitive in the market place and graduates go on to advise decision-makers, change business practices and industries, and shape green systems throughout the region.

Students participate in co-curricular activities that engage the campus and surrounding communities. UMA Eco Reps students can get credit for participating in and managing on campus initiative such as: the student bike share program, the Resident Hall sustainability education program, the Green Campus Cookout, and New2U, one of the region's largest campus reuse tag sales. UMA Sustainability Fellows are hired as interns to focus on: Community Development, Green Buildings, Green Games, Green Office Programs, Media & Marketing, Transportation, and Waste/Recycling.

Research:

The University of Massachusetts Amherst is one of the nation's top public research universities as measured by national and international rankings, academic citations, and research funding. UMA has over 200 faculty from 36 different departments engaged in sustainability research. UMA continues to be on the forefront of sustainability research and innovation. UMA is leading a \$7.5 million federal grant to address climate change with a consortium of seven other universities and UMA has been on the cutting edge of green technology for more than forty years with its Wind Energy Center.

10. Public Recognition of Efforts

- Princeton Review's Top 50 Green Colleges - 2015 & Green Honor Roll - 2014
- Rated STARS Gold University by the Association for the Advancement of Sustainability in Higher Education (AASHE) - 2015, 2014, & 2011



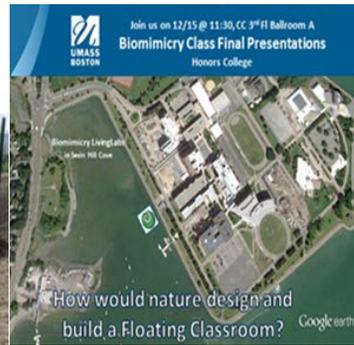
- Second Nature Climate Leadership Award -"Doctorate Granting Institution" category, 2014
- Sustainability Awards Gold Recipient from NACUFS for UMass Dining Services' procurement practices - 2014
- State Champion in Northeast Business Leaders for Energy Efficiency Recognition Program by Northeast Energy Efficiency Partnerships (NEEP) - 2014
- MassRecycle University Recycling Award - 2013
- U.S. Environmental Protection Agency (EPA) Food Recovery Challenge "Colleges and Universities" and "Innovation" Awards - 2013
- Winner of Gale Cengage Learning Financial Leadership Development Award for Libraries Sustainability Fund – 2013
- Winner of the White House Campus Champions of Change Challenge for UMass Amherst Permaculture Gardens - 2012



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Boston Campus



1. Clean Energy

UMass Boston completed its fourth greenhouse gas inventory as part of its ACUPCC reporting for 2014. The University of Massachusetts system's energy consultant, CES, is working with UMass Boston on the design of a new Energy Producing Facility being planned on the UMass Boston campus as well as exploring renewable energy options.

UMass Boston is working with 3 solar developers contracted at various off-site locations for 10 MW of virtual net metering credits (NMCs). The NMC contracts will represent a cost reduction of over \$500 Thousand/annum when they are fully operational. Upwards of 4 MW are expected to come online during FY15.

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. 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.

UMass Boston Wheatley solar PV installation was featured in the City of Boston's Greenovate site as part of Boston's Solar Map.

UMass Boston sustainability staff and faculty as well as CES attended the Green Ribbon Commission Clean Power Purchasing Network Conference held at Boston University April 2015.

About 25 members, including ACUPCC members from UMass Amherst, Boston, Lowell and Dartmouth and from upstate NY, CT, other MA area campuses etc. attended the "Ramping Up Renewables" workshop hosted by Second Nature in Boston to explore and provide expertise in PPAs and other renewable energy purchasing.

UMass Boston first Master Planning Sustainability Advisory Committee (MaPSAC) met in Nov 2014. MaPSAC's purpose is to "suggest best practices and facilitate implementation with regard to overall sustainability on campus, with a particular focus on achieving UMass Boston commitments under the American College and University Presidents' Climate Commitment (ACUPCC), the UMass Boston Climate Action Plan, and Massachusetts Executive Orders 484 and 515". MaPSAC is officially charged by School for the Environment Dean Robyn Hannigan with an initial focus is updating and revising the UMB Climate Action Plan by identifying specific actions needed to achieve its greenhouse gas reduction goals, along with cost estimates and timing requirements for

these actions. There are currently 13 members, co-chaired by a faculty member and A&F Campus Planning office representative.

The Center for Governance and Sustainability is working on sustainable energy solutions with a focus in the Horn of Africa. Collaborating with Addis Ababa University, the Center is a partner on a successful grant from USAID on Powering Agriculture: An Energy Grand Challenge for Development. The project will improve coffee production and quality by using innovative infrared technology.

2. Climate Protection

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.

Climate Resilience Center

UMass Boston, in collaboration with higher education institutions across the state and globe, serves as a partner with the City of Boston and the Commonwealth on assessing climate preparedness, developing and enabling adaptation plans for critical infrastructure, and supporting resilience of natural and human resources. This large effort encompasses all units on campus and engages students and faculty in applying their knowledge to address the most pressing challenges of our time. In collaboration with the Green Ribbon Commission, Massport, MassDOT, National Park Service, and other key government agencies and non-profits the UMass Boston Climate Resilience Center will not only inform planning for climate change for municipalities but will also work to ensure that the UMass campuses are leaders in innovation in climate adaptation through pilot projects and public-private partnerships.

Green Ribbon Commission Higher Ed Working Group

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, and now expanded to include Tufts University, Boston College, Emerson and the BAC) 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. The UMass Boston Urban Harbors Institute and the School for the Environment were formally introduced to the Green Ribbon Commission in Fall 2014 and collaborated with its Higher Ed Working Group for a leadership role in climate preparedness and resilience Initiatives in Boston and the with the State of Massachusetts.

In January 2015, speakers from the Urban Harbors Institute, and UMass Boston office of Campus Planning as well as Office of Emergency Preparedness participated in a Climate

Resilience Forum hosted by the Green Ribbon Commission along with speakers from Boston University, Harvard University and the Boston Architectural College.

Regional Mayor's Climate Preparedness Summit, Community Engagement Forums

In May 2015, UMass Boston campus hosted the Regional Mayor's Climate Preparedness Summit. Boston Mayor Martin Walsh was joined by more than a dozen Greater Boston mayors to formalize a commitment to climate preparedness and resilience. As reported in campus media, the summit was a first-of-its-kind convening on regional climate preparedness, establishing a mechanism for coordination of regional, cross-government action going forward. It was hosted by the City of Boston and the Metropolitan Area Planning Council's Metro Mayors Coalition. Jack Wiggin, director of UMass Boston's Urban Harbors Institute and the new master's program in urban planning and community development, said in his remarks that projections show if climate change effects are not mitigated, what is UMass Boston could be an island in 2100. The summit concluded with a dozen Greater Boston mayors signing the "Metro Boston Climate Preparedness Commitment," a regional agreement to establish a common policy framework throughout the Metro Boston area to prepare for climate change. The mayors pledged to work together to address critical regional infrastructure and systems and develop best practices. A Metro Boston Climate Preparedness Task Force will also be meeting every two months, coordinating regional, cross-government action to prepare for the effects of climate change such as rising sea levels, storm surges, and other weather events

UMass Boston faculty, students, and staff are heavily engaged in researching, preparing for, and battling climate change. In March 2015, the School for the Environment co-sponsored an event at the Climate Change Resiliency Forum at the State House. The College of Management is developing financial mechanisms to fund climate change adaptations, the Urban Harbors Institute is assisting communities to prepare harbor waterfront plans, and the Edward J. Collins, Jr. Center for Public Management is working with cities and towns on their climate change plans.

Sustainable Seafood Collaboratory

UMass Boston, in collaboration with sister campuses UMass Amherst and UMass Dartmouth, and our New England Aquarium established, with seed funding from the UMass President's Science and Technology Fund the "Sustainable Seafood Collaboratory". This collaborative research and educational effort will evaluate the impact of climate change on seafood resources and explore how seafood production through aquaculture and restoration of shellfish reefs can help protect our coasts and mitigate the impacts of climate change not only on our coastal marine resources but our human communities. The collaboratory serves as a critical partner to shell fishers and fin fishers as well through strategic partnerships for research and education in Wellfleet, Duxbury, and Gloucester.

Center for Sustainable Enterprise and Regional Competitiveness (SERC)

SERC organized several sustainability related events for students and local community which attracted a large number of students, alumni, faculty and local companies as highlighted in their newsletters in the Academic Section, for more details at www.umb.edu/serc. In the Fall 2015 semester Austin Blackmon, City of Boston Chief of Environment, Energy and Open Space (Oct. 22nd) is scheduled to speak to the College of Management students on climate adaptation and preparedness.

The Center for Governance and Sustainability

This Center undertakes rigorous research on climate change. Wondwossen Wondemagegnehu is working on a doctoral dissertation analyzing the operational mechanisms of science-policy interfaces for climate adaptation policy in Ethiopia. He received a prestigious 3-year research fellowship from the International Livestock Research Institute (awarded only to two recipients globally). The Global Leadership Dialogues published by the Center offer insights into the professional work and personal experience of notable leaders in the global governance field. The series features a thought-provoking interview with Christiana Figueres, the Executive Secretary of the UN Framework Convention on Climate Change. <http://environmental-governance.org/publications/global-leadership-dialogues/>

3. Green Building Design and Sustainable Building Operations

On April 1, 2015, state and university officials celebrated the Ribbon Cutting for the Integrated Sciences Complex (ISC), the first new academic building on the University of Massachusetts Boston campus in nearly 40 years and the first new facility in the University of Massachusetts Boston 25-year Master Plan. Designed by Boston-based architectural firm Goody-Clancy, the ISC provides 220,000 gross square feet of space featuring: research lab and support space for biology, chemistry, environmental sciences, physics, and psychology; undergraduate introductory biology teaching laboratories; an interdisciplinary undergraduate sandbox teaching lab; an infant cognition lab; two new research centers—the Center for Personalized Cancer Therapy and the Developmental Sciences Research Center; exhibition space; conference rooms; and food service and lounge space.

As the first building on campus to seeking a U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver certification the building encompasses a variety of sustainable features including 26% energy savings over baselines, high efficiency energy recovery program, solar hot water systems, water efficient landscaping and low flow fixtures, recycled content materials and a number of design innovations including energy recovery, transportation options, composting, green informational dashboard, state of the art indoor air quality, daylighting and cool roofs, certified wood and more.

The UMass Boston ISC was selected as host site for the Second Nature's ACUPCC Presidential Summit on Climate Leadership Green Campus Tour Oct 1, 2014. featured in the UMass Boston Campus Constructions newsletter : *ISC Extends Sustainability Commitment*

www.umb.edu/editor_uploads/images/news/BuildingConnectionsConstructionNewsletterSpring2015.pdf

The second campus green building seeking LEED Silver certification or higher is the General Academic Building No. 1, is well on its way to completion.

4. Sustainable Transportation

UMass Boston new Emergency Ride Home Program made its debut with UMass Human Resources in Fall of 2014, whereby as part of a program offered by Massrides, if an unexpected emergency arises participants can take a taxi, transit, rental car or get a ride from a co-worker in the event of an emergency, submit a reimbursement request afterwards, and can avail this up to 4 times a year.

UMass NuRide rideshare program and ZIPCAR cars-on demand programs are available on campus and increasingly used, while the free eco-friendly 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

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.

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.

5. Environmentally Preferable Purchasing

UMass Boston has a broad commitment to environmental preferable purchasing as highlighted in the other subsections of this report.

As part of its commitment to sustainable purchasing, and EO 515, the campus regularly purchases 30% or higher recycling content paper, recycled content desk recycling bins, eco-friendly food service products, eco-friendly interiors choices in its new construction, bookstore and food service offering, both Fair Trade and cruelty-free

personal products. The campus also has a green cleaning program in place and uses eco-friendly cleaners.

The UMB Campus Bookstore participated in the Better World Books Donation Program, where students are able to donate their textbooks that have a zero buyback value.

6. Sustainable Food Services

Campus Dining offers a variety of local, vegetarian, and international offerings. It also hosts Global Chef culinary events and campus users can even order a special Earth Day menu and works with local vendors and farms for baked goods, meats, cheeses and fruit.

UMB Dining services uses 100% Cage-Free shelled eggs and has made efforts to educate its leadership and team on local and sustainable seafood choices via educational workshops, such as Red Best Seafood.

UMass Boston's kitchens and dining service use biodegradable and compostable bags. The campus is a leader in its zero-waste dining program. They have purchased floor scrubbers that uses less water than traditional mopping Organics composting began at UMass Boston in the late 1990s and has grown to become a comprehensive zero-waste program over the years.

Organic and fair trade coffees are now widely available all over campus.

UMass Boston has a reusable cup discount program at all dining cafes on campus.

UMass Boston also hosts Campus Kitchens, which participates in food recycling, hunger relief, and nutritional information programs. Recently, there has been an expansion of Campus Kitchens space allocation to allow for greater capacity and more meals served.

Student government at UMass Boston passed a resolution in February 2012 to limit the use of disposable bottles. Since 2012, hydration stations on campus have saved more than 400,000 bottles from reaching the landfill.

UMass Boston's Fall Farmers Market will be returning in partnership with its Dining Services in September 2015 and Marshall's Farm, Gloucester, Massachusetts

7. Sustainable Water Systems/Landscaping

The HarborWalk Project

A newly constructed section of the HarborWalk, between the JFK Library and Museum and Harbor Point Apartments, was opened to the public. A formal dedication of the new section is scheduled for September 2015. The 800-foot stretch of shoreline on the north side of the UMass Boston campus features a paved walkway, benches, lighting, gathering

spaces, bike racks and an area to display artwork. Signs with historical narratives will be installed later this summer. The construction project, which began last summer, placed 3,200 tons (6.4 million pounds) of stone along the shoreline to stabilize it, before adding the walkway and other amenities. A significant amount of granite blocks unearthed from the Big Dig was donated by the Massachusetts Department of Transportation.

- Areas along the section of the HarborWalk have been seeded with grass and native plants. The public is asked to refrain from using these areas until the vegetation has taken root.
- All trees and bushes are drought resistant and will not need to be watered after initial planting.
- About half of the grass being planted in the hilly area (closer to the DCR and lot D side) is meadow grass seeds. This area will not need to be mown, except once a year. Meadow is also a feature at the ISC.
- The rest of the grass near the site furniture (benches and scored concrete areas) is grass that needs to be mown regularly, but does not require watering.
- The newly installed rip rap will significantly improve resiliency of the shoreline during storm events.

The UCRR Project

On a larger scale, the university is engaged in the Utility Corridor and Roadway Relocation (UCRR) project. The UCRR is a key transformative project under way in the university's 25-Year Master Plan. The UMass Building Authority has hired BVH Integrated Services Inc. to design the utility corridor. In order to create a reliable and redundant utility loop, the project includes an underground utility corridor, rerouted campus roads, and a multitude of site and landscape improvements including a new roadway and pedestrian system, improve overall traffic circulation and pedestrian connections and a storm water management plan.

The UCRR project incorporates many sustainable features including:

- Over three miles of bicycle lanes along the new roadways of the Harbor walk
- Over 100 bicycle racks across campus.
- Support the infrastructure of new buildings such as the Integrated Sciences Complex (ISC) and General Academic Building (GAB1) which are seeking LEED Silver certification.
- Extensive tree plantings.
- Create a campus-wide storm water management system with planted bio-retention areas to reduce runoff and pollution into Boston Harbor

8. Waste Reduction and Recycling

As a commuter campus, UMass Boston has one the earliest leading zero-waste cafeterias offering compostable foodware since 2004, composting more than 200,000 lbs. of food prep and post-consumer food, greenhouse 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 700,000 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 have saved more than 400,000 bottles/year 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 cafe venues on campus, encouraging re-use and reduce the use of disposables.

The UMB sustainability office along with the School for the Environment and College of Management helped collaborate on a NOAA-SFE Grant for marine plastic debris pollution reduction.

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.

9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc.)

UMass Boston has many outstanding faculty and programs in 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. Additionally, departments include GIS, Clean Energy, Green Chemistry, Sustainable Management, Center for Sustainable Enterprise and Regional Competitiveness (SERC), Urban Harbors Institute, Biology, Living Labs and Biomimicry, Environmental Economics, Coastal, Harbors and Oceans, Center for Governance and Sustainability - offer a wide variety of degrees, immersions, outreach and expertise in sustainability and environmental academic programming. It is estimated that at least 25% percent of students at UMass Boston have taken a sustainability-related course, some of which are highlighted below

Center for Sustainable Enterprise and Regional Competitiveness (SERC)

SERC promotes engagement by students in sustainability research as part of its mission. A notable achievement last year was the presentation of student-led research at several conferences. Clean Energy and Sustainability Certificate (CES) alum Mark Gallo '17 and his faculty advisor Prof. Vesela Veleva presented Mark's independent study research on tidal energy at the National Council for Science and Environment annual conference in Washington D.C. in January 2015.

Original student research on advancing UMass Boston campus sustainability (part of course work in MGT481 Introduction to Environmental Management and Clean Energy) was presented at the 5th Sustainable Communities/4th Sustainable Campuses Conference in Devens, MA, on April 16, 2015. Several of their PhD students are engaged in sustainability-related research.

Chris Whynacht won an award for Best Student Paper from the Administrative Sciences Association of Canada, International Business division, and he presented the paper at the ASAC June conference. The paper is titled The Ecological Embeddedness of Global Production Networks. Tom Bejarano, another PhD student, is presenting his work on the development of clean tech clusters, with his supervisor Stephan Manning, at several summer conferences, including the Academy of Management, the Academy of International Business, and EURAM.

As part of SERC mission to advance collaboration with industry, it launched the SERC - company named Fellowship in Clean Energy and Sustainability in summer 2014. Last year's Fellow, Sandeep Gummadi, Master's Student in Finance at CM, successfully completed the research on "Developing a process of End of Life Management of Biotech R&D Equipment" which will be presented at the upcoming Global Cleaner Production and Sustainable Consumption Conference in Barcelona, Spain, November 1-4, 2015.

SERC publishes a newsletter that highlights its many achievements.

Spring 2015 and Fall 2014 newsletters:

- https://www.umb.edu/editor_uploads/images/college_management/SERC_newsletter_Spring_2015-May.pdf?cachebuster:36
- [newsletterhttp://cdn.umb.edu/images/college_management/SERC_newsletter_Fall_2014-FINAL_12-15-2014.pdf](http://cdn.umb.edu/images/college_management/SERC_newsletter_Fall_2014-FINAL_12-15-2014.pdf)

Honors College Sustainability Courses

Fall 2014

- **Biomimicry** – a course that studies nature’s best ideas and then imitates these designs and processes to solve human problems. Students designed a floating classroom using sustainability principles they learned by studying the ecosystem in Savin Hill Cove next to UMass Boston. Some notable quotations from students about the project and the poster that a student designed for the final class presentations.

“This project is certainly a foundation in which multiple disciplines can take part. Though the amount of research and conceptual analysis was, at times, overwhelming; I know that this project was pioneering and will be the at the forefront of new and innovative technological research and applications at UMB. To be one of the pillars for a potential new biomimicry and biotech research is humbling.”

“Creating a floating classroom means providing the possibility of a greener, more educated future; UMB students will have the incredible opportunity for hands on experience, truly setting UMass Boston from the rest.”

“This class is a revolution in the way we shape our education, and learn about our relation with the nature. Nature is not about going camping, its about bringing the camping home.”

“This class project and process meant caring for something besides myself, how can you love yourself without the rest of the planet and people; and vice versa”

- **Understanding the Environment: Measuring, Analyzing, and Gaining Deep Insights**

Students learned how to conduct quantitative analysis through the examination of measurements that scientists use to interpret fluctuations in the environment. In the process, they studied such environmental topics as climate change, water resource management, energy consumption, waste and pollution.

- **Sustainability: Is it Still Possible**

A junior-level course in which students were asked to research and explore the following issues—the critical conditions of declining water supply, global warming, and diminishing energy resources. Students focused on human, social, and economic systems as they conducted their research. They were also required to explore some

aspect of sustainability on the UMass Boston campus, report on its status, and suggest possible actions that could be taken.

Spring 2015

- **Investigating Environmental Changes over a Variety of Scales: Geospatial Analysis and the Modeling of the Environment**

This course focuses on global environmental change and the impact of human activity spatially across the Earth's ecosystems. Students learn how geospatial data (both field data and remotely-sensed data across large spatial areas) are being used to monitor and model current changes and predict change under future environmental scenarios. They discuss changes to the atmosphere, land, oceans, and the cryosphere (the frozen and snow-covered ecosystems).

Center for Governance and Sustainability

In 2014, the center launched a groundbreaking research project assessing the implementation of global environmental conventions. The initiative evaluates the implementation of 10 global environmental conventions and compares performance across countries and across conventions. It will produce an Environmental Conventions Index.

Professor Maria Ivanova, co-director of the Center for Governance and Sustainability, has engaged in high-level sustainability discussions at the United Nations. At the invitation of the President of the UN Economic and Social Council, she presented at the High-Level Political Forum on Sustainable Development. A member of the UN Secretary-General's Scientific Advisory Board (one of 26 scholars worldwide), she has created many opportunities for students to participate in UN-related research projects and discussions with policymakers.

In collaboration with the Horn of Africa Regional Environment Centre and Network (HoA-REC&N) at Addis Ababa University, the Center was among the winning teams in the Global Resilience Partnership Challenge current students are engaged in research through. This competitive grant is a multi-phase design challenge administered by the Rockefeller Foundation, USAID, and the Swedish International Development Agency (SIDA). The team's project, "Integrated Landscape Management for Resilience in the Horn of Africa," will study the root causes and build capacity in communities to address a wide set of inherently connected challenges in the field of land, water, energy and biodiversity.

A research team from the UMass Boston Center for Governance and Sustainability traveled to Bern, Switzerland twice in 2014 to present its research on environmental conventions at the Swiss Federal Office for the Environment. The Environmental Conventions Initiative is supported by the Swiss government.

Student Clubs And Activities

UMass Boston's offers a number sustainability internships with the sustainability office, College of Managements SERC program, professional Greek organizations such a Sigma Gamma Epsilon, on campus environmental groups including Net Impact, Fair Trade Club as well as Food harvesting and food waste reduction organizations like Campus Kitchens, MASSPIRG, and individual student efforts and academic "for-credit" internships as well as Earth Weeks 2015.

The mission of **Net Impact** is to inspire, educate, and equip individuals to use the power of business to create a more socially and environmentally sustainable world.

To fulfill this mission, Net Impact will remain committed to providing its members with an array of opportunities that will 1) empower undergraduate students to use their skills to positively impact their surroundings, 2) help them put their beliefs into action through sustainability efforts, and 3) enlarge their professional network with other like-minded individuals who have demonstrated their commitment to corporate social responsibility.

Net Impact in particular held an event where they hosted organic farm products and gave out information on locally sourced organic and sustainable farming methods. They also participated in the 2015 UMass Boston Earth Weeks fest with a UMass Boston Food Fest celebrated food, music and success of sustainable food at UMass Boston and its surrounding communities.

The **UMass Boston Fair Trade Club** provides information about the fair trade movement and products. They hold events where students can sample fair trade foods and become a more educated consumer.

UMass Boston Society for Women Engineers with support of IEEE, Institute of Electrical and Electronics Engineers hosted a electric bike workshop. The workshop was set up with two main goals in mind, (1) to show students how to take an idea and make a project proposal all the way to a finish product; and (2) to show student how easy it is to take an idea (wanting a motor bike) and keeping it green with simple adaptations of current technologies. Ilan Levin, M.S. from Tufts, currently working as an engineer for BBN, ran the electric bike workshop. Students learnt the process starting with preliminary research and choosing an appropriate budget through testing down to enjoying the final product. After the lecture and technical discussions, everyone got a chance to ride the bike and get excited about creating new things, they even had the campus public safety staff give it a spin.

4th Annual Green Careers Forum

The Office of Career Services and Internships partnered with the Center for Sustainable Enterprise and Regional Competitiveness to present the 4th annual Green Careers Forum, on April 15, 2015 as part of Earth Weeks 2015. This annual event is designed to expose students to potential green careers, allow them to learn about industry trends to help them

better prepare to meet the demands of a clean energy economy. The 2015 Green Careers Forum hosted Alicia Barton, Chief Executive Officer of the MA Clean Energy Center as Keynote Speaker.

Travel Abroad Service Learning Projects: Office Of Student Leadership

Beacon Voyages for Service (BVS) is a program within the Office of Student Leadership and Community Engagement that coordinates Alternative Break programs. These trips give students the opportunity to take part in service trips all over the country and the world to volunteer alongside local organizations.

The trips that took place last year that focused on sustainability were:

Renewable Energy – New York, New York : Students volunteered with GRID Alternatives which is a nonprofit organization that brings the benefits of solar technology to communities that would not otherwise have access, providing needed savings for families, preparing workers for jobs in the fast-growing solar industry, and helping clean our environment.

Farming and Sustainability – Las Marias, Puerto Rico: Students volunteered with Plenitud, an educational farm and learning center that focuses on the research, demonstration and dissemination of sustainable practices for today's rural and urban environment. They offer programs of permaculture practices such as agro-forestry, rain water harvesting, urban food production, animal husbandry, food processing and food security.

Women Empowerment – Xela, Guatemala: Students had the opportunity to help empower women and their families who live in poverty by volunteering on projects that range from construction of ventilation systems, building stoves in women's homes and leading/participating in workshops that will enable women in situations of vulnerability to start their own entrepreneurial initiatives.

OTHER ENGAGEMENTS:

UMass A&F departments and faculty participated in Green Labs Symposium, Renewable Energy and Green Power Purchasing Conferences, presented at Climate Preparedness seminars, Earth Day 2015, Green Careers forum 2015, provided input in the 2015 City of Boston Climate Action Plan, Go Boston 2030 transportation Envisioning Lab and similar sustainability fora.

COMMUNITY HAZARDOUS WASTE DROP-OFF: CITY OF BOSTON RECYCLING

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

10. Public Recognition of Efforts

- **2015 PRINCETON GREEN COLLEGES RATING**

UMass Boston was chosen by Princeton Review as one of the 353 most environmentally responsible colleges in the U.S. and Canada, according to The Princeton Review in 2015. UMass Boston was also recognized by Princeton Review in 2014, 2013, 2012, 2011 and 2010 as one of the country's leading green campuses.

- **2015 ECO-AWARD BY MASSDOT**

UMass Boston was awarded for Leadership in the Excellence in Commuter Options (ECO) Leadership Award in 2015 by the Massachusetts Department of Transportation. It also earned this recognition from 2014, 2013, 2012 and 2011.

- **HOST: ISC TOUR ACUPCC 2014 PRESIDENTIAL SUMMIT ON CLIMATE LEADERSHIP**

The UMass Boston Integrated Sciences complex (ISC) was selected as host site for the Second Nature's ACUPCC Presidential Summit on Climate Leadership Green Campus Tour Oct 1, 2014. This was organized over several months with the UMass President's office, UMass Boston Chancellor's office, A&F, Campus Services, Sustainability office, Procurement, Campus Center, Master Planning, Construction Communication, EHS, Marine Operations, Food Services, Bookstore, the Urban Harbors Institute and faculty from School for the Environment, Biology, Economics and more. A group of 25 high level ACUPCC participants from all over the country including Michigan, Arizona and Pennsylvania toured the ISC seeking LEED Silver certification after a talk from the architect from Goody Clancy. The group also toured the Campus Center which opened in 2004 and was featured in the NESEA Green Buildings Tour. The tour concluded with a marine environmental speaker showcase highlighting the campus' engagement around Boston Harbor and showcasing the campus engagement in the field of climate resilience. UMass Boston provided transportation from the conference to the campus and refreshments to the guests. The campus leadership welcomed the guests and integrated operational staff and faculty members into the tour to discuss their research and/or related campus sustainability projects.

- **Morrissey Boulevard** was chosen as a finalist in the 2015 Living with Water competition: <http://www.archdaily.com/768685/bsa-announces-boston-living-with-water-winners>. A number of UMass Boston staff and faculty and students also

submitted entries for this visionary competition held to support Boston's Climate Action Plan and mitigation ideas.

- **UMass Boston student Nicole Hamilton**, undergraduate student and former Net Impact president (she graduated in December 2014) won an award for best paper for her honors thesis in the field of sustainability. The paper, "The Upside and Downside Risk of Corporate Social Responsibility," won Best Paper Award for the sixth volume of the UBER Journal.
- **UMass Boston student Chris Whynacht, a first year PhD student, College of Management**, won an award from the Organizations and Natural Environment division for Best Student Paper from the Administrative Sciences Association of Canada (ASAC), International Business division, and he presented the paper at the ASAC June conference.
- **Professor Maria Ivanova (first from left in pic below) co-director of the Center for Governance and Sustainability** was selected as one of 32 inaugural Andrew Carnegie Fellows, with a project titled "United Nations at a crossroads: collection of conventions or mechanism for planetary stewardship." The New York Times, Washington Post, and Chronicle of Higher Education ran full-page ads about the cohort of fellows.



- **College of Management Professors and co-directors of SERC Drs. David Levy and Vesela Veleva** have been invited to serve on the Scientific Committee of the 2016 SCORAI Conference (Sustainable Consumption Research and Action Initiative) which will be held in Orono, Maine in June 2016.
- **Professor Anamarija Frankic**, Director Green Harbors Project Green Boston Harbor Project, Center for Governance and Sustainability was elected on the AASHE (Association for the Advancement of Sustainability in Higher Education) Advisory Council through Dec 2016.



Dartmouth Campus



The Dartmouth campus focuses our efforts into four areas of sustainability: Academics, research, operations and student engagement. As leaders within our community we are aware that we need to both prepare the next generation of decision makers with the tools on how to make our society more sustainable, and we also need to insure that we are operating our campus in a way that models that for them.

1. Clean Energy

The campus completed the first two phases of steam line replacements, which is going to help reduce the volume of steam needed to heat and cool the campus as well as conserve water as all of the condensate can be returned to circulate through the system again. Both the East Residence Halls and the DION / Science and Engineering building supply and return lines were replaced. We experienced several challenges with getting our co-generation plant working consistently, which finally happened in the latter part of the year. We are just now getting an idea of how much this will affect both our budget and GHG emissions, though the initial numbers look favorable.

The wind turbine was operational for some of the year and has produced 5 million megawatt hours of electricity to date, which is no small amount. DCAM has officially taken ownership of the unit and changed the service company to reflect the increased need for service for this particular model. It currently needs to have several seals replaced and is likely to be back online in October.

The 269 kW solar photo-voltaic arrays on campus continue to operate well. We have had not appreciable down time with them, even with this winter's increased snow amount.

We have also started conversations with a solar developer to consider building solar carports over our parking lots in a land-lease arrangement, while purchasing some of our power from them. This would allow us to support additional green power going into the grid without surpassing the net-metering caps currently in place in our grid area.

The University has contracted at TWO off-site locations for 8.4 MW of virtual net metering credits (NMCs). The NMC contracts will represent a cost reduction of over \$450 Thousand on our FY 15 Energy Budget. During FY 14, an electrical energy cost reduction of \$143,000 was realized to the FY 14 Energy Budget with the NMC contracts. All projects are expected to be live for the entirety of FY15.

2. Climate Protection

The Dartmouth campus has close to 400 acres held in forest, wetlands and open space. We have intentionally left this space for these purposes and concentrated our building into a 300-acre footprint. Doing so allows us to be surrounded by a natural buffer that filters noise, air and water from both coming out as well as coming into the campus.

3. Green Building Design and Sustainable Building Operations

Two of the new building projects which are on the drawing boards (SMAST II and iSEB) are aggressively looking at sustainable features. Both design teams are working in

partnership with DCAM to improve the initial building envelopes and operating systems to reduce as much as possible the operating costs of these facilities and their GHG's. While DCAM has not committed to a "Zero Net Energy" standard, they have come quite a way in their building standards to be either high performance or zero net energy ready.

The Dartmouth campus has also been purchasing green cleaning products that are used by our custodial team for more than 5 years. These were initially used in our housing operations, then later adopted by our academic team as well. Members of our Facilities and Purchasing teams are working with the Procurement Council to share these lessons throughout the entire system and bid out the necessary supplies as a system wide contract.

4. Sustainable Transportation

The Dartmouth campus has expanded it's use of shuttle vans to assist in moving students, faculty and staff around campus and into the local community. This has included adding daily bus service this year to Boston and weekend access to New York City.

We have also added bike racks at every entrance to campus buildings as well as racks to hold longboards at 4 strategic locations in our academic core of campus. We have seen an increase in the use of bikes on campus as a result of the additional racks and look forward to a similar participation rate for the longboards as well.

The campus also has a ZIP car program that has expanded from two cars on campus to now three due to an increase in demand. The typical membership fee is waived for all members of campus that leaves users with only the cost of usage, which is one benefit that is driving us demand and usage.

5. Environmentally Preferable Purchasing

The Dartmouth campus has spearheaded the purchasing of green cleaning products on campus and is sharing that through the Procurement Council with the other campuses in the system. We did the same with our printing services contract (currently held by Xerox) to bring multi-function devices throughout the system as significant discounts. We will be conducting a second round of analysis and consolidation and improvement of services in the near future as well.

Our improvement of purchasing greater quantities of recycled content paper has had some success. The new chief IT officer agreed to have all of our computer labs purchase 30% recycled paper. The Office Campus Sustainability and Residential Initiatives will be working to create a campus-wide policy that will help to require offices to purchase paper that is at minimum 30% recycled, if not 100% recycled. There are also tree free papers available that are made from either sugar cane stalks or wheat stalks as well. While the price points for those products are a little higher at this point, with usage reductions (required duplexing & other reduction strategies) offices may not even see a difference in their costs.

6. Sustainable Food Services

The relationship that the Dartmouth campus has with Chartwells is one that was based in sustainability and continues throughout their contract here. They have continued their commitment to diverting pre-production food waste to a local chicken farmer. They also participate in the “Project Clean Plate” program to measure food waste so that students can change their behaviors and take less food. This is also supported through the lack of trays in our main dining hall as well.

They have continued to purchase products both sustainably and locally, including coffee from a local, organic coffee roaster, bagels from a local bagel shop, produce from other specialty products from a local food supply company as well as locally sourced seafood.

7. Sustainable Water Systems

The steam line replacement project has allowed the Dartmouth campus to avoid dumping the entire amount of condensate water from one building. This has resulted in a large quantity of water being re-circulated within the system rather than requiring being replaced.

We have also been designing landscape features for the three new building projects on campus with native, water resilient plants. This should eliminate the necessity for irrigation systems entirely, thus saving on both the up front and operational costs in these areas.

8. Waste Reduction and Recycling

The Dartmouth campus held steady with our recycling numbers this year showing only a drop of 2.5 tons in our overall tonnage. However, we estimate that we diverted approximately 21 tons of garbage from our recycling stream as this year we were sorting all of our single stream material on campus. While this registered a slightly lower overall weight of recycling, it improved the quality of the recyclable materials that we sent to our haulers. Our overall weight went from 148.11 tons in FY’14 to 145.53 tons in FY’18. Had we not sorted them on campus, that number would likely have been 166.53 tons (actual recycling tonnage with diverted waste still in it), which would have represented a 12.4% increase in the recycling rate.

The campus is switching to a new garbage / recycling hauling contract for FY’16. This took the better part of two years of research to do in combination with several departments on campus and the help of an outside consultant. The results at minimum are that we will be saving approximately 50% of our previous costs on this service while still providing garbage, recycling and food waste removal from campus.

9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc)

The Dartmouth campus continues to offer a minor in Sustainability, and a Masters in Public Policy or Business with a concentration in Sustainability. We have been working

to propose a BA program in Environmental Science and Sustainability that will be working it's way through the approval process this year.

10. Public Recognition of Efforts –

The Dartmouth campus was recognized in two ways this past year. First, we received a Leading By Example award for Higher Education through the Massachusetts Department of Energy. Second, we were recognized for the 4th year in a row by the Princeton Review's list of 322 Green Schools.

The Dartmouth campus also received three grants this year. The first was through the Southeast Regional Planning and Economic Development District for \$10,000 to purchase and install 90 additional bike racks across campus. The second was through the Keep America Beautiful Foundation for \$10,000 to get 90 additional recycling bins for the Claire T. Carney Library. The last was a Creative Economy Grant through the UMass President's office for \$35,000 to support permaculture education in our community.



Lowell Campus



The University of Massachusetts Lowell (UMass Lowell) is a school that has been transformed. Along with our robust offerings of high-quality academic programs, creation of state-of-the-art facilities and strong partnerships, UMass Lowell has made a conscious decision to accelerate its commitment to sustainability and environmental stewardship. This path to acceleration, initiated with the University's 2011 Climate Action Plan (CAP), was built on a strong foundation of greenhouse gas emissions reductions already present on campus and supported by senior officials from a cross section of the campus.

As part of our growing reputation for excellence and commitment to continuous improvement, UMass Lowell took its vision for sustainability further through the creation of the UMass Lowell Office of Sustainability in January, 2015. The creation of the Office of Sustainability dovetails with the current UMass Lowell 2020 Strategic Plan in which sustainability has been incorporated as a strategic priority. The first major initiative undertaken by the Office of Sustainability was UMass Lowell's first submittal under the AASHE Sustainability Tracking, Assessment & Rating System (STARS) which resulted in UMass Lowell being recognized as a STARS Silver Institution based on our reported accomplishments in campus sustainability.

UMass Lowell is proud of the progress we have made toward sustainability and environmental stewardship on our campus and we are looking forward to continually advancing our efforts. Our commitment to sustainability serves as a means to attract the best talent and engage the entire campus community to help our students become leaders in a changing world.

1. Clean Energy

The University has contracted at five off-site locations for 15.9 MW of virtual net metering credits (NMCs). The NMC contracts will represent a cost avoidance of over \$1.15 Million on our FY 15 Energy Budget. During FY 14, an electrical energy cost reduction of \$132,000 was realized to the FY 14 Energy Budget with the NMC contracts. The First Wind solar installations all on-line as of June, 2015.

As part of our South Campus Exterior Lighting Project to improve exterior lighting, safety, security and energy efficiency, the University has added a SolarOne renewable solar-powered bus stop enclosure with LED lighting, motion detection, and storage battery that operates 24 hours a day every day.

Our four Owner-operated and serviced solar arrays located on the roofs of Costello, Bourgeois, Leitch and Duggan are rated at 250 kW DC and during FY 14 generated 227,159 kWh and reduced electrical costs by \$26,850 and sale of 153 Solar Renewable Energy Certificates (SRECs) generated revenue of \$38,719 (average price of \$253/SREC). This reduced solar generated energy was in part due to the harsh winter but primarily due to the renovation of Bourgeois and Leitch Halls that rendered both systems inoperative for 6 months during the 1-year total construction period.

The Accelerated Energy Program (AEP) is planning to build a Canopy Solar generating facility on the roof deck of the South Garage with the following statistics:

- a. Area used will be half the roof deck or approximately 16,900 SF of deck surface. It will actually cover (like a car port roof) the cars parked on this half of the roof.
- b. We will seek a grant from DOER for \$100,000.
- c. Estimated utility rebate amount is approximately \$259,000.
- d. Cost to implement after rebates and grants is estimated at \$1,150,000.
- e. SREC sales revenue at \$280/SREC is estimated at \$60,000. The array will generate 200 kW DC or up to 230,000 kWh/annually. At \$0.123/kWh this will reduce cost of electricity by \$26,500 annually.
- f. Simple Payback with energy reduction and SREC revenue included is approximately 13 years.

Clean energy research continues to grow at UMass Lowell. Research centers such as the Center for Sustainable Energy, the Center for Electric Car and Energy Conversion, and WindSTAR are to the forefront in clean energy. UMass Lowell delivers world-class research that focuses on real world solutions that are environmentally and economically sustainable.

2. Climate Protection

In addition to the clean energy accomplishments outlined above, UMass Lowell has long recognized the importance of climate protection. The University's Climate Action Plan (CAP) and its associated CAP Steering Committee, is guided by senior leadership from across campus including subcommittees for Administration and Finance; Energy Project Identification and Conservation; Sustainability; Academic; Residential Life; Transportation and Public Relations.

Each subcommittee goal is to develop and initiate action plans to further the University's goal of climate neutrality. The CAP Steering Committee and its subcommittees are one of the cornerstones for climate protection at UMass Lowell. From FY11, when the CAP was developed, to FY14 campus building area has grown by 6.5%; and campus FTE student enrolment has grown by 10.1%. Even with this growth, UMass Lowell's GHG emissions have been reduced by almost 2%. In addition, recently completed energy projects have reduced GHG by 3,700 MTCDe/year. Working through the state's Accelerated Energy Program (AEP), 106 energy conservation measures are in the process of being designed and implemented which will further reduce GHG emissions by an estimated 5,000 MTCDe/year.

UMass Lowell takes an extremely proactive approach to climate protection through its academic programs. UMass Lowell's Climate Change Initiative brings faculty, students, and communities together to address climate change. The Initiative draws its members from all six Colleges and Schools of UMass Lowell and from departments and disciplines as diverse as environmental science, public health, engineering, education, management, sociology, art, and others. The goal of the Climate Change Initiative is to address climate change through education, research, and developing solutions to transition to a more sustainable and resilient society.

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.

The Residential Life, Sustainability and Transportation Subcommittee's each foster programs that engage our students as well as local, regional and statewide partners for educational, outreach and awareness programs in relation to climate protection year round.

3. Green Building Design and Sustainable Building Operations

Energy Efficiency Increases

Since FY 11 UMass Lowell has seen its Energy Use Index or EUI (Kbtu/SF) drop 14.5 % and since FY 04, EUI has dropped 34.9 %. Also UMass Lowell has seen its EUI drop in 10 of the last 11 Years.

Green Building Design- LEED

In compliance with Executive Order 484, all State agency projects over 20,000 SF shall adhere to the "Massachusetts LEED Plus" standard for projects designed for public entity.

For projects smaller than 20,000 square feet, all executive agencies shall design and construct new buildings and major renovation projects to meet at least one of the following:

- a. Adhere to the "Massachusetts LEED Plus" standard described above
- b. This criteria evolved into LEED Silver for new and renovated buildings greater than 20,000 SF and Mass LEED Plus for construction projects less than 20,000 SF.

New Buildings

The University has a list of ongoing newly constructed buildings all of which meet the above criteria: Emerging Technologies and Innovations Center (ETIC) was certified LEED Gold. The Health and Social Sciences Building (HSSB), University Suites, and University Crossing are complete but have not yet been certified. McGauvran Hall is under construction and is due to be occupied in early 2016 while the Pulichino-Tong Business Center is undergoing site preparation and is due to be occupied in 2017.

Major Renovation Projects

Leitch and Bourgeois Residence Halls- by the beginning of the Fall of 2015, both had major renovations to the building automation systems, space heating, outside air ventilation, domestic hot water and electrical and lighting systems incorporating building and energy code updates.

Perry Hall is in the beginning of the design process and will include many new energy efficient hoods with heat recovery.

North Campus Infrastructure Renewal Program which adds more greenspace to the campus and updates the mechanical systems for several buildings in the North Campus Quad will be designed with many Mass LEED Plus updates. This project is scheduled for completion in the Fall 2017.

Internal Energy Projects

Many internally funded lighting efficiency projects have occurred on campus including:

- Exterior LED upgrades: Costello building sidewall and overhangs; South Campus building roof, wall packs, parking lot, street and post lights; Tsongas Arena grounds; North Campus wall packs and walkways and East Garage Parking Area lighting.
- Interior LED Lighting: Olsen First Floor; Ball 210; Cumnock and Olney Auditoriums; ICC Interior LED Lighting; Olsen Restroom all floors; Fox stairwells; CRC Weight room; Durgin Mechanical Room and Restrooms-Floors 2-4; O'Leary 222; Mechanical Rooms and Ball 210.
- Lighting Controls were added to North Campus Field lighting; and Southwick Occupancy Sensors.
- Steam, piping and Steam Plant projects included: Steam Insulation Jackets for North Campus Steam Plant; Vault and piping upgrades for both North and South Plants; EPA Maximum Available Control Technology permitting; NCSP Study and Upgrade Flash Tank and Piping.
- Phase 4 and 5 of Steam Trap Maintenance program was completed and these projects repaired or replaced all traps on campus.
- HVAC Efficiency Upgrade Projects are in process for Weed HVAC; ETIC Lab and Clean Room- all floors; ICC HVAC Units for Floors 1 and 2.

Accelerated Energy Program (AEP)

The AEP will reduce energy by more than 20% of the annual energy usage of the buildings in the project scope. It is calculated to reduce annual campus utilities usage by 6 Million kWh; 500,000 therms and 2.5 Million gallons of water. The program includes the modernization and energy efficiency upgrade of Olney Laboratory fume hood systems; renewal of the South Campus Steam Plant; replacement of Boilers, AHUs; and Tsongas Arena LED Lighting Upgrade; Mechanical System Controls; Low flow plumbing fixtures; showers; and interior and exterior Lighting System upgrades. The program will install or upgrade BAS, energy recovery, plumbing, electrical and perform

fuel switches. Renewable technologies programs include: Solar thermal heating at ICC; and Parking Canopy Solar PV at South Campus Garage. It will reduce Deferred Maintenance by about \$10M. In addition, the AEP will reduce GHG by approx. 5,000 Metric Tons of CO₂ equivalent.

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 (most recently updated in June 2015). It is also standard practice for UMass Lowell projects to reuse and/or recycle used furniture whenever possible.

Green Housekeeping Policy

UMass Lowell has a Green Housekeeping Policy. The intent of the policy is to "Reduce exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particle contaminants, which adversely impact air quality, health, building finishes, building systems, and the environment.

Also, it is to reduce the environmental impacts of cleaning products, disposable janitorial paper products and trash bags. The use of sustainable cleaning systems and cleaning products is a requirement under this policy. UMass Lowell also includes the use of sustainable cleaning products in its bid packages for outsourced cleaning contracts.

Utility Incentive Account

The Administration and Finance and Energy Subcommittees created a Parent Energy Project account that will be funded by third party incentive programs. The University was approved for \$1.6 Million in incentive funds by National Grid; a balance of over \$1.27 Million is currently in the account and \$261,000 has been used to finance new energy projects. 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.

4. Sustainable Transportation

The campus has instituted a number of major changes that have brought notable improvements in relation to sustainable transportation. UMass Lowell's efficient and flexible shuttle bus system, the River Hawk Roadster, continues to grow. The system provides an average of 8,000 unlinked passenger trips per day. Coordination efforts with the Lowell Regional Transit Authority (LRTA) are ongoing with the desired goal of bringing more coordination between both systems resulting in greater efficiencies and more sustainable transportation choice for the campus.

Transportation Demand Management continues to play a vital role in helping students and employees commute to and between university campuses in ways which are environmentally friendly, healthy, and economical through providing ongoing programs, services, events, and education about walking, bicycling, carpooling, and public transit.

UMass Lowell received a Pinnacle Award from MassDOT's 'Eco Awards' Program in 2015 for Excellence in Commuter Options. Notable highlights from 2015:

- The University added four EV charging stations to campus this year, including one publicly accessible station at University Crossing that has been heavily utilized to date. In addition, UMass Lowell staff have access to a zero emission electric vehicle for official use.
- Carsharing, through Zipcar, continues to grow at UMass Lowell. This year, an additional four cars were added to campus, doubling the fleet. All of the Zipcars at UMass Lowell are at a minimum EPA Smart-Way Certified Vehicles.
- Expansion of the Freewheelers Bike Share Program included new locations on campus, automation of the system, and the addition of ten additional bikes for week-long rentals. UMass Lowell was named a spotlight winner for commuter excellence for its bike program at MassDOT's 2015 Eco Awards
- UMass Lowell's Bike Advisory Committee was established this year and received honorable mention as a Bike Friendly University from the League of American Bicyclists.
- UMass Lowell offers its employees the option to 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.

5. Environmentally Preferable Purchasing

As a University UMass Lowell has continued to be an ongoing effort and demonstrated a dedication to sustainable purchasing throughout FY 2015 some highlights include:

- We are continuously increasing purchases of paper with recycled, post-consumer content. This year our purchases of recycled paper have increased by 26% based on dollars spent.
- If new furniture was purchased for one of the many new construction and major renovation projects, FSC Certification was required.

We have also laid the framework to further integrate environmentally preferable purchasing into our institutional business model in FY 2016.

6. Sustainable Food Services

UMass Lowell works closely with its dining partners to develop and implement sustainable solutions for the dietary needs of an expanding campus population. University Dining Services sources food from many local farmers, growers and distributors with a revolving list of suppliers throughout the year depending on seasonality and availability. The following areas have seen major improvements over the last year:

- University Dining partners with the campus to recycle from all dining locations across campus. We are committed to minimizing our environmental footprint.
- Trayless Dining: University Dining has been trayless since 2007. By dining trayless, there is a positive impact on the waste stream. Dining trayless minimizes

food waste, conserves energy and water, and reduces the amount of cleaning chemicals entering the waste stream.

- Fryer Oil Recycling: One hundred percent of University Dining's used fryer oil is recycled and used for heating oil in homeless shelters.
- Hydration Stations: University Dining offers several hydration stations throughout campus.
- Recycled Content Paper: We use 100% recycled content office and copy paper in all dining locations on campus.
- Green Cleaning: All dining locations are committed to using daily green cleaning products in our operations to reduce the need for chemical based cleaning products and provide a healthy and safe learning environment.
- Energy and Water Conservation: We train our employees each semester on common energy and water conservation practices in order to conserve precious natural resources.

7. Sustainable Water Systems

UMass Lowell has had Water Conservation fixtures in its Design Standard since the first Plumbing Standard and the Sustainability Guidelines were written in early 2011. In the last fiscal year Facility Management finished upgrading all five floors of restrooms in Wannalancit with new low flow fixtures. In the Maker Space on the Falmouth Hall first floor we did the same and also installed Instant Heat tankless heaters.

All LEED designed buildings were fitted out with water conservation fixtures. This includes ETIC, HSSB, University Suites, both University Crossing buildings, Bourgeois and Leitch resident halls, McGauvran Hall under construction and the Pulichino Tong Business building currently in site development.

University Crossing has built rooftop plantings that absorb rainwater, provide insulation and reduce the effects of heat.

The Infrastructure Renewal Project, scheduled for completion in the Fall of 2016, will be decommissioning old restrooms and installing 22 new restrooms containing all water conservation fixtures.

In the AEP project, Ball, the Boathouse, Concordia, Donahue, Durgin, Falmouth, Kitson, Lydon, O'Leary, Pasteur, Sheehy, and Southwick are having low flow restroom conversions and in the aforementioned resident halls the plan is to replace the shower heads with low flow type if not already converted.

8. Waste Reduction and Recycling

UMass Lowell has a well-developed Recycling & Waste Diversion program in place and continues to see reductions in solid waste and increases in recycling. The university's primary goal is to reduce our overall output of waste. The majority of recycling occurs through our single stream recycling program including all mixed paper, plastic,

cardboard, glass, aluminum, tin and steel. Collection bins with clear signage are located throughout the university and picked up regularly.

During FY 2015 our compost program expanded to cover all food service operations campus-wide. On October 1, 2014, the effective date for the MA organics waste ban, the DEP Commissioner, David Cash, and his team visited the university to recognize us for our notable composting efforts prior to the organics waste ban becoming effective.

The end of the spring 2015 semester marked our second move out donation drive, where students donate usable goods that they no longer want or need. Since its inception the program has diverted over 10,000 pounds of goods.

9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc)

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; Environment & Society Minor

Courses:

UMass Lowell currently offers over 115 sustainability-related courses that incorporate sustainability, environment, health, energy management, renewable energy, or climate change. 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 are also currently under development).

Community Engagement Opportunities

Opportunities for students include various departmental internships in Environmental & Emergency Management, Facilities and Transportation and internships solely or jointly funded by partners such as FirstWind and Constellation Energy. The campus has also fully funded student attendance to the annual Massachusetts Sustainable Communities and Campuses Conference.

The Climate Change Initiative's annual Teach-In has seen continued growth. This year over 500 students attended the event, some were from regional high schools.

Industry leading sustainable research continues to grow and bring in more grants through our various research centers including the Climate Change Initiative, Center for Wind Energy, Toxics Use Reduction Institute, Lowell Center for Sustainable Production, Center for Sustainable Energy, Center for Electric Car and Energy Conversion, and the Center for Work, Environment, and Human Development.

Several sustainability events afford students an opportunity to be exposed to state legislators with influence in affecting sustainability and environmental policy. For example, UMass Lowell hosted talks by Massachusetts' State Senator Mike Barrett and State Legislator Marc Pacheco. Furthermore during Earth Day we kicked off the Accelerated Energy Project and featured guest speakers including Massachusetts Energy and Environmental Affairs Secretary Matthew Beaton, Division of Capital Asset Management and Maintenance Commissioner Carol Gladstone, Massachusetts Department of Energy Resources Acting Commissioner Dan Burgess, and state Representative Rady Mom.

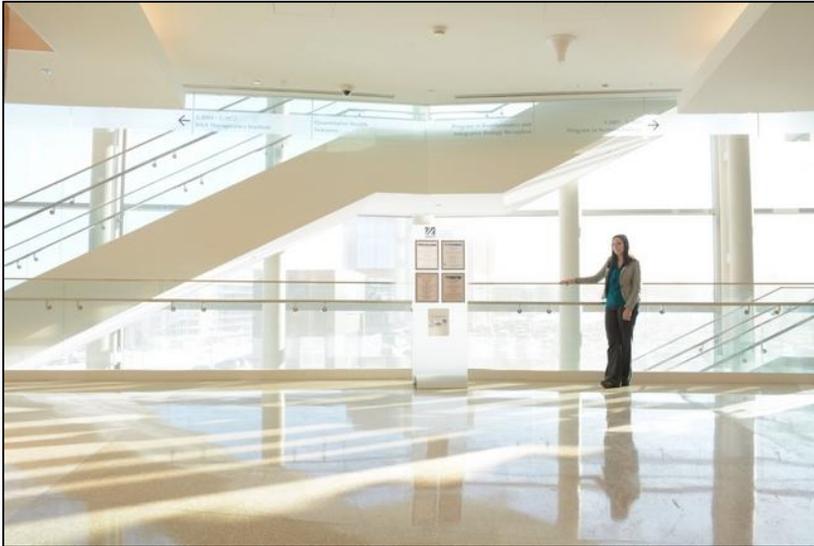
10. Public Recognition of Efforts

Awards

- AASHE's STARS Silver Institution - 2015
- White House Champions of Change - Climate Education and Literacy: 2015
- Commonwealth Citation for Outstanding Performance – UMass Lowell Climate Action Plan Steering Committee: 2015
- MassRecycle Recycling Award: Institution Category: 2015
- Massachusetts ECO Awards
- Pinnacle Award- Excellence in Commuter Options: 2013-2015
- Spotlight Award – Bike Programs: 2015
- Tree Campus USA: 2010 -2015
- GreenGuard Certification: First Campus in New England
- Commonwealth Citation for Outstanding Performance to the UMass Strategic Energy Committee
- Greenovate Boston Award: 2015



Medical School



Recycle

clean paper & cardboard rigid plastics # 1 - 7 (empty) glass & metal containers (empty)

please do your part

Trash

styrofoam flexible plastics, snack bags & wrappers soiled paper and cardboard food waste

please do your part



earth day celebration

April 22, 2015
10 a.m. to 3 p.m.

W3CYCLE
The University of Massachusetts Medical School



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.

1. Clean Energy

Net metering

Through the President's Office, UMMS is participating in three solar net metering contracts with the support of Competitive Energy Services. These projects include a 2.5M-DC array in Palmer, MA, a 6MW-DC array in Warren, MA and 2.1MW-DC project in Williamsburg, MA which is slated to come on line in August 2015. The NMC contracts will represent a cost reduction of over \$500 Thousand on our FY 15 Energy Budget. An electrical energy cost avoidance of \$40,500 was realized to the FY 14 Energy Budget with the NMC contracts. The First Wind solar installation was not on-line until June, 2015. In FY 16 we expect a cost avoidance of over \$700 Thousand.

Combine Heat and Power Plant

UMass Medical School operates a 17.5 MW combine heat and power plant, which uses natural gas as its primary fuel source. The plant was awarded APS (alternative portfolio standard) approval by MA DOER in 2012. The plant met all of the steam and chilled water needs for the campus and 90% of the campus electricity consumption.

2. Climate Protection

FEMA Grant

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) to develop a Campus Hazard Mitigation Plan. The intent of the plan was 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. The plan has been completed and submitted MEMA and FEMA for approval.

Modernization of local area distribution grid

UMMS continues to work closely with National Grid, 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 National Grid to have the main feeders replaced and the automatic transfer protocol adjusted to assure timely transfer to our secondary feeder.

3. Green Building Design and Sustainable Building Operations

Retro-commissioning of the ASC

UMMS is currently completing retro-commissioning the Albert Sherman center as a part of a project to optimize building operations. Major energy conservation measures incorporated into this project include reducing air flow and static pressure set point in office areas and optimizing the enthalpy wheel.

ECM #	Energy Conservation Measure Description	Electricity Reduction (kWh/yr)	Steam Reduction (klb/yr)	Chilled Water Reduction (ton-hour/yr)	Total Energy Reduction (kBtu/yr)	Energy Cost Reduction (\$/yr)
1	Reduce Enthalpy Wheel Speed to 0 Hz and Install Modulating Bypass Dampers	0	0	435,800	5,229,596	\$52,296
2	Optimize Enthalpy Wheel Modulation Sequence and Maintain 55F DA-T	0	0	365,461	4,385,536	\$43,855
3	Reduce CFM Setpoint in Office Spaces	395,089	158	0	1,536,251	\$41,085
4	Reduce CFM in office spaces to 0 CFM during unoccupied mode	305,227	134	0	1,201,177	\$31,861
ESTIMATED TOTAL		700,316	292	801,261	12,352,560	\$169,097

Biotech Park Demand Ventilation Assessments

The Medical School is in the process of conducting a demand ventilation assessments (DVA) for the five buildings in the Biotech Park. The DVA is the first step in upgrading the performance of the buildings as the study will evaluate the current ventilation requirements, determine capabilities of the existing system, and identify opportunities to modify the system to improve safety and maximize energy conservation.

Lighting Retrofits

UMMS undertook a major effort to replace roughly 18,000 fluorescent bulbs across the Hospital, Main School Building, and Lazare Research Building with more energy efficient one. The effort is expected to save over 600,000kWh annually.

318 fluorescent stairwell lighting fixture in the Main School Building and Hospital were replaced with new LED light fixtures that are equipped with integral occupancy sensors. Light levels are now automatically reduced to 20% of fixture output when no motion is detected. The new fixtures result in significant energy savings, approximately 60,000kWh annual, while still maintaining compliance with life safety code requirements for egress stairwells.

Additionally, as the Medical School renovates exiting space florescent fixtures are update to LEDs. During renovations of the Student Lounge and the Main School Building’s 4th floor student wing, roughly 150 fluorescent fixtures were replaced with LEDs.

DCAMM Accelerated Energy Program

The Division of Capital Asset Management & Maintenance (DCAMM) contracted with B2Q Associates, Inc. to perform a comprehensive energy audit of the campus through the Accelerated Energy Program. B2Q developed energy baselines and analyze relevant existing conditions, resulting in recommendations for energy conservation projects. The scope of the project covered approximately 2.6 million square feet including the original

Medical School and Hospital, Lakeside Addition, Benedict, Ambulatory Care Center, Lazare and the Power Plant. The Study was completed in the June 2015 and identifies over 90 energy conservation measures with potential savings of approximately 72,000,000 kWh and 287,000 MMBtu of fossil fuels.

4. Sustainable Transportation

EV Charger/additional grant

In the spring of 2015, a new Tesla Charger was installed to go along with the existing two level 2 charging stations and two “trickle” outlets installed on the first floor of the First Road employee garage. This new charger allows for quicker charging of Tesla’s which require more electricity to charge efficiently than the standard level two chargers provide. Additionally UMMS medical school plans to expand charging infrastructure in the Plantation Street Garage through a MassDEP Workplace Charging Grant which was awarded to cover 50% hardware cost for the installation of the chargers.

Bike week

In May 2015 UMass Medical School participated in Bay State Bike Week in collaboration MassRIDES by hosting an event to show our support for bicycles as a commuter option. During the event UMMS provided information on bike storage, the Emergency Ride Home program, NuRide, and bike maps. During the event over 150 giveaways including bike bell, reflective arm bands and lights were handed out.

Commuter Challenge

UMass Medical School and UMass Memorial participated in a commuter challenge through collaboration with MassRIDES. Each team earned point by either signing up for NuRide or logging green commutes (i.e. carpooling, vanpooling, taking transit, walking, biking, or telecommuting) during the competition. During the competition which ran from February 1st to April 22nd 2015, UMass Medical School logged over 40 green commutes and signed up 60 people for NuRide securing the win against the Hospital.

5. Environmentally Preferable Purchasing

The Medical School continues to support University’s goals to support Massachusetts based and Minority owned business enterprises, promote sustainability, and leverage cost savings opportunities. UMMS continues to increase the purchase of office paper containing post-consumer recycled content. The purchase of recycled content paper increased from 2% in the fourth quarter of FY14 to 36% by quarter three of FY15 based on dollars spent. Additionally, approximately 13% of the toner cartridges based on dollars spent contain some post-consumer recycled content.

6. Sustainable Food Services

Food donation

Pre-consumer food waste from the Albert Sherman Center Cafeteria operations is donated to a local pig 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.

Oil recycling

UMass Medical School recycles over 5,00lbs of waste oil from its kitchens annually.

Farmer's Market

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). Both of these activities help to bring awareness to the value of food grown locally, including the reduced transportation emissions.

7. Sustainable Water Systems

Potable Water Consumption

Beginning the summer of 2015 the Medical School began tracking potable water usage as a key performance indicator looking specifically at irrigation, building water usage, and power plant water usage. In doing so, the university will be able to gain a better understanding of how water is used on campus and develop strategies to reduce water consumption in the future.

Rainwater collection

In order to reduce potable water use, rainwater from the roof and condensate water from the heating and cooling systems of the Albert Sherman Center is captured and reused by the campus power plant, saving approximately 750,000 gallons of potable water each year

8. Waste Reduction and Recycling

Centralized trash program

The centralized trash program was a pilot initiative launched in the summer of 2014 in the Lazare Research Building designed to increase recycling rates by removing desk side trash bins from office areas, leaving only blue recycling bins in place. Centralized trash bins were installed in a couple of locations on the floor. By design, the experiment kept recycling at hand, but throwing something away required getting up and walking down the hall. This pilot program was successful in increasing recycling rates in this building from 12% to 20%. With success of this pilot the University will continue to expand the program to the Albert Sherman Center next, and make centralized trash the norm in office areas across campus.

New Recycling Signage

A significant effort has been made to improve the recycling signage across campus. This new signage consists of signs for both trash and recycling and is designed to use images to depict the type of materials that are and are not recyclable. Additionally, the signs are designed to be area specific since the type of materials one would find in a cafeteria are very different from the materials found in an office setting, or a clinical area.



Electronic Recycling Program

In FY 2015 the Medical School recycled over 16,500 lbs of electronics. Most recently the electronics recycling program was expanded to the Biotech Park as well.

New Ink and toner

In 2015 a new ink and toner recycling program was launched which allows university members a means to recycling old ink and toner cartridges in one of three ways 1) return by mail using manufacturer supplied shipping label, 2) return to Office Max delivery personnel, 3) deposit in ink and toner recycling bin located on the trash docks. The new program developed through collaboration with Office Max, our e-waste recycling vendor, and various UMMS departments, allows for flexibility and convenience.

9. Academic Programming, Research, and Community Engagement (courses, majors, certificates, masters programs, etc)

UMass Medical School works to engage campus community member through outreach campaigns, bi-monthly newsletters, events, and through the sustainability committee and student groups. As a graduate institution focused on medical education and research, the Medical School's academic programming and research therefore does not include sustainability as part of the course work or degree programs.

Growing green

Growing Green continues to gain traction on campus since it was launched in 2009. Growing Green is designed to educate and motivate the campus to become part of the UMMS sustainability efforts. Growing Green includes a web site, signage, electronic bi-monthly newsletter, and various outreach campaigns. In fiscal year 2015 new area specific new recycling signage was launched through the growing green "do your part" campaign to help increase recycling rates by providing campus community members with easy identification of items that are recyclable and non-recyclable.

Earth day

University Campus and members of the public participated in the annual Earth Day Celebration on April 22, 2015 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.

Sustainability Committee

The Medical School Sustainability committee brings together campus members with an interest in sustainability. Members include faculty, staff, students, such Environmental Building Services, Housekeeping, Environmental Health and Safety, IT, Communication, and student groups. This year the committee helped once again to support to annual Earth Day Celebrations, as well as assist in the creation of the new recycling signage for cafeterias and clinical areas.

WOOcycle

In 2015 two School of Medicine student body committee members founded a student group, WOOcycle, to support the sustainability initiatives and help to increase recycling rates throughout campus. To date the group has helped with increasing recycling infrastructure on campus and was heavily involved in the annual Earth Day event.

10. Public Recognition of Efforts –

2015 Pinnacle Award for Excellence in Commuter Options

The Massachusetts Department of Transportation awarded UMass Medical School the Pinnacle Award for its contributions toward encouraging and supporting employees who use green, sustainable and healthy transportation options in the Commonwealth.

Clean Heat and Power Champion award

UMass Medical School received the Clean Heat and Power Award from The Northeast Clean Heat and Power Initiative (NECHPI) for the 2012 expansion of the power plant through the addition of a 7.5 MW Taurus 70 gas turbine, with heat recovery that operates at 60,000 lb of steam output. The 17.5 megawatt plant operates at 80% efficiency producing all of the steam and chilled water used on campus for heating and cooling systems. The plant also generates nearly 90 percent of the electricity used by the University Campus.