Plymouth State University

University Climate Action Plan—2010

Langdon Woods Residential Complex (right) is PSU's first LEED Certified building.

...making changes now for a sustainable future

January 2010

2010 University Climate Action Plan

President's Commission for Environmental Sustainability
Plymouth State University
Plymouth, New Hampshire

Acknowledgments

The President's Commission for Environmental Sustainability would like to thank the many PSU and community members who have given us assistance in thinking about and preparing this document. In particular we recognize President Sara Jayne Steen and the cabinet for giving us the leadership and authority to recommend these bold goals and objectives for the university. In addition, we want to praise our Physical Plant department for their leadership and sustainable efforts to date and to thank Nick Mathis for his assistance in editing and organizing the document.

Lastly we would to thank Jennifer Andrews and Clean Air–Cool Planet for their help and assistance and for everything they do for the environment.

The PCES membership during the 2010 academic year is:

Stephanie Aubert – student
Bill Bayard – New Hampshire Electric Cooperative
Nicholas Casali – student
Casey Bisson – Public Relations
Bill Crangle – Environmental Sustainability, co-chair
Linda S. Dauer – Finance and Administration
Anastasia Deflumeri – student
Katherine C. Donahue – Professor, Anthropology/Social Science
Kelly Donovan – student
Brian Eisenhauer –Associate Professor, Anthropology/Social Science, co-chair
Rodney Ekstrom – College Union
Dana Ernst – Assistant Professor, Mathematics
Ray Gosney – New Hampshire Electric Cooperative
Thad Guldbrandsen – Director, Center for Rural Partnerships
Vasken Hauri – Information Technology Services
Leeanne O'Connor – student
Donald Perrin – Physical Plant Administration
Nancy Pettengill – Finance and Administration
Brittany Phelps – student
Len Reitsma – Professor, Biological Sciences
Ellen Shippee – Physical Plant Administration
Cynthia Vascak – Professor, Art

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Executive Summary

Welcome to the Plymouth State University "Climate Action Plan". The President's Commission for Environmental Sustainability has been working for two years to develop this report, and we are pleased and excited by the results. The PSU green house gas emissions as defined in Chapter Four are significant at over 21,100 metric tons in 2009. Actions that we have taken to date have made a difference, but we still have a long way to go to meet our commitment of reducing our emission by 50% in 2025 and fully eliminating emissions by 2050. We also have a responsibility to include the topic of sustainability across our curriculum. This report provides the university with a roadmap to achieve all of these goals. As long as this document remains in the forefront of our strategic plan, we believe that we can and will achieve our goals.

Environmental Education

The university has developed an impressive array of research centers, academic programs and courses, cultural programming, student services, student activities, and special initiatives related to sustainability and environmental education. The commission has found a strong foundation for the ongoing growth and development of our environmental initiatives and has identified a host of opportunities for the university community to consider.

Continuing Initiatives

The Institute of the White Mountains initiative will provide core programming that includes research and scholarship opportunities, community partnerships, cultural programming, summer programming, historic preservation, eco-tourism, and outdoor recreation and will enable PSU to more fully utilize resources, facilities, and geographical location that is directly connected to our mission of service and commitment to the environment and sustainability. The Institute of the White Mountains Museum will develop an interdisciplinary archived collection of cultural artifacts representing multiple disciplines and provide opportunities to develop educational outreach, cultural programming, and invite scholarship and research across and between disciplines.

Continue to examine and develop integration of service learning initiatives with environmental initiatives.

Maintain environmental awareness and sustainability practices in PSU Strategic Plan and strategic planning priorities.

Proposals

Faculty Training Institute - This can be a key vehicle for cultivating faculty ownership, the development of interdisciplinary collaborations, the development of key understandings relative to the integration of environmental themes and topics into existing course content across all disciplines (without changing courses), promoting cross campus discussion, and truly integrating environmental awareness, appreciation, and sustainable practices throughout all of the diverse programming offered at PSU. This training institute could also address the design of dedicated courses, general education programming, first year seminar, and other possibilities not yet identified relative to the development of a comprehensive and systemic environment and sustainability knowledge base and experience at PSU for all students.

Nature Trails – We have a campus and geographical environment rich in an abundance of nature trail opportunities. Moving forward with the formal development of nature trails, signage, and mapping would significantly increase awareness, interaction, and appreciation.

Public Relations Campaign - Develop and enhance a comprehensive public relations campaign. This could be a very dynamic interdisciplinary collaborative capstone project between environmental studies students, graphic design students, and writing option majors.

Initiatives for Continuing Discussion

Research possibilities for integration of teacher training/education programming with New Hampshire Department of Education initiatives focusing on environmental education.

Sustainable Summer programming for students that will provide opportunity for students across the country to earn a certificate in environmental sustainability while studying green technologies, environmental health, local foods, environmental planning, carbon footprints, natural resources, and leadership. Graduate level programming will offer opportunities for advanced research in environmental science and sustainability.

Family Hostels varying in length from 3-5 days and providing unique summer vacation opportunities in partnership with NH businesses.

Sustainable Studies and White Mountain History that bring arts, science, and humanities together for dynamic summer courses, workshops, mini-institutes, and research opportunities.

Opportunities

The university has a variety of opportunities to explore in the coming months and years, including such actions as further incorporating environmental content into the curriculum in various ways, developing new initiatives in the recruitment of faculty and staff to emphasize commitment to sustainability, improving our website, and the like.

Mitigation Strategies

The university has had considerable success over the last decade at developing projects that have resulted in significant energy reductions and cost savings. The road map is in place to direct our mitigation efforts for the next two decades. Over the next five years, PSU should take the following actions:

- Continue to focus on better understanding our energy sources and uses.
- Continue to invest in annual projects from deferred maintenance funding that have an immediate impact on GHG and reduce associated energy costs.
- Study the options for replacing our fossil fuel-based heating and electrical system and develop a plan and financing for implementation as soon as practical.
- Develop a number of demonstration projects that will serve as both educational and practical experiments for learning about various technologies as they are developed.
- Finish the development of construction standards for future new and rehabilitation work.
- Provide training to all operations on campus to reduce their impact on the campus environment.

Several specific projects should be completed in this period:

- Complete metering for steam and electricity across the remainder of the campus
- Re-commission all existing buildings
- Finish the upgrade and replacement of the underground steam system.
- Develop minimum construction standards for new and rehab construction.
- Develop standards for vehicle purchases.
- Create procedures to insure that all other equipment purchases comply with Energy Star standards.
- Form a study committee in 2010 to begin planning for a new biomass plant to be added no later than 2014 (consider a community heating options if financially feasible).
- Form a study committee in 2011 to consider the value of additional geothermal locations on campus for heating and cooling.

- Introduce demonstration projects annually to demonstrate various technologies that could be implemented on campus and to serve as an academic research activity for graduate and undergraduate students (for example, projects could consider solar, wind, fuel cells, pellet biomass heating in smaller buildings, and the use of cisterns to water campus lawns).
- Through the Office of Environmental Sustainability, train students (student fellows, sustainability fellows and other volunteers) to make visits to individual offices and departments to help individuals identify green office practices that will minimize paper use, energy consumption, and waste minimization.
- Make the Climate Action Plan report an integral part of all campus planning including the updates to the campus Master Plan scheduled for 2014.

During the decade from 2015 to 2025, the university should take these actions:

- Replace the current heating system with a biomass plant for heat and a portion of the campus electrical load.
- Work with the NHEC as they comply with GHG laws for renewable energy to balance the university load.
- Form a study committee to investigate the technologies that will be the best replacement for the engine that uses fossil fuel to create electricity.
- Form a study committee to review the impact of commuting to campus and develop methods to mitigate some or all of the GHG impact.
- Install solar or geothermal or possibly wind powered generation on campus to target 2025 GHG goals.
- Start a task force in 2010 to continue to review the feasibility study, talk with the local schools, Speare Memorial Hospital, and the National Guard Armory to confirm their continued financial interest in a district heating project.
- Develop a series of financial plans and projections using different fuel scenarios, such as wood chips versus pellets.

In addition, the commission has identified a long list of other actions that would help to mitigate the university's GHG emissions and enhance its efficient use of energy. They include such actions as installing pellet heating systems, solar hot water systems, information feedback systems on buildings, and the like. These actions are listed in Chapter Five.

Costs and Financing

Because the university's utility costs have risen from under 2% our budget in 1995 to nearly 9% in 2009, it is critical that we make the changes called for in this report in order to

avoid or at least minimize future cost increases. The commission has identified a number of actions it believes we must take to achieve this goal.

Commit to an annual investment of $1.5 million for all of our buildings for energy conservation projects.

Create an annual fund that supports applications for sustainability type demonstrations, with a goal of $75,000 annually by 2015.

Keep our energy conservation and sustainability plan moving forward by researching new alternatives and ideas.

Implementation and Tracking Progress

Assign responsibility for implementation of the academic and research elements of the plan to the Vice President for Academic Affairs and the Director for Environmental Sustainability.

Assign responsibility for the mitigation strategy to the Vice President for Finance and Administration.

Assign responsibility for an annual assessment of progress to the Director of Environmental Sustainability.

Ensure that the annual strategic planning process embraces the goals and objectives of this plan.

Ensure that the Master Plan embraces this plan and incorporates the elements of this plan into every element of the future campus.

The President's Commission for Environmental Sustainability should request an annual update on the progress of the plan and report to the President and the campus of the successes and shortfalls.

The President's Commission for Environmental Sustainability should every three years update the CAP report, reassess the goals and objectives, and set new timelines for elimination of emissions.

The Director of Environmental Sustainability along with a team from Finance and Administration and Physical Plant Administration should update the CA-CP calculator annually and report the results of this review to the campus and to ACCUP.

Chapter One
Introduction

Concern over the relationship between humans and the environment has grown in recent years as the issues of resource depletion, energy dependence, and climate change have become acknowledged as some of the biggest challenges facing current and future generations. To address these challenges, changes are needed at the individual and institutional levels, with innovation and cooperation as essential parts of successful efforts to decrease human impacts on the environment. Plymouth State University has joined other institutions of higher learning in recognizing their important leadership role in efforts to address environmental issues. It strives to serve as an example of the ways institutions can work with their constituents to reduce environmental impacts. The university is trying to achieve these goals in many ways, including making a formal commitment to reduce the effects of its operations on climate change. This report analyzes Plymouth State's contributions to greenhouse gas emissions and presents a plan for eliminating the university's contributions to climate change. We invite you to help us achieve our goals.

About Plymouth State University

Plymouth State University has a long tradition of meeting the evolving educational needs of the New Hampshire and New England community. Established in 1871 as Plymouth Normal School, the institution became Plymouth Teacher's College in 1939, Plymouth State College in 1963, and Plymouth State University in 2003. A founding member of the University System of New Hampshire, Plymouth State now serves New Hampshire and the New England region as a comprehensive institution of higher education. The university confers degrees at the Bachelor's, Master's, and Doctoral levels, as well as the Certificate of Advanced Graduate Studies. Professional outreach activities and graduate courses are offered at several satellite locations around the state, and articulation agreements with other campuses of the University System and the Community College System of New Hampshire offer a variety of program and transfer opportunities. The university also contributes directly to the ongoing academic and cultural life of the region by providing a variety of continuing education programs, concerts, and theater performances, art exhibits, and the athletic events of seventeen varsity sports. PSU's attractive residential campus of wide greens, tree-lined walkways and traditional brick buildings with an array of towers is located in the

White Mountains and Lakes Region of New Hampshire, a pristine rural setting of great natural beauty and multiple outdoor recreational opportunities within the New England region.

The university motto *Ut Prosim* (That I May Serve) underscores the values upon which the Plymouth State University mission is built. These values are supported by the faculty, staff, and administration through a commitment to excellent teaching based on scholarship, research, and creative endeavor; active involvement in university activities; and service to the wider community. As part of its commitment to its region and the constituents it serves, PSU emphasizes sustainability. The university creates an environment that supports diversity, equity, and inclusiveness for the entire community and actively prepares students to participate respectfully and responsibly in a pluralistic society. The university is committed to providing the best possible educational programming and therefore strives for continuous program improvement through comprehensive institutional assessment.

The educational philosophy of the university is based on academic excellence, learner-centered teaching, experiential learning, applied research, regional service, and leadership. The Plymouth State University education features a complementary relationship between liberal arts and professional studies, between academic and professional development, between service and individual growth, and between the university campus and the larger community.

As a regional comprehensive university, Plymouth State serves the state of New Hampshire and New England by providing well-educated graduates; by offering ongoing opportunities for graduate education and professional development; and by extending to community's partnership opportunities for cultural enrichment and economic development. In each of these roles, the university has a special commitment of service to the North Country and Lakes Region of New Hampshire.

Climate Change

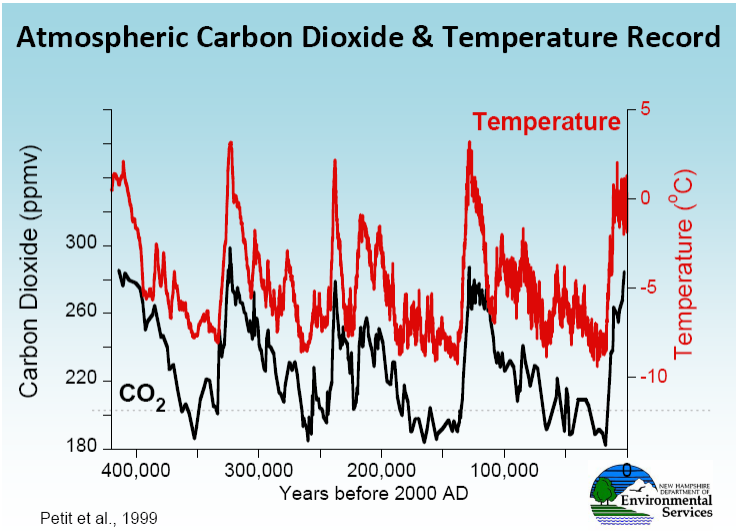
Plymouth State University strives to improve its relationship with the environment in many ways, but the reduction of greenhouse gas emissions (measured as tons of carbon emitted) is a particularly important measure at the current time. While not universally accepted, the majority of the international scientific community has reached consensus that human activities are causing rapid climate change. In 2007 the Intergovernmental Panel on

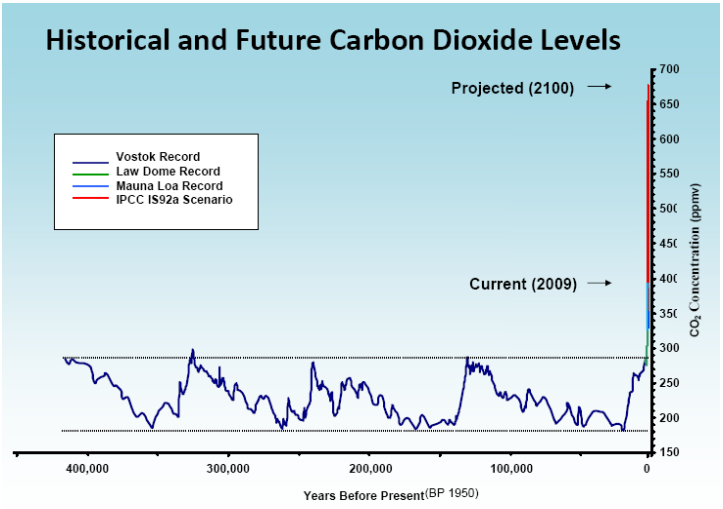
Climate Change (IPCC) asserted that the evidence for humanity's role in causing global warming was "unequivocal."[1]

Humans affect climate change primarily through the emissions of chemicals released into the atmosphere from a wide variety of activities, many of which involve the combustion of fossil fuels. A starting point for a very simplified discussion of the dynamics involved is that the Earth has carbon dioxide (CO_2) in its atmosphere. Carbon dioxide and other gases are essential in what has been termed "the greenhouse effect", a metaphor which represents the way these gasses trap solar heat close to the planet by preventing its radiation into open space. This process greatly affects temperature on the Earth and is a part of climate change cycles.

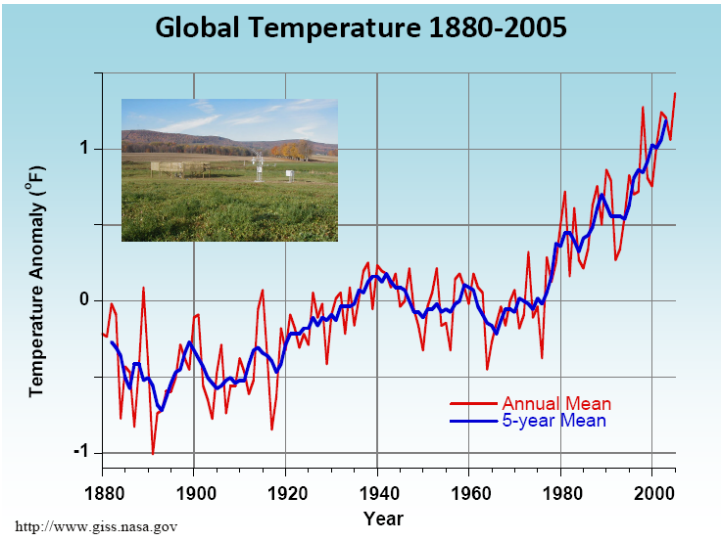
The natural carbon cycle on earth primarily involves CO_2 in the atmosphere, interactions with ocean water, photosynthesis in plants, metabolism in other living organisms, and geologic processes. Since industrialization, humans have altered the earth's natural carbon cycle through increased use of energy, primarily fossil fuels. These energy sources were formed very long ago from plant or animal remains that were buried, compressed, and transformed. In terms of the natural carbon cycle the carbon in these fuels was "fixed" in place, essentially locked out of the natural carbon cycle. Humans intervene by burning the fossil fuels. During combustion in the presence of air (oxygen), carbon dioxide and water molecules are released into the atmosphere. Because of the temperature regulating effects of greenhouse gasses, their increase in the atmosphere has effects on global climate. While there have been many climactic changes in the history of the Earth, those concerned with global warming believe that the human induced change in greenhouse gasses is causing this climate change much more rapidly than natural cycles occur, with devastating consequences for the environment including humans. The charts below are adopted from the New Hampshire Climate Plan and represent some of the most current data used to illustrate the relationships between CO_2 in the atmosphere, global temperatures, and their current trends.

[1] Monastersky, Richard. "International Scientific Panel on Climate Change is 90% Sure that Human Actions Have Warmed the Planet." *Chronicle of Higher Education.* February 2, 2007. http://chronicle.com/daily/2007/02/2007020208n.htm (Accessed September 6, 2008).





Source: C. D. Keeling and T. P. Whorf; Etheridge *et.al.*; Barnola *et.al.*; *(PAGES* / IGBP); IPCC



There are many possible impacts of climate change across the globe including sea level rise, increased species extinction, changes in ecosystems and agricultural productivity. In New England climate change is expected to impact energy, security, and food systems as part of these global effects, and within the region changes may include increased precipitation, more frequent extreme storm events, winter warming, less snowfall, and earlier ice-out on lakes. In combination these effects may have dire consequences. The severity of the potential impacts of global warming and the continuing goal to improve the university's relationship with the environment and its own sustainability provide the impetus to reduce the carbon footprint of Plymouth State.

Chapter Two
Commitment

Plymouth State University's Environmental Commitment: A Brief History

Plymouth State has long history of commitment to the environment and energy conservation. The university has employed an energy management system for the past twenty-seven years, and has been cogenerating its own electricity for over fifteen years. More recently the university built a new Gold LEED certified 347 bed residence hall and has continued a commitment to energy efficiency. The cold weather environment of northern New Hampshire poses significant energy challenges for the campus, both environmentally and financially. As the cost of providing heat and electricity using fossil fuel has increased at a high rate, the university has been retrofitting buildings with new roofs, added insulation, new windows, and lighting systems. These efficiency improvements will continue to be ongoing projects as funding and new products become available. In addition to campus infrastructure the university is also engaged in continuing efforts to reduce the environmental impacts of its operations. For example, in 2009 the university made a new commitment to using paper with increased proportions of recycled content, and recycling on campus has increased steadily over the last five years. These efforts represent only as few examples of the ways the university continually renews its commitment to reducing its environmental impacts.

The efforts to reduce the environmental impacts of the operation of Plymouth State have been accompanied by curricular changes that empower students to be future stewards of the environment in their professional and personal lives. New interdisciplinary undergraduate and graduate Environmental Science and Policy programs have been created in the last ten years, and the Center for the Environment and the Center for Rural Partnerships now actively engage students in environmental research that serves the residents of New Hampshire. A new EcoHouse facility was created in 2008 to provide a student-directed living laboratory for classes and workshops on sustainability, and to provide a home for the Office of Sustainability to coordinate and share PSU's continuing steps towards a more sustainable institution. Residence Life and many other student and campus services, including Sodexo Food Services, continue to make efforts to reduce their environmental impacts and frequently involve students in their endeavors. Student organizations are also active on environmental issues, and as a whole the university community and academic programs continue to improve their commitment to sustainability.

Plymouth State University's Commitment to Reducing its Greenhouse Gas Emissions

Plymouth State seeks to attain a place of leadership in environmental stewardship and sustainable ecologies on our campus and in the larger community of which we are a part. We will bring proactive vision, intellectual intensity, and high ethical standards to our pursuit of environmental leadership with research and teaching, institutional operations, and our relationship with the community.

With support from across the campus, in late spring 2007 President Sara Jayne Steen signed the President's Commitment (Appendix I). Beginning in the fall of that year the President's Commission for Environmental Sustainability began by identifying Clean Air-Cool Planet (CA-CP) as the system we would adopt for collecting data and measuring the university's green house gas (GHG) emissions. In addition the university is also committed to the following:

- PSU is committed to reducing its GHG emissions by 50% no later than 2025 and 100% by 2050.
- The university is committed to developing and implementing a plan to assure that all students better understand the issues of sustainability.
- We are committed to supporting interdisciplinary environmental scholarship and research, increasing faculty and student awareness of environmental issues, and enhancing environmental educational offerings.
- Plymouth State will comply with all relevant environmental laws and regulations and go beyond the requirements for compliance by integrating the values of sustainability, stewardship, and resource conservation into our activities and services.
- The university will make decisions with the goal of improving the long-term quality and regenerative capacity of the environmental, social, and economic systems that support the university's activities and needs. All new campus buildings will obtain a Silver LEED certification or equivalent and Energy Star equipment will be the standard when available.
- We are committed to assessing the environmental impacts associated with our activities and services, for which we will develop and track measures of our progress.
- PSU is committed to our region. The university is committed to playing a constructive and collaborative role as a responsible environmental citizen in the life of the surrounding community and the region and to continuing to offer research and development activities through its Center for the Environment and the Center for Rural partners.

- The university will maintain a positive and proactive role in communicating its environmental activities and performance.

This Climate Action Plan provides the campus with a road map for achieving carbon neutrality by 2050 and also provides a plan for increasing the focus of sustainability across the curriculum to enhance research and community interaction. Without providing a method for measuring our current future GHG emissions, we would not be able to measure our successes. The CA-CP calculator was selected as our partner for collecting, storing, and interpreting data for a number of reasons:

- They are a New Hampshire firm located in Portsmouth.
- They are a nonprofit supported by grants and offer the calculator at no cost.
- The calculator has become the standard for most of higher education and is currently accepted by the EPA and other regulatory agencies that will soon be requiring this data.
- They provide excellent support and regular updates.
- The calculator is an excellent tool for identifying and measuring the financial and emissions impact of future projects and activities.

Moving Forward to Reduce Plymouth State University's Carbon Footprint

The rest of this document presents the results of the university's carbon inventory conducted to determine the contributions of its operations to climate change and outlines a plan for reducing them through innovation and behavioral change and offsetting the remainder. Because there are still many unknowns, it is important that this document become a part of the university's ongoing planning process for strategic and master planning. There needs to an annual review of the CAP plan along with a measurement of our progress and a reassessment of our goals and actions, and this plan will be continually refined as this process continues.

Chapter Three
Education, Research, and Public Engagement

Education in a university takes many forms and has many facets. These can range from formal academic degree programs to courses within the disciplines that may be taken as requirements in the major or as electives, to general education, interdisciplinary, first year seminar, communications, and public relations courses to cultural and residential life programming to faculty development, academic and community research centers, and special initiatives.

This report will provide an inventory of diverse educational initiatives, a qualitative Strengths, Weaknesses, Opportunities, and Threats (S.W.O.T.) analysis, and proposals for future consideration as we continue to develop, expand, and deepen the educational opportunities at PSU that support the growth and development of our students as proactive environmental advocates, practitioners, and socio-cultural agents while facilitating support for the university's commitment to sustainability and our future.

Inventory

This inventory provides a baseline of current educational programs and initiatives, a loom upon which to weave sustainability issues and practice into the complex tapestry of the PSU teaching and learning culture.

The inventory of educational initiatives has been subdivided into the following categories: research centers, academic programs and courses, cultural programming, student activities, residential life and dining services, communications, and special initiatives.

Research Centers

- **Center for the Environment** (CFE)
  www.plymouth.edu/cfe.index.html
  The Center for the Environment is a collaborative effort between PSU academic departments, government agencies, and regional nonprofit organizations. Established in 2004, the goal of the Center for the Environment is to address the science, policies, culture, and economics of the natural environment in northern New England through research, education and collaboration with a special commitment to the North Country and Lakes Region of New Hampshire. The Center focuses on applied environmental problems and engages local communities and organizations in envi-

ronmental demonstration projects that integrate the natural and human environment. Projects include the following:

- Plymouth State University's Masters of Science in Environmental Science and Policy is coordinated by CFE in partnership with the College of Graduate Studies. Started in the fall of 2005, the program focuses on applied environmental science, policy implications, and science translation. Four students graduated in 2008, and eight new students entered the program in the fall of 2008. These students are studying a variety of topics including studying vegetation changes along an altitudinal transect, designing effective methods to influence lawn care practices that are better for the environment, exploring conflicts in managing for different land uses in the White Mountain National Forest, investigating the unintended social and ecological consequences of land use and policy in the Squam Lake watershed, and determining if pharmaceuticals and personal care products are present in Squam Lake.

- Numerous partnerships with students and off-campus partners are updated regularly. For example:
  - CFE's National Science Foundation funded Research Experience for Undergraduates began in 2008. Eight undergraduate students from around the country work during the summer with research mentors at Hubbard Brook Experimental Forest. These students also complete science communication projects linking their research to a partner organization.
  - Engaged scholarship that blends research, service, and educational opportunities for students throughout the Lakes Region and North Country.

- **Center for Rural Partnerships (CfRP)**
  www. plymouth.edu/rural/about/index.html
  The center is an organization aimed at connecting the needs and goals of rural communities with insightful research and production partnerships. The Center works with diverse local populations and community leaders including elected officials, community groups, schools, developers, and others to preserve and enhance New Hampshire's rural quality of life. The CRP is building diverse coalitions of people throughout the Northeast, including Maine, New Hampshire, Vermont, and upstate New York, to consider public concerns form a variety of perspectives. The needs of communities generate the goals of the center, helping to drive the research and service agenda. Programming includes:

- Engaged scholarship that blends research, service, and educational opportunities for students throughout the Lakes Region and North Country,
- Several student internship opportunities within and through the center devoted to environmental issues,
- Community research experience course that involves students in environment-related consulting jobs,
- The CfRP has collaborated with several organizations around the state to promote sustainable forestry and prudent use of biomass fuels and other resources. The center's director is actively involved with the NH Community & Institutional Scale Wood Biomass Energy Committee, The NH Center for a Food Secure Future, the Northern Forest Biomass Energy Initiative Action Plan committee, the Groveton District Heating Committee, and more,
- Conferences and lecture series each semester,

Academic Programs and Courses

The Department of Environmental Science and Policy and the College of Graduate Studies provide two degree programs addressing Environmental Science and Policy. These are a Bachelor of Science in Environmental Science and Policy (with options in Community and Environment and Environmental Science and a minor in Earth Science) and a Master of Science in Environmental Science and Policy. In addition, the Department of Health and Human Performance provides a Bachelor of Science in Adventure Education, a degree that integrates environmental awareness, social agency, and concerns of sustainability.

Undergraduate Courses Dedicated to Environmental Studies

PSU offers many undergraduate courses that are dedicated to themes and topics addressing environment and sustainability and/or are correlated with the Environmental Studies degree programs.

ESP2000	Introduction to the Environmental Science
ESP4530	Environmental Science and Policy Seminar
BI 2040	Conservation
AN3110	Cultural Ecology
BU 3220	Business and Environment
EPL 3100	Environmental Planning
IS3480	Perspectives on Wilderness
PO3680	Public Policy Analysis
BI2100	Winter Ecology
BI3260	Freshwater Ecology

BI4050	Ecology
CH3420	Environmental Chemistry
NSDI 2500	Environmental Science
AR 3570	Art of Sustainability (currently an experimental course)
SO3390	Environment and Sociology
GE3290	Ecotourism in Acadia
GE3780	Nature, Heritage Tourism
	First Year Seminar Courses offered 2009:
	"Do we need to be Green?"
	"What are the lives of other species worth?"
	"Our Water Planet"

Undergraduate Courses that May Address Environmental Topics from Multi-disciplinary Perspectives

EN1550	Wilderness Literature
HE2900	Disease Safety and Environment
IS 3480	Perspectives on Wilderness
AN2210	Cultural Anthropology
EPL2100	Community Planning
EPL4150	Topics in Environmental Planning
GE3280	White Mountain Region
GE320	Natural Landscapes of the US
GE3330	Population Dynamics
PO3680	Public Policy Analysis
AP2010	Foundations of Adventure Education
AP3100	Wilderness Expedition
AP3101	Immersion Wilderness Expedition
AP3320	Adventure Education Philosophy
AP3880	Adventure Education Practicum
AP3890	Adventure Education Clinical
AP4880	Adventure Education Internship
AP4190	Independent Study

Graduate Courses Dedicated to Environmental Science and Policy

EV 5200	The World of Life: the Biosphere
EV5230	Fresh Water Ecology
EV5250	Earthscape Pattern and Process

EV5360	Marine Biology
EV5370	Wetland Community Ecology
EV5560	Special Topics in ES
EV5800	Practicum in ES Education
EV5910	Independent Study in ES

Graduate Courses Integrating Environmental Themes and Topics

AE5560	Arts in Education Summer Institute
AE 5020	Introduction to Eco/Community Art

Cultural Programming

Plymouth State provides a diverse array of cultural programming that serves our university, local, and regional community through the provision of public events and educational outreach.

- **Karl Drerup Gallery and Exhibitions Program** *www.plymouth.edu/gallery/*
  The Karl Drerup Art Gallery and Exhibitions program is dedicated to promoting interdisciplinary understanding of art and visual culture. The Karl Drerup Art Gallery exhibits nationally and internationally renowned artists and designers and features annual exhibits of faculty and student works. The gallery programs in the Silver Center Exhibition Hall highlight culturally, socially, and environmentally engaging issues in a variety of media. Lectures and panels, educational programming, integration of exhibition experience into course work in addition to cross campus and regional collaboration stimulate involvement in the learning process. Internet resources extend the educational outreach of the gallery to the broadest possible audience. The gallery further serves as a site for students to increase their understanding of exhibition practice and education.

  Past exhibits addressing environmental themes:

  09-10: Pat Musick: Up and Down – Art, Ecology and Collaboration
  Sheila Pallay: The Poetry of Place
  Protecting the Forest: Weeks Act of 1911
  08-09: Beyond Brown Paper
  07-08: Enchanted Gardens
  06-07: Susan Smith – Comerford Dam Project
  05-06: Karl Drerup Painting: A NH Treasure
  04-05: NH in Print, Green Map, and Abstractions of Nature by Nancy Hellebrand

- **Art Department Visiting Artists Program**
  www.plymouth.edu/artdept/visiting_artist.html
  The Art Department visiting artist program brings artists, scholars, and guest speakers of regional and national repute to our campus. Guest artists visit PSU during the academic year to provide workshops, critiques, exhibits of work, and/or public presentations and artist's talks. The program includes a graduate level guest artist summer courses which is open to selected advanced undergraduate students. We seek to cultivate a core network of artists returning to us on a regular basis in order to cultivate and sustain meaningful relationships and friendships between these artists, students, faculty, and community members.

  The spring 2010 guest artist will be Andy Moerlein presenting his work and addressing the topic of Environmental Art Installations: Healing and Harmony.

- **Sidore Lecture Series**
  www.plymouth.edu/sidore/about.html
  The Sidore Lecture Series was established in 1979 by Plymouth State and the trustees of the Sidore Memorial Foundation. The series brings a variety of speakers to PSU to address critical issues and events in the political, social and cultural arenas to PSU and residents of New Hampshire.

  This year's Saul O. Sidore Lecture Series at Plymouth State University features diverse perspectives on our increasingly interconnected world to promote peace, prosperity, and a viable planet. This is a time of global mobility and communication, and Americans' awareness of diverse cultures, people, world events, and institutions must keep pace. Students and citizens need to understand the issues in which international cooperation is vital: ensuring opportunity and sustainability in the global economy, resolving enduring conflicts, preventing genocide, and managing the tension between sovereignty and human rights. With this understanding comes the potential to facilitate problem solving at the local, national, and international levels.

  This spring's lectures are "How Green Economics Can Revive the Economy" and "The Fight to Stop the Corporate Theft of the World's Water"

- **Center for the Environment Colloquium Lecture Series**
  www.plymouth.edu/cfe/course.html
  Each semester the Center for the Environment hosts an Environmental Science Colloquium on Wednesday afternoons in Boyd Science Center. The colloquium features a variety of speakers on topics related to environmental science and policy. The talks are open to the public.

Student Environmental Activities

- **Common Ground**
  Common Ground is PSU's Environmental and social justice student organization. The group has several objectives it focuses on. These include outreach and education through speaker, film, and various other educational events, community building through networking and collaboration, and service to the campus and community. Common Ground works in conjunction with the Office of Environmental Sustainability, The President's Commission for Environmental Sustainability, the University Environmental Committee, and the Sustainability Fellows in accelerating the movement towards campus sustainability. In addition, Common Ground has traditionally organized and run Earth Day. New leadership within this group is helping the organization expand and is more involved in a broad range of activities throughout the academic year. The group meets each week in the EcoHouse and meetings are open to the entire campus community.

- **Hartman Union Student Union**(HUB)
  The mission of the HUB is to education for personal growth and responsible citizenship. The HUB coordinates student activities, provides for new student orientation, supports recreation activities, offers and outdoor center, and sponsors community service. Here are several examples of HUB-sponsored environmental activities:
  - The HUB worked with Physical Plant to upgrade all of their interior lighting with motion sensors to be more energy efficient.
  - Plans are underway to develop an environmental literacy survey of new students.
  - Recreation Programs introduced a bike loan library last fall, with seed money provided by PSU's student senate.
  - The HUB, also in conjunction with Physical Plant, has added several sets of recycling bin throughout the HUB for increased opportunities for students/patrons to recycle.
  - Orientation planning and events now incorporate the theme of environmental responsibility. We expanded and continue to improve our "green room" displays during orientation. These rooms are set up for incoming students and parents to take note on "green products" and their impact (or lack thereof) on our environment and suggests why these products make good choices when sending their students off to college. All first year orientation processes are now available on-line in order to reduce paper used in mass-mailings.

Residential Life and Dining Services

The Department of Residential Life coordinates many programs and initiatives that support, model, and apply environmentally conscious living choices, awareness, and action. Initiatives include:

- Creation of environmental fellowship program within the residence halls. These select students live and work in our residential facilities and have responsibilities that promote sustainable living practices.
- Move-in and move-out programs that support recycling, better community relations and energy conservation.
- All washers and dryers on campus are Energy Star front load machine which use less water and electrical energy.
- All refrigerators purchased for college apartments are Energy Star rated.
- RecycleMania started in the residence halls last year and now the program has been expanded to the entire campus. RecycleMania is a national program focused on increasing recycling efforts and decreasing the total amount of solid waste.
- Over the past two years, Residential Life facilitated an energy competition between all of the campus residence halls. The "Do It in the Dark" campaign provided incentives for the competition including free t-shirts and half-price laundry for the residence hall that decreased their energy usage most during the competition.
- Residential Life continues to facilitate a textbook recycling drive at the end of each semester.
- Langdon Woods, a Gold LEED certified structure, was featured on the cover and in an article in the July/August 2007 issue of *School Construction News*. The article featured the Langdon Woods' LEEDS gold award and our efforts on sustainability. To view the article, visit *www.schoolconstructionnews.com*.
- Mary Lyon Hall had its grand re-opening as a student residence hall in October 2008. During remodeling, attention was paid to historic detail as well to environmental sustainability, making the nearly 100-year old building 40 to 50 percent more energy efficient. In addition to providing living spaces, Mary Lyon is the new home of the College of University Studies, Undergraduate Advising, and Residential Life.

Dining Services

Dining Services has initiated an environmentally sensitive program titled "Walking the Talk". This approach to education via modeling has produced a number of actions that model progressive environmental values:

- In January 2008 PSU's dining facility went trayless. With the support of our student government this new program, this program means that students no longer have trays in the dining facility. The rest of the dining program remains as it was before. After a full year of operation the result are impressive. The University estimates that it saved approximately $160,000 on food, electricity and solid waste costs. In addition that reduced the amount of food wasted by 35 tons.
- The snack bars on campus have all moved to using biodegradable plates and take-out containers.
- Vegetarian entries are available at all meals.
- Locally grown products are used whenever possible and special events are held featuring an entire meal of products from New Hampshire.
- Some of the solid waste produced by the food service is given to D-Acres, a local sustainability farm and is used to feed pigs.
- Sodexo Dining Services has developed sustainable menu and dining options for catered events.

Communications

The Office of Public Relations provides ongoing communications through diverse forms of publication: website, Plymouth Weekly e-newsletter, featured articles in Plymouth Magazine, and public announcements sent to local, regional, and state newspapers.

The university's efforts on sustainability are anchored in a commitment to educate students about a sustainable lifestyle, to study and care for the environment, and to promote sustainability to the campus community and the world beyond. Sustainability efforts are evident throughout campus in a program that integrates sustainability across the curriculum, in residential life, and student activities. The website links to the Office of Environmental Sustainability, EcoHouse, Green Guide, Department of Environmental Science and Policy, Center for the Environment, Center for Rural Partnerships, President's Commission for Environmental Sustainability, EcoHouse on Facebook, and Sustainability Fellows in Residential Life.

Our sustainability website may be found at *www.plymouth.edu/sustainability/*. The website provides news, announcements, and information regarding recent events. For example: "Katherine Holder's EcoHouse Foundation Project and Report", "EcoHouse Combines Living with Learning" news clip, "Amory Lovins' Conversation With PSU Students & Faculty", " News Clip: Amory Lovins In Laconia Citizen", "PSU EcoHouse Taking Shape", "Skating on , 'Green Ice'", "PSU and HBRF Providing Hands On Ecology Training At Hubbard Brook Experimental Forest".

Special Initiatives

EcoHouse

www.plymouth.edu/sustainability/ecohouse

EcoHouse, a new residential demonstration program featuring environmentally appropriate technologies, was developed through a University System of New Hampshire initiative on innovation and entrepreneurialism and received funding through a grant from the chancellor's office. The mission of the EcoHouse is to demonstrate environmentally sustainable technology in a residential setting, to provide hands-on experiential learning opportunities to PSU students and the surrounding region, to collect and disseminate information about sustainability, and to help others live in more sustainable ways.

EcoHouse is the home of the Office of Environmental Sustainability, Common Ground, and PSU's Student Sustainability Fellows. Bill Crangle, Director of the Office of Environmental Sustainability; Brian Eisenhauer, Social Science faculty member and associate director of the Center for the Environment; and Steve Whitman, Geography faculty member, serve as co-directors of EcoHouse. To achieve its mission PSU EcoHouse will perform the following services:

- Provide a home to involve students in a "green renovation" and installation of renewable energy systems.
- Provide a location for workshops, seminars, demonstrations of how the average single family home can be retrofitted for sustainable design.
- Create a living laboratory for students and faculty to conduct experiments with sustainable design, alternative energy sources, and other technologies and ways of living.
- Provide a location for students to educate each other and the public by providing tours of the house and monitoring its energy use.
- Create a home and enhanced sense of identity for PSU students involved in environmental programs and activities.

A series of classes has been developed, and plans are underway to expand this project to serve as a campus and public resource for information on residential level actions to address climate change. The first EcoHouse course, Sustainability in Residences, was at capacity in fall 2008. Class work focused on issues around sustainability and individual residences, included guest speakers with sustainability expertise from around the region, and resulted in papers and presentations proposing the work needed to turn EcoHouse into an environmentally friendly building, reduce energy loss, and improve air quality in the build-

ing. An expanded course offering was offered in the 2009-10 academic year: an introductory sustainability course in the Fall and a Spring course that will enable students to determine the next set of environmental projects for EcoHouse. The plan for Academic Year 2011 is to expand to a residential program.

Sustainability Fellows

www.plymouth.edu/reslife-staff/sustainability-fellow.html

The Sustainability Fellow is a student working with the Department of Residential Life to promote the awareness and value of sustainable efforts to the on-campus housing community. Sustainability Fellows increase awareness of environmental related issues, create dialogue that enhances the perception of sustainability, and work to promote environmentally conscious choices and living habits.

Strengths, Weaknesses, Opportunities and Threats

Examining strengths, weaknesses or challenges, opportunities, and threats is an informative means of review, reflection, and strategic planning.

Strengths

The current inventory of educational initiatives provides a firm foundation for ongoing growth and development in terms of future breadth and ongoing depth of study, research, involvement, community collaborations, awareness, and increased faculty participation – fertile ground for the ongoing growth of interdisciplinary and inter-campus collaborations and opportunities. There are two central research centers, three dedicated degree programs, one minor, twenty dedicated undergraduate courses, eight dedicated graduate courses, and eight undergraduate and two graduate courses that link or integrate environmental themes and/or topics. Supporting all of these programs, there is a core of dedicated faculty, staff, and students who share a vision of systemic interdisciplinary educational programming that weaves together the many facets of educational opportunities and who are dedicated to the ongoing growth and development of this vision as it comes to life and continues to evolve and transform our lives.

We have a strong level of student involvement through the efforts of Common Ground, Residential Life, and EcoHouse. Our educational programming builds upon the infrastructure that has been constructed to analyze and reduce our carbon footprint through sustained and systemic energy management – fully supported by our administration. The PSU infrastructure is walking the talk – modeling for students – and mirrored dramatically via the micro community of EcoHouse. The growth and development of the PSU research centers and their work provides another layer of commitment to sustained research, the promotion

of community partnerships, and a constant seeking of new opportunities whether they be via community partners, interdisciplinary collaborations, cultural collaborations, or graduate and undergraduate program collaborations – all of which vitalize the entire PSU community and place a priority on sustainability education and practice as integral to all we do as a responsible and progressive academic community.

Weaknesses

Our analysis identifies internal communications as an area of need. At this time there is a lack of systemic strategically planned communications across campus and the campus community. Although there are pockets of well-developed communication, efforts remain fragmented. For example, the sustainability website, a well-developed resource, remains difficult to access (almost impossible unless one is specifically searching for this site); and there is an overabundance of non-systemic e-information. To date, many faculty and staff are not fully aware of the Campus Contract, the purpose of EcoHouse, the mission and goals of the President's Commission on Sustainability, and the comprehensive system of initiatives underway regarding sustainability.

On the other hand, communication to students has been far more productive due to the combinations of direct participation in pursuit of environmental degree choices, research opportunities, course selections, residential life initiatives, EcoHouse, student fellows, the public face of Common Ground activities, and involvement in cultural programming. However, overall sustainability and environmental awareness levels of students have not yet been determined.

Opportunities

Looking ahead, an initial brainstorming of possible future initiatives provides significant considerations for strategically planning the ongoing growth and development of educational programming. The commission has identified many possible actions both large and small, from a training institute for faculty to possible enhancements to the curriculum to new recruiting initiatives to improved public relations. These opportunities are elaborated in the section on ongoing growth and development of educational programming.

Threats

The most serious threat to the ongoing growth of educational programming that we have identified at this time would be future funding cuts or lack of funding streams to support current and future initiatives. A second threat, very dependent upon continued educational

programming and communications, is that of not being able to sustain and expand faculty and student participation and future loss of interest and engagement. The key question is how to maintain momentum and increase involvement across the entire campus community.

Proposals for Ongoing Growth and Development of Educational Programming

Our motto *Ut Prosim* includes our environmental responsibility from local to global, a responsibility that is transdisciplinary and rooted in our deep and abiding commitment to stewardship and place in all its forms and facets. There are many opportunities at hand that could be selected and prioritized for development. The commission will begin discussion and review of ideas and initiatives currently generated, open discussion to the full campus for input and advisement, welcome new ideas, and set the goal of proposing a set of initiatives for funding and implementation.

First, we believe that the university should sustain and continue development of all current initiatives relating to sustainability, including especially the following:

- The Institute of the White Mountains initiative will provide core programming that includes research and scholarship opportunities, community partnerships, cultural programming, summer programming, historic preservation, eco-tourism, and outdoor recreation and will enable PSU to more fully utilize resources, facilities, and geographical location that is directly connected to our mission of service and commitment to the environment and sustainability. Additional Institute of the White Mountains programming may offer *Family Hostels* varying in length from 3-5 days and providing unique summer vacation opportunities in partnership with NH businesses and *Sustainable Studies and White Mountain History* that bring arts, science, and humanities together for dynamic summer courses, workshops, mini-institutes, and research opportunities.
- The Institute of the White Mountains Museum will develop an interdisciplinary archived collection of cultural artifacts representing multiple disciplines and provide opportunities to develop educational outreach, cultural programming, and invite scholarship and research across and between disciplines.
- Continue to examine and develop integration of service learning initiatives with environmental initiatives.
- Maintain environmental awareness and sustainability practices in PSU Strategic Plan and strategic planning priorities.

Second, we recommend funding and implementation for the following three proposals:

- *Faculty Training Institute* - This can be a key vehicle for cultivating faculty ownership, the development of interdisciplinary collaborations, the development of key understandings relative to the integration of environmental themes and topics into existing course content across all disciplines (without changing courses), promoting cross campus discussion, and truly integrating environmental awareness, appreciation, and sustainable practices throughout all of the diverse programming offered at PSU. This training institute could also address the design of dedicated courses, general education programming, first year seminar, and other possibilities not yet identified relative to the development of a comprehensive and systemic environment and sustainability knowledge base and experience at PSU for all students.
- *Nature Trails* –We have a campus and geographical environment rich in an abundance of nature trail opportunities. Moving forward with the formal development of nature trails, signage, and mapping would significantly increase awareness, interaction, and appreciation.
- *Public Relations Campaign*-Develop and enhance a comprehensive public relations campaign. This could be a very dynamic interdisciplinary collaborative capstone project between environmental studies students, graphic design students, and writing option majors.

Third, we recommend continuing discussion by the commission of the following initiatives to determine their feasibility and desirability:

- Research possibilities for integration of teacher training/education programming with New Hampshire Department of Education initiatives focusing on environmental education.
- *Sustainable Summer* programming for students that will provide opportunity for students across the country to earn a certificate in environmental sustainability while studying green technologies, environmental health, local foods, environmental planning, carbon footprints, natural resources, and leadership. Graduate level programming will offer opportunities for advanced research in environmental science and sustainability.

Finally, we believe the following opportunities are worthy of consideration as our climate action plan develops over the next several years:

- The faculty could consider opportunities for incorporating environmental content in First Year Seminar course development.
- We could consider integration of environmental content into required Composition courses, including design of more “pair” courses linking First Year Seminar and Composition as is being piloted in fall 2009.

- In the General Education program, we could re-examine current set of critical skills and consider cultivation of environmental awareness and appreciation as a critical skill. (This item links to our proposal on faculty training.)
- The faculty could consider establishment of an integration goal of 50%, i. e., that 50% of courses across campus in next five years will integrate environmental awareness, appreciation, and/or sustainability topics into existing course content.
- The university could establish cross referencing of speaker series and increasing student participation at presentations. This might include development of interdisciplinary or Self and Society course that would require attendance at speaker series.
- The university could develop new initiatives in the recruitment of faculty and staff to emphasize commitment to sustainability and the environment.
- The public relations office could develop increased and enhanced community publicity of the environmental initiatives undertaken by the university.
- The physical plant office could develop infrastructure tours and signage.
- The Karl Drerup Gallery could make a priority of its website enhancement to include on-line resources for educators and expansion of its on-line exhibitions.
- We could improve our website to create easy access to the sustainability webpage.
- The university could involve the Graphic Design program in a public relations campaign for PSU's commitment to sustainability.

Through such initiatives and the ongoing exploration of possible actions, we can continue to share our pedagogy, scholarship, creativity, and expertise, to catalyze and develop pedagogy of place, stewardship, connection, and sustainability. As we do so, we bring together the responsibilities of citizenry, community, and ecology; integrating our physical environment, sense of personal-community-cultural history, our creative culture, our social activism and quest for social justice, our sense of awe and mystery and wonder, and our shared understandings of the intricate web of connections that permeate our human and environmental relationships.

Chapter Four
Our Campus Carbon Footprint

To begin to address campus green house gas emissions, the university joined the President's Climate Commitment in 2007 (see the introduction), established the President's Commission for Environmental Sustainability in the summer of 2007, and began the process of collecting the data necessary to measure our emissions. To accomplish this, we have used the Clean Air–Cool Planet "Greenhouse Gas Emissions Calculator". This calculator is a very elaborate Excel spreadsheet that allows for input of data, calculates our GHG emissions, allows us to enter projects and project changes in emissions as a result of the project, and provides tools for preparing graphs and spreadsheets for reports. We started the process with those emissions for which we had the best supporting data, and it is our plan to add new measures to the calculator as data becomes available.

Plymouth State University resides within Plymouth, NH, a town of about 6,400 permanent residents and a primary shopping and services center for the Lakes region of the state. The university has 4,260 undergraduate and 1,985 graduate students enrolled in 2009. We are primarily a residential campus, housing and feeding approximately 2,500 students. About 800 undergraduates live within walking distance of the campus in off-campus student rentals within the town of Plymouth. Our largest commuting population is graduate students that tend to be working adults taking evening and summer classes. The University has 43 major buildings and 22 smaller buildings with 1.5 million gross square feet on 177 acres of land. There is a central heating system that supports all of the major buildings and produces approximately 50% of the campus' electricity.

The university has a long history of managing our energy consumption, evidenced by the installation of a campus energy management system in 1982. This system collects data and helps control the use of steam and electricity at approximately 6,000 locations across the campus. The system allows for temperature to be controlled remotely and to schedule changes in room temperature automatically, this has generated years of energy savings and reduced emissions.

In 2008 the university formed the Office of Environmental Sustainability to coordinate and house the data supplied by the energy management system. When we started to consider the available data, we had little historic data about campus emissions other than electrical use and steam production. Therefore, we selected 2001 as our base year for measurement of GHG emissions and initially included only the data described above from our energy management system plus available data on wastewater, solid waste, and transportation. In

2009, we added commuting, refrigeration, paper, and fertilizers to the calculator going back to the base year of 2001. Because we did not always have historic data for these data elements, in some cases we simply applied the 2009 base back to 2001 in order to restate the base for future comparison. (The only issue for concern for the restatement is the growth we have had in our graduate programs since 2001, resulting in an increase in commuter students.) The only major element that is not included in this report is air travel, and we need to find a way to generate this data in the future.

The final product of the CA-CP calculator is an annual measure of GHG emissions by individual measured unit or summarized by *scope* which is a common presentation for these measures:

- Scope 1 emissions are those that the university has the most direct control over such as heating and electricity produced at our cogeneration facility.
- Scope 2 emissions are those major utilities produced off campus and sold to the university such as the electricity we purchase from the New Hampshire Electric Coop.
- Scope 3 emissions are a series of smaller unrelated emissions such the emissions from commuting, solid waste, wastewater, and paper use.

A comparison of the university GHG emissions by scope is as follows, in metric tons:

Scope	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	15,033	15,293	16,929	18,029	17,583	12,994	13,120	11981	12,779
2	773	721	814	816	766	4968	3830	4881	3714
3	3546	3876	3895	4166	4283	4756	4173	4425	4640
Total	19,352	19,890	21,638	23011	22,632	22718	21123	21287	21133

Notes:

1. During this eight year period, PSU added 214,223 sq. ft. of new building space to the campus. Based on this growth in space, emissions per square foot of building space dropped from .0156 mt in 2001 to .0145 mt in 2009 of total emissions, a 7% reduction.

2. The university increased its student body by students over this same period. Emissions per student went from 5.42 to 3.72. A small part of this growth results from change in the way graduate students were historically counted.

3. The shift in emissions from Scope 1 to Scope 2 is a result of purchasing more electricity directly from New Hampshire Electric Cooperative (NHEC) and producing less in our cogeneration facility. As the price of oil began to increase in 2005, the financial benefit of generating our own electricity in the summer was lost. Since then we have shifted more of our electrical use to our off-campus supplier.

Over 80% of the institution's emissions are a direct result of heating our space and providing electricity. The university provides electricity and steam for heat and hot water from the following sources:

- The *campus cogeneration facility*, located on Tobey Road, produced approximately 50% of campus electricity needs in 2009. This is in stark contrast to 2001, when the campus produced approximately 90%. The engine used to produce this electricity runs on # 2 diesel fuel. As a byproduct, the heat captured from the engine is used to provide hot water for approximately 10% of the campus square footage, and heat from the exhaust is converted to steam, producing approximately 14% of the steam needs for the campus annually.
- The university provides the remainder of our steam for heat and hot water from a *steam plant* located in the same facility on Tobey Road. We operate two primary boilers which run on #6 fuel and a smaller boiler that operates on #2 Diesel fuel.
- There are *smaller boiler operations* on campus such as the PE Facility and a few smaller building scattered around campus. These facilities represent a small amount of our overall energy demands.

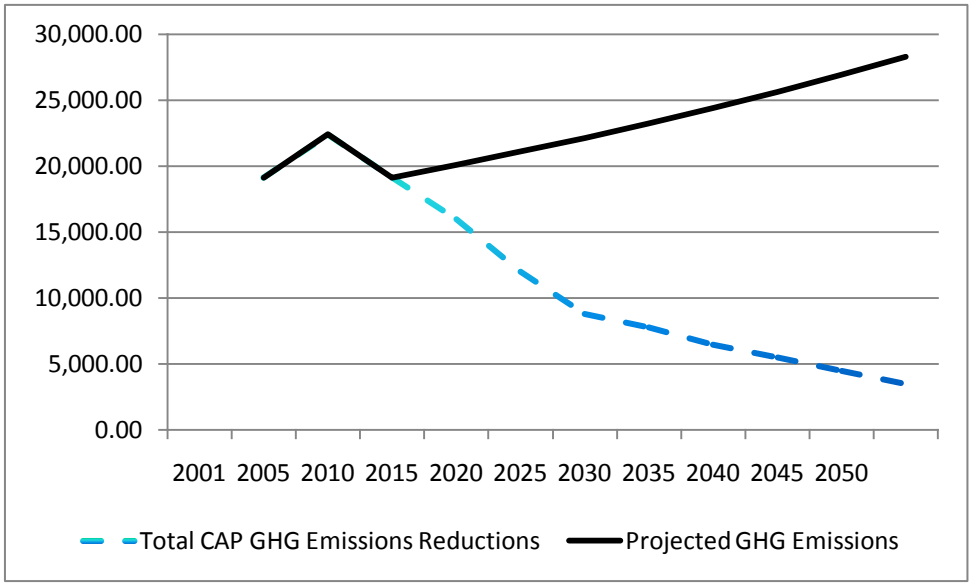
New Hampshire Electric Cooperative, the local electric distributor, provides the balance of our electricity needs.

Despite growth in overall square feet and in our student body, PSU has been able to reduce our overall emissions for two primary reasons. First, our Physical Plant department has taken energy management seriously for many years. Since the initial installation of our first energy management system in 1982, they have monitored and controlled energy use on the campus. The number of points monitored on campus at this time is 6,000 and growing. These systems are upgraded regularly for updates and software changes. Second, since the institution has very limited resources for addressing deferred maintenance issues, planning for projects has primarily focused on energy management and reduction. As the cost

for utilities began to increase well ahead of inflation, the focus on energy projects intensified.

Appendix II contains a list of projects completed since 2001. Here are a few major highlights:

- Beginning in 2002, we replaced a significant amount of an old, poorly insulated and leaking underground steam system with a highly energy efficient series of tunnels. This project has saved on annual repairs and reduced steam loss, and will provide at least double the expected life of the older system.
- In 2006, PSU opened Langdon Woods, a 113,555 sq. ft. residence hall housing 347 students. This building was among the first Gold LEED certified residence halls in the country. The building was designed to be energy efficient, and the entire building is heated with hot water created from waste heat generated by our cogeneration facility.
- Campus enthusiasm and education has produced some of our reductions. PSU has a tradition of caring for the environment and has been fortunate to garner sustained support for our many projects. Examples of these are our involvement in RecycleMania, energy competitions in our residence halls, programs that have turned down the set points heat and turned up the set points for air-conditioning. As we discover new concerns, we will continue to provide education to the students, faculty and staff, and the commission is confident we will continue to receive support.
- The university GHG emissions have been reduced every year since 2004 resulting in a 15% reduction by 2009. In addition, we have created awareness that the university is committed to environmental sustainability. The following trajectory graph shows university GHG emissions, assuming none of the proposed projects called for in this report are completed, compared with GHG emissions if the university follows the projects called for in the CAP plan. This graph, though simply an estimate of 1% growth in emissions per year, serves as a warning to all of us that we must have responsible growth that requires that new space produce no new net emissions.



Despite the progress we have made, several significant challenges lie ahead, including:

- The major deferred maintenance projects that allow for further energy reduction and conservation are complete, and it is approaching the time when the university will need to invest in *newer or different technologies* that will reduce or eliminate emissions.
- We will need to *balance growth and increases in emissions*. In 2011, PSU will bring a new ice arena on-line that will add to our electric demand. We have taken some steps to reduce the impact on emission by installing a geothermal system that will result in the reduction of energy use by as much as 30%. Over the next ten years, PSU will be replacing the entire physical education and athletic facility complex. It will be important that the design of these facilities be done in a way that produce no net new emissions and, if possible, negate the increase produced by the ice arena.
- We will need to deal with *funding streams* that are not predicable.

Chapter Five
Mitigation Strategies

The road map for the elimination of GHG emissions at PSU is already started, but we have a long way to go. We have begun the process of measuring our current status and have been working for the past eight to ten years undertaking projects that have provided for energy reductions and cost savings, as well as a reduction of overall university deferred maintenance. Looking ahead to our future options, a small working group of facilities staff, IT personnel, and a representative from the local electric co-op have studied the options and sequencing of planned and available projects. These projects were matched with the university Strategic and Master Plan to assure that all elements of campus planning are fitting together.

First five years: 2010 to 2015– PSU will take the following actions:

- Continue to focus on better understanding our energy sources and uses.
- Continue to invest in annual projects from deferred maintenance funding that have an immediate impact on GHG and reduce associated energy costs.
- Study the options for replacing our fossil fuel-based heating and electrical system and develop a plan and financing for implementation as soon as practical.
- Develop a number of demonstration projects that will serve as both educational and practical experiments for learning about various technologies as they are developed.
- Finish the development of construction standards for future new and rehabilitation work.
- Provide training to all operations on campus to reduce their impact on the campus environment.

Several specific projects are to be completed over the next five years:

- Complete metering for steam and electricity across the remainder of the campus.
- Re-commission all existing buildings.
- Finish the upgrade and replacement of the underground steam system.
- Develop minimum construction standards for new and rehab construction.
- Develop standards for vehicle purchases.
- Create procedures to insure that all other equipment purchases comply with Energy Star standards.

- Form a study committee in 2010 to begin planning for a new biomass plant to be added no later than 2014 (consider a community heating options if financially feasible).
- Form a study committee in 2011 to consider the value of additional geothermal locations on campus for heating and cooling.
- Introduce demonstration projects annually to demonstrate various technologies that could be implemented on campus and to serve as an academic research activity for graduate and undergraduate students (for example, projects could consider solar, wind, fuel cells, pellet biomass heating in smaller buildings, and the use of cisterns to water campus lawns).
- Through the Office of Environmental Sustainability, train students (student fellows, sustainability fellows and other volunteers) to make visits to individual offices and departments to help individuals identify green office practices that will minimize paper use, energy consumption, and waste minimization.
- Make the Climate Action Plan report an integral part of all campus planning including the updates to the campus Master Plan scheduled for 2014.

Next ten years: 2015 to 2025– PSU will take these actions:

- Replace the current heating system with a biomass plant for heat and a portion of the campus electrical load.
- Work with the NHEC as they comply with GHG laws for renewable energy to balance the university load.
- Form a study committee to investigate the technologies that will be the best replacement for the engine that uses fossil fuel to create electricity.
- Form a study committee to review the impact of commuting to campus and develop methods to mitigate some or all of the GHG impact.
- Install solar or geothermal or possibly wind powered generation on campus to target 2025 GHG goals.

Remaining 25 years to 2050– PSU will need technologies that are currently under development, or not yet known, to help eliminate the remaining GHG emissions. For example, improvements in automobile efficiencies such as the electric car will in time reduce GHG's from commuting. Further, as the NHEC purchases more electricity from renewable sources our GHG emissions will be reduced, but the university needs to find an economical way to produce electricity without using fossil fuels. To make sure that the university is investigating all possibilities, we will continue to incorporate the CAP report and future planning as part of the strategic and master planning for the university.

Following is a detailed list of specific mitigation strategies that are currently under review by the Commission. Over the next five years, we will work through these and either eliminate them as not being feasible or affordable, or refine them into real projects and, if funding is available, move ahead with the project. The following actions are divided among physical plant, campus education and orientation, information technology, and transportation.

Physical Plant

Biomass I

The introduction of a biomass plant to generate the majority of the heating load for the campus would reduce our overall GHGs by as much as 39%. The 2008 feasibility study done by NORESCO shows that there is a ready supply of woody material available in this region and that the long-term cost savings could be significant. That report also indicated that construction of a plant would be very expensive. The university is continuing to review biomass options that may reduce capital costs and still achieve our GHG reduction goals. The next steps in this review are as follows:

- The Vice President for Finance and Administration will start a task force in 2010 to continue to review the feasibility study, talk with the local schools, Speare Memorial Hospital, and the National Guard Armory to confirm their continued financial interest in a district heating project.
- Using the 2008 study, the VPFA will develop a series of financial plans and projections using different fuel scenarios, such as wood chips versus pellets.
- The university should consider approaching neighbors to discuss the use or sale of their property adjacent to the current plant.
- At the end of the current contract with NORESCO in 2014, we must be prepared to move quickly with construction of a biomass addition and also be prepared with a new Utility management structure.

Biomass II

The university should consider installing a pellet heating system in one or more of our smaller facilities that currently burns #2 fuel oil, such as the old church property, 20 Highland Street, and/or EcoHouse. There are labor cost, delivery, and availability issues with this approach which need to be reviewed and considered. However, having a practical experiment on campus would help us explore and better understand this technology, its fuel

delivery requirements, and cost methods. The elimination of oil as a fuel in our smaller buildings would eliminate as much as 40,000 gallons of #2 fuel per year.

We should re-commission all major buildings on campus. Re-commissioning older buildings is a process of making sure that a building's systems, such as heating and air handling, are working as designed. The proper tuning of a building will make sure it is running as efficiently as possible.

Geothermal

By using geothermal energy at the new ice arena, we have reduced the electrical demand by upwards of 33% compared to a conventional building. Based on the success of this implantation, we recommend that the university conduct a study of the entire campus to find other locations and uses where a geothermal field would provide a similar benefit. We further recommend that as the university continues with the design of future phases of the ALLWell Center, we consider geothermal to be a major energy source.

Solar

There are a variety of solar products available that need to be reviewed and considered:

- Photo Voltaic will require the placement of solar panels on roofs around campus where we receive the most solar benefit. We recommend that we contract with a specialist for large building installations to review all of our major roofs and create a plan that will take into account issues such as the effect of solar panels and roof warranties and develop a prioritized list for adding solar PV to the campus. By adding solar panels over time, the university will grow the amount of renewable electricity produced on campus, begin a replacement cycle, and allow the university to take advantage of new technologies as they are developed. Further, this decision will not lock the university into a single technology that may be outdated in a short time. An example would be to invest $50,000 annually and, assuming the technology remains the same, to mount 10 KWh of PV. This would produce approximately 13,000 KWh and, by 2025, would amount to 195,000 KWh, or 2% of our current electric load.
- As the university plans future phases of the ALLWell center, we will need to design a roof that will maximize a solar PV system. The goals for these new facilities should be a design that is GHG neutral.
- Solar hot water should be considered on buildings that have a major use of hot water. Prospect Hall and the HUB are the two buildings that should be considered first.
- The use of day lighting instead of artificial lighting is a major energy saver. To maximize this, buildings generally need to be designed with this in mind. All new buildings should have as a standard that day lighting should be maximized at all times.

Wind

It is unclear if there is enough wind on campus to make an investment in wind turbines affordable. We recommend that our meteorology department be asked to do a study of several locations on campus and provide a recommendation for a demonstration project. The results of these experiments will be critical to the final decision to install or not install wind turbines.

Annual Energy Conservation Projects

This is a category that is difficult to define because it contains a variety of different projects that change annually, such as lighting retrofits, installation of occupancy sensors, building envelope improvements, motors and fans replacement, and the expansion of the energy management system. This type of retrofitting of the campus will allow for the greatest possible energy savings. For instance, commercial sized composters are currently being considered for the dining hall and snack bar. If adopted, a reduction in solid waste of 20% is possible, and the compost produced would be used on our lawns and gardens across campus. Following are several specific recommendations:

- The university should develop a long range deferred maintenance plan focused on energy conservation and should commit to an annual investment.
- We should conduct a study of our older buildings to see if we can reduce heating demand by the installation of heat recovery units.
- When the next master plan is developed, the university may want to consider the replacement of all the smaller, less energy efficient buildings on campus with one new facility that would be a highly efficient building.
- The university should survey major buildings that remain open on nights and weekends to see if it is possible to consolidate activities in one location, which allow several buildings to shut down earlier in the evening and reduce electrical and heating demand.

Campus Education and Orientation

The university should install an information feedback system in all major buildings that demonstrates energy consumption within that building. These real time displays keep the occupants of a building informed about their energy consumption and will help change living habits, which reduces demand for heat and electricity.

The annual orientation for new students should be updated to include a greater emphasis on sustainability and the new student's responsibilities to the university community. These efforts would focus on recycling habits, heat and electrical use in the residence halls, as well as an introduction to the issues around sustainability as it pertains to their lives.

The university should expand the annual fall energy competitions and spring RecycleMania competitions. We have shown year after year that these programs heighten awareness and reduce consumption.

Campus Information Technology

Computers and related infrastructure have increased the university's demand for electricity significantly over the past twenty years. Our IT operation is taking steps to bring this demand under control and, in fact, reduce electrical consumption. The conversion to virtual servers and the remote control of student lab space is a great direction. The university will also take the following actions:

- Continue to replace multiple servers with virtual servers which will reduce the number of servers by 10 to 1 (this reduces the annual cost of server replacement, reduces the amount of electricity consumed to operate the servers and reduces the amount of air-conditioning necessary to cool them).
- Review ways to further reduce air-conditioning needs for centralized computer rooms.
- Review the possibility of moving as many of the computers on campus away from a desk top model to a thin client technology (this will reduce the annual cost of replacing computers; it will also reduce the amount of energy consumed by the large number of public computers on campus).
- Establish a policy that all printers and computers should have duplexing (printing on both sides of the paper) set as the default.

Transportation

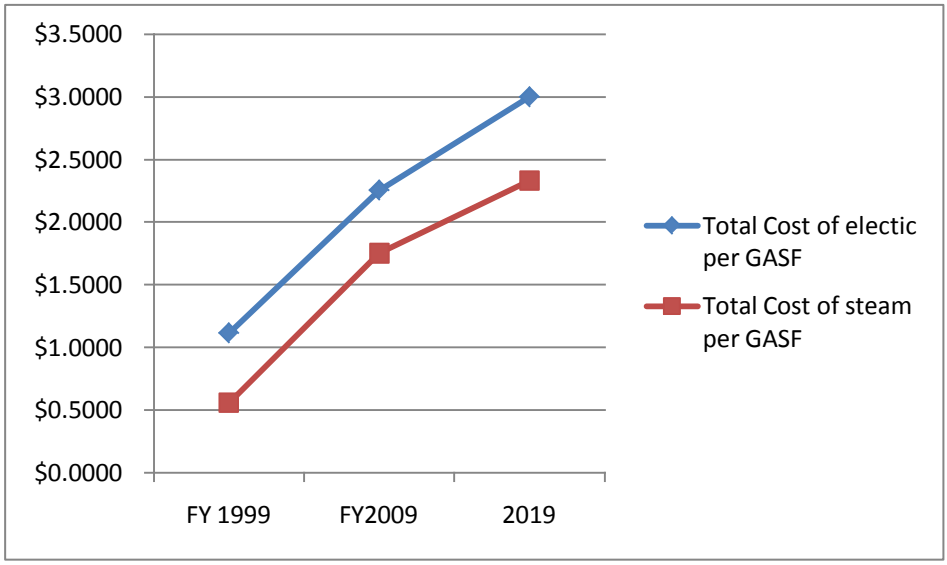
Commuter and parking related issues are difficult for the university to control. Student faculty and staff commute to campus because other than the campus shuttle service there is no public transportation available in our region, and it is unlikely that there will be any in the near future. We believe that given time the cars purchased by our constituents will be more and more energy efficient, eventually becoming GHG free. There are several actions we can take to encourage a movement in this direction:

- Develop a better tracking tool for measuring the many aspects of campus travel.
- Review the campus fleet vehicles replacement plan and set standards that will minimize energy use and reduce emissions by purchasing more hybrid type vehicles.
- Provide electric outlet close to buildings and allow only electric cars to park there.
- Create specific parking spots for compact cars, thus requiring larger vehicles to park further away from the main campus.
- Expand the shuttle services to create a new route that would include Russell and Langdon Streets so the students living on these streets stop driving to campus.
- Provide distance-learning and web conferencing tools, training and support to enable students, faculty, and staff to participate in these and other electronic communications where such activities can appropriately replace land and air travel.

Chapter Six
Costs and Financing

Funding for public higher education is always a challenge. There are always better ways to support students and faculty than there is available funding. In fact, it is often a struggle to simply fund the basic operations of the organization. A major part of the funding problems over the past ten years has been the increasing cost of fossil fuels. The university utility costs have gone from *under 2% in 1995 to nearly 9% in 2009* of the organization's general operating budget. This means that tuition rates had to increase and other areas of the institution had to contain costs in order to pay for heat and electricity. The institution would much rather spend its limited resources on direct instruction and student support services than on the cost of utilities. It is therefore important that the university make the changes called for in this report in order to avoid or at least minimize future cost increases and, if at all possible, reduce operating costs associated with the delivery of heat and electricity. Those of us who have worked on this project believe it is possible to reduce our utility costs by ensuring this report and its future revisions become an integral part of PSU's strategic planning process.

It seems inevitable that the cost of fossil fuel will continue to increase. As you can see in the following table, the cost per gallon of our #2 and #6 fuels has more than doubled over the past 10 years. The future forecast made by the New York Mercantile Exchange and various articles in the *Wall Street Journal* forecast that both of these oils will continue to increase and reach $105 per barrel by 2019. If this is true, the cost of #6 and #2 fuels, assuming no increase in gross area square feet (GASF) for the university, will increase from $2.7 million in 2009 to $3.6 million in 2019.



In addition to paying for the increase in fossil fuel prices, there is a very strong possibility that PSU will be required to pay a carbon tax in the not too distant future. At the time we are writing this report the estimates in congress are for an $11 to $15 tax per metric ton of CO_2 created directly from fossil fuel. It is unclear how the calculation would actually be applied, but we can guess that if passed, it will be an additional cost in the range of $140,500 to $247,400 annually. This would be a significant increase in the cost of doing business for the university.

One of the major dilemmas for the university is that the current cogeneration facility is only fifteen years old, and the debt service will not be fully paid on the facility until 2014. The building and support facilities appear to be in excellent condition and have an additional useful life of at least thirty years before major work will be necessary. The boilers and the engine are about half way through their useful lives and are capable of providing at least fifteen more years of service. As we consider moving away from fossil fuels, it is important to consider the investments we have already made in these existing facilities.

The university is spending $2.7 million on fossil fuel annually. The majority of these funds are being sent overseas to purchase crude oil, and every year this money is being drained from our local and regional economy. We believe that finding a fuel such as biomass that is owned, produced, and delivered within New Hampshire or the New England region would help farmers, loggers, and manufacturers; it would create jobs and help the state's overall economy.

Last is the cost of electricity we purchase from the New Hampshire Electric Cooperative. The average cost per KWh we have purchased from the NHEC has actually decreased since

the mid 90's. In part, this is a result of our purchasing more KWh from them. However, deregulation and good management on the part of NHEC have held the cost stable over the past ten years. With that said, at current oil prices, a KWh from NHEC is still more expensive than generating our own power and using the waste heat to supply steam and hot water to our campus buildings. Therefore, as long as the cost remains competitive the university will continue to generate approximately 50% of electrical energy. Finding an alternative fuel for the cogeneration of electricity in the Plymouth area will not be easy and may require a costly change in equipment, but is certainly worthy of investigation.

The costs of making the structural changes as laid-out in this plan are easy to separate into four categories:

- Deferred maintenance
- Demonstration projects
- Major capital expenditures
- The unknown future

Each of the categories has a unique list of projects and is separated because of the nature of the project and because of the differences in cost. For example the addition of a biomass plant to our current cogeneration plant is going to be a significant cost and therefore falls into the category of a major capital expenditure. It will likely require either internal or external borrowing to accomplish. On the other hand, recommissioning of existing buildings will be funded from annual operating funds or deferred maintenance. These projects and their funding are discussed in more detail as follows.

Deferred maintenance projects are funded annually from current operating funds. The total transfers of $5.4 million were made in FY2009 to support a large list of projects. This annual transfer represents about half of what is traditionally recommended to support a top quality deferred maintenance program over the long term. This is not a problem that is unique to Plymouth; the University System of New Hampshire has recognized this issue and is developing a plan to address this problem. In the meantime the PSU maintenance department has been using the available funds wisely and carefully. There is a very detailed annual planning process which identifies needed projects and prioritizes each project which is then approved by the president and the cabinet. This process has allowed for a better understanding of the opportunities and challenges that physical plant faces every day. Appendix II is a list of major energy related deferred maintenance projects funded from this annual budget from 2001 through 2009. This represents a significant amount of organization and planning and the department deserves a great deal of praise for what it has accomplished.

Going forward, specific amounts of the annual deferred maintenance funding will be set aside for annual energy conservation projects as defined in Chapter Five, Emissions Mitigation. Funding these projects annually will not only produce energy savings, but also reduce emissions and make our buildings more comfortable for the occupants and assure a longer life for the overall building and structure. We are recommending an annual investment of $1.5 million for all of our buildings be committed for these projects. If we reach that level of commitment in the next few years, we believe that it is possible to set an achievable goal for emissions reduction of 20% over the next ten years.

Demonstration projects are designed either to provide a place to experiment or gain a better understanding of how an alternative energy technology might help the university or present an educational opportunity that can be used as part of a laboratory. We have had experiments like this in the past that have been very successful. The Physical Plant offices purchased our first hybrid Prius four years ago and have since then replaced all of our current cars with the Prius. This experiment led us to a better understanding of hybrid technology and reduced our fuel consumption and emissions by 50%. We are now looking to find vehicles to replace our larger trucks and vans that will achieve this same level of reduction. This experiment in Physical Plant was funded by the department's annual equipment replacement funds.

We believe the university needs to create an annual fund that supports applications for sustainability-type demonstrations. This process should have participation of faculty, staff, and students who make recommendations to the administration. We could see projects for solar and wind energy, additional geothermal to reduce our demand for heat, smaller biomass projects in small buildings around campus, experiments in IT for energy reduction, and so on. Some of these experiments would result in viable projects requiring further development. We recommend a goal of $75,000 by 2015 for this fund making it possible to achieve a 5% reduction in emission over the next ten years.

Major capital expenditure such as an entirely new biomass plant would require a significant investment. Our plan calls for a review of the feasibility and options available to the university for moving in this direction. Depending on the cost of the facility and the potential cost savings from switching fuels, the university will need to consider using either short term debt funded through the USNH, major long term debt through HEFA, or a performance agreement as we have had with NORESCO over the past fifteen years. If we can accomplish a conversion to biomass to replace our current heating system, we can reduce our emissions by as much as 35%.

The unknown future makes it difficult to predict either a fuel source or the eventual cost of adding or converting to a new technology. Not understanding the total cost makes it very difficult to show how it will be funded. The important action is for the university to keep this plan moving forward by researching new alternatives and ideas.

Chapter Seven
Implementation & Tracking Progress

Being a small community of very committed faculty and staff, we believe that a decentralized implementation has the best chances for success.

- The Vice President for Academic Affairs along with the Director for Environmental Sustainability will be responsible for implementation of the academic and research elements of the plan (Chapter Three).
- The Vice President for Finance and Administration will be responsible for the mitigation strategy (Chapter Five).
- The Director of Environmental Sustainability, who reports to the president, is responsible for an annual assessment of the progress toward meeting all of our goals.

What is essential for this plan to be successful? It must be closely linked to all the major elements of planning that go on at the campus.

- The annual *strategic planning* process which prioritizes and helps focus annual spending priorities must embrace the goals and objectives of this plan.
- The institution's *Master Plan* which is updated every ten years must embrace this plan and develops future plans for the campus that incorporate the elements of this plan into every element of the future campus.
- The President's Commission for Environmental Sustainability must request or expect an annual update on the progress of the plan and report to the President and the campus of the successes and shortfalls.
- The President's Commission for Environmental Sustainability should every three years update the CAP report, reassess the goals and objectives, and set new timelines for elimination of emissions.
- The Director of Environmental Sustainability along with a team from finance and physical plant should update the CA-CP calculator annually and report the results of this review to the campus and to ACCUP.

Communication with the campus and the community is essential to the success of this commitment. There are so many avenues for communication that it is impossible to reach a broad audience by selecting one or two media. We suggest that the Office of Environmental Sustainability hire a student annually to be responsible for writing weekly and monthly communications and for ensuring that we employ a broad selection of the media that are available to the university.

American College & University Presidents Climate Commitment

We, the undersigned presidents and chancellors of colleges and universities, are deeply concerned about the unprecedented scale and speed of global warming and its potential for large-scale, adverse health, social, economic and ecological effects. We recognize the scientific consensus that global warming is real and is largely being caused by humans. We further recognize the need to reduce the global emission of greenhouse gases by 80% by mid-century at the latest, in order to avert the worst impacts of global warming and to reestablish the more stable climatic conditions that have made human progress over the last 10,000 years possible.

While we understand that there might be short-term challenges associated with this effort, we believe that there will be great short-, medium-, and long-term economic, health, social and environmental benefits, including achieving energy independence for the U.S. as quickly as possible.

We believe colleges and universities must exercise leadership in their communities and throughout society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve climate neutrality. Campuses that address the climate challenge by reducing global warming emissions and by integrating sustainability into their curriculum will better serve their students and meet their social mandate to help create a thriving, ethical and civil society. These colleges and universities will be providing students with the knowledge and skills needed to address the critical, systemic challenges faced by the world in this new century and enable them to benefit from the economic opportunities that will arise as a result of solutions they develop.

We further believe that colleges and universities that exert leadership in addressing climate change will stabilize and reduce their long-term energy costs, attract excellent students and faculty, attract new sources of funding, and increase the support of alumni and local communities.

Accordingly, we commit our institutions to taking the following steps in pursuit of climate neutrality:

1. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.

   a. Within two months of signing this document, create institutional structures to guide the development and implementation of the plan.

   b. Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter.

   c. Within two years of signing this document, develop an institutional action plan for becoming climate neutral, which will include:

      i. A target date for achieving climate neutrality as soon as possible.

      ii. Interim targets for goals and actions that will lead to climate neutrality.

      iii. Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.

      iv. Actions to expand research or other efforts necessary to achieve climate neutrality.

      v. Mechanisms for tracking progress on goals and actions.

(continued...)

2. Initiate two or more of the following tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.

   a. Establish a policy that all new campus construction will be built to at least the U.S. Green Building Council's LEED Silver standard or equivalent.

   b. Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist.

   c. Establish a policy of offsetting all greenhouse gas emissions generated by air travel paid for by our institution.

   d. Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution.

   e. Within one year of signing this document, begin purchasing or producing at least 15% of our institution's electricity consumption from renewable sources.

   f. Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested.

   g. Participate in the Waste Minimization component of the national RecycleMania competition, and adopt 3 or more associated measures to reduce waste.

3. Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination.

In recognition of the need to build support for this effort among college and university administrations across America, we will encourage other presidents to join this effort and become signatories to this commitment.

Signed,

_____

President/ Chancellor Signature

_____

President/ Chancellor Name

_____

College or University

_____

Date

Please send the signed commitment document to:

Presidents' Climate Commitment c/o Second Nature
18 Tremont St., Suite 1120 Boston, MA 02108
or fax to: 320-451-1612 or scan & email to: ACUPCC@secondnature.org

Appendix II – Completed Energy Projects

2001	Draper Maynard	LED exit light systems have been installed in 34 fixtures.
2002	Belknap Hall	Retrofitted with 29 new 2.5 GPM showerheads for energy savings in hot water.
	Blair Hall	Retrofitted with 32 new 2.5 GPM showerheads for energy savings in hot water.
	Grafton Hall	Retrofitted with 25 new 2.5 GPM showerheads for energy savings in hot water.
	Grafton Hall	High efficiency LED exit light systems have been installed in 42 fixtures.
	NonTrad StApt Total Complex	Seavey (Year of fire) - Roof was replaced with new energy efficient roof (minimum R-30 of insulation). New energy efficient window replacement throughout the building for 48 windows.
	Pemigewasset Hall	Retrofitted with 21 new 2.5 GPM showerheads for energy savings in hot water.
	Pemigewasset Hall	High efficiency LED exit light systems have been installed in 22 fixtures.
	Prospect Dining Hall	Semi-instantaneous hot water heaters have replaced the old large 1,000 gallon capacity hot water tanks.
	Samuel Read Hall Hall	Retrofitted with 21 new 2.5 GPM showerheads for energy savings in hot water.
	Samuel Read Hall Hall	All fluorescent lights replace with T8 lamps and electronic ballasts in 170 fixtures.
	Samuel Read Hall Hall	High efficiency LED exit light systems have been installed in 40 fixtures.
	Samuel Read Hall Hall	The original steam heat was replaced with a new more efficient forced hot water system. Also replaced was the old tank style 2,500 gallon domestic hot water heater with a high efficiency semi-instantaneous hot water heater.
	Silver Center	Energy efficient lighting installed, the corridor and lobby lighting has been rewired for better operator control and efficiency.
	Smith Hall	High efficiency LED exit light systems have been installed in 44 fixtures.
	Smith Hall	Retrofitted with 26 new 2.5 GPM showerheads for energy savings in hot water.
	StApt Original Complexes Code	Exterior underground steam/condensate upgraded from manhole #12 to 4 mechanical rooms were replace and housed in tunnel to improve efficiency and life expectancy. The mechanical rooms were completely retrofitted with new semi-instantaneous water heating units, new condensate pumps, new heating controls, piping and pipe insulation.
2003	Blair Hall	Replacement of 215 fixtures w/ T12 lamps with energy efficient lighting T8 lamps and electronic ballasts throughout the building
	Boyd Hall	A new high efficiency power distribution transformer was installed as a part of the renovation project as were all new high efficiency T8 lighting fixtures with electronic ballasts. High efficiency LED exit light systems have been installed. Automatic occupancy sensors have been used throughout the building's bathrooms, public spaces and classrooms areas to conserve electrical as well as heating and cooling energy when these spaces are not occupied. All new fume hoods are carefully integrated into the building's complex ventilation system. These hoods increase the efficiency and safety of indoor air contaminates at the source with specialty exhaust systems. There is also energy recovery units built in to the outdoor air heating process. The cooling tower system is designed to reuse the water supplying the system for a significant reduction in water use. Also all the water fountains in the building share a shingle central chiller rather than point of use chillers. All of pumps and motors are variable speed drives which reduce electrical consumption. Cooling systems also use environmentally friendly chiller refrigerants. The ventilation system is a variable air volume system which increases indoor air quality as well as delivers energy conservation. Individual electrical metering installed in order to be able to better measure electrical consumption in the future. Semi-instantaneous hot water heaters have replaced the old large capacity hot water tanks .
	Centre Lodge	High efficiency LED exit light systems have been installed.
	Facilities Services Building	Relighting with energy efficient T8 lamps and electronic ballasts has also taken place in 185 fixtures.
	Rounds Hall	Relighting with T8 energy efficient fluorescents and electronic ballasts has also taken place in 507 fixtures.
	Russell House	New energy efficient window replacement throughout the building for 89 windows.
2004	Belknap Hall	The ventilation system ductwork was thoroughly cleaned resulting in increased ventilation effectiveness.

Appendix II – Completed Energy Projects

	Belknap Hall	The old 2,500 gallon tank domestic hot water was replaced with a more energy efficient semi-instantaneous hot water unit.
2004	Belknap Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Blair Hall	The ventilation system ductwork was thoroughly cleaned resulting in increased ventilation effectiveness.
	Blair Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Blair Hall	High efficiency LED exit light systems have been installed in 35 fixtures.
	Campus - General	8 trees and 39 shrubs planted.
	Grafton Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Hartman Union Building	High efficiency LED exit light systems have been installed.
	NonTrad StApt Total Complex	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Pemigewasset Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Rounds Hall	High efficiency LED exit light systems have been installed in 28 fixtures.
	Samuel Read Hall Hall	Toilet fixtures in Heritage Commons utilize 1.5 gallon flushometers which greatly reduce water consumption.
	Samuel Read Hall Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Smith Hall	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	Speare Hall	Some areas had T8 energy efficiency lighting and electronic ballasts in 47 fixtures.
	StApt New Complexes Code	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
	StApt Original Complexes Code	Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers.
2005	16 Merrill	Replacement of old furnace to upgraded energy efficient model.
	Belknap Hall	High efficiency LED exit light systems have been installed in 28 fixtures.
	Belknap Hall	Roof was replaced with new energy efficient roof (minimum R-30 of insulation).
	Belknap Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.ar Completed Building Project Description
	Blair Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Campus - General	7 trees and 47 shrubs planted.
	Grafton Hall	consumption in the future.
	Hartman Union Building	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Hartman Union Building	Installed new carpet (Interface - that doesn't release off gases) in the Snackbar, rooms 109, 119 123, 029A, 029, 030, 032, 033, 034, 035, 036, 037, 038, 040B, 041, 042, and 043.
	Human Resources	Replacement of old furnace to upgraded energy efficient model.
	Lamson Library	Roof replacement with additional insulation (minimum R-30 of insulation).
	Memorial Hall	Upgrade of heating which included hot water reset & ventilation system with an increase in size of duct for improved air quality in the lecture halls.
	Memorial Hall	High efficiency LED exit light systems have been installed in 12 fixtures.
	NonTrad StApt Total Complex	All toilet fixtures utilize 1.5 gallon flushometers which greatly reduce water consumption.
	NonTrad StApt Total Complex	Retrofitted with new 2.5 GPM showerheads for energy savings in hot water.
	P.E. Center	The recently remodeled Performance Center/Weight Room has all new energy efficient lighting with electronic ballasts and new HVAC with improved automated controls.

	Pemigewasset Hall	An Energy Recovery Unit was installed that will save the University almost $6000 a year by recovering and exchanging energy that would normally have been lost. Installed 477 low E thermal insulated windows. New roof installed including the addition of extra insulation (minimum R-30 of insulation). New T8 energy efficient lighting with electronic ballasts throughout the building in 259 fixtures. New bathroom ventilation has been installed throughout building improving the air quality in both restrooms and public circulation spaces.
2005	Pemigewasset Hall	Steam & condensate line were replaced and the new piping has been installed in steam tunnels This increases energy conservation by reducing heat loss and also extends the lifespan of the materials of use.
	Pemigewasset Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	President's House	Installed 53 new energy efficient window replacement throughout the building.
	Prospect Dining Hall	The roof has been replaced and increase roof insulation installed. New T8 energy efficiency light fixtures with electronic ballasts in 163 fixtures and energy conserving LED exit lights have been installed in 28 fixtures and Variable air volume ventilation systems are in operation. Cooling systems also use environmentally friendly chiller refrigerants. Energy efficient windows were installed throughout the new addition. New exhaust and ventilation systems are tied into the energy management system for improved air quality and energy efficiency. Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Rounds Hall	Installed a ventilation system to improve indoor air for the 005 rooms.
	Samuel Read Hall Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Smith Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Speare Hall	High efficiency LED exit light systems have been installed in 19 fixtures
	Speare Hall StApt New Complexes Code	Installed new carpet (Interface) in the hallways that doesn't release off gases. Retrofitted with new 2.5 GPM showerheads for energy savings in hot water.
	StApt Original Complexes Code	Retrofitted with new 2.5 GPM showerheads for energy savings in hot water.
2006	Blair Hall	Roof replacement with additional insulation (minimum R-30 of insulation).
	Boyd Hall	Installed A/C unit in Weather Center (reduces use of the whole building's system in the shoulder seasons).
	Campus - General	Shutdown Cogeneration plant due to the increase of oil pricing and we purchased power from NHEC at a much cheaper cost
	Campus - General	A member of ISO New England – Price Response Program.
	Campus - General	Reduced our municipal waste and increased our recycling (now measure cardboard collected in tons). Issued personal mixed paper containers to office personnel. Created both Faculty & Staff and Student guide to recycling brochure. Created materials and signage for consistent look for the program.
	Campus - General	A member of ISO New England - Price response program
	Campus - General	Infrastructure Central Phase I – replace centralized steam distribution from Rounds tunnel, Summer St., Grafton Hall to Merrill St. and manhole #16
	Campus - General	For 2 of the 3 seasons in question, I ordered approximately 3 pallets each year of Agway brand organic fertilizer. This fertilizer was a 60% natural organic type. The fertilizer I replaced was Green Mountain fertilizer which had no organic properties, it was entirely chemical. The pallets contained 50 bags each with each bag weighing 50 lbs, for a total of 7500 lbs of the organic product. The fields took two of the pallets each time and the campus took one pallet. The cost of the fertilizer was approximately 1,500 dollars per pallet or 4,500 dollars a year. I believe there was one year where we had the time to do a second fertilizing using the same material so that year we ended up using 6 pallets or 9,000 dollars in material. The organic fertilizer gave a deeper and longer green than the previous products we had been using. It also had a lower Nitrogen number (12) which I believe is better for the environment as grass can only absorb so much Nitrogen in the course of a feeding, the rest leaches by and is left unused. The previous

		fertilizers were high numbers of over 20 and were not slow release,so much of the fertilizer was wasted.
	Campus - General	65 trees and 351 shrubs planted.
	Campus - General	Used only "Green Chemicals" for all general summer cleaning.
	Campus - General	Percentage of toilet fixtures on the campus utilizes 1.5 gallon flushometers which greatly reduce water consumption.
2006	Campus - General	Ongoing upgrade to A campus-wide energy management and building automation system monitors and controls total building temperature, electric and HVAC systems resulting in energy conservation. Project cost is $25,000 yearly.
	Campus - General	Zone 1 - Retrofitted all exterior lighting to reduce light pollution
	Centre Lodge	Replacement of 95 fixtures w/ T12 lamps with energy efficient lighting T8 lamps and electronic ballasts throughout the building
	Child Development Center	Replacement of 2 old furnaces to 2 upgraded energy efficient models.
	Draper Maynard	Exhaust ventilation - air duct cleaning to increase performance and efficiency
	Facilities Services Building	High efficiency LED exit light systems have been installed.
	Facilities Services Building	Installed 3 new recycling containers.
	Hartman Union Building	Installed 15 new recycling containers.
	Hartman Union Building	Installed better exterior collection containers (on-going)
	Holmes House	Replacement of old furnace to upgraded energy efficient model.
	Hyde Hall	Major chiller unit was replaced with an up to date energy efficient chiller unit.
	Lamson Library	Installed better exterior collection containers (on-going).
	Lamson Library	Installed 36 new recycling containers.
	Langdon Woods	Installed better exterior collection containers (on-going).
	Langdon Woods	Just completed Langdon Woods construction is a LEED's certified facility which means it incorporated sustainability and energy conservation into all aspects of the building design. This acility maximizes day lighting, and use of low-maintenance native plantings in landscaping, as well as the usual complement of energy- and water-conserving fixtures and systems. A significant opportunity for energy conservation arose from cogeneration plant adjacent to the site. Excess heat from the cogeneration plant was harnessed through a jacket water recovery system to supply hot water and heat to the dormitory. During the construction process, the plant also supplied heat for the construction workers on the site, greatly reducing the use of propane heating equipment. Individual room control for improved occupant comfort as well as complete control of HVAC by energy management system. Roof, lights, exit lights, dual flush toilets, shower heads, sink aerators and washers. Occupancy sensors in public spaces. LEED cleaning products and procedures. Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Mary Taylor	Replacement of old furnace to upgraded energy efficient model.
	Pemigewasset Hall	A new semi-instantaneous water heater was installed to replace the 2,500 gallon tank.
	Samuel Read Hall Hall	Heritage Room - Installed 3 new recycling containers.
	Silver Center	Installed 18 new recycling containers.
	Smith Hall	New ventilation system to improve indoor air flow - part of project.
	Smith Hall	Retrofitted all the existing light fixtures with T5 bulbs and electronic ballasts in 390 fixtures.
	Speare Hall	Installed 15 new recycling containers.
	StApt Original Complexes Code	All sliding glass doors have been replaced with energy efficient window units.
2007	Campus - General	upgrade of energy management system - phase 3
	Campus - General	upgrade of energy management system - phase 2
	Campus - General	Zone 2 - Retrofitted all exterior lighting to reduce light pollution is ongoing.
	Campus - General	upgrade of energy management system - phase 1

Appendix II – Completed Energy Projects

	Campus - General	An anti-idling initiative was launched on campus in the fall of 2007. Signs provided by the NH Department of Environmental Services have been posted in all areas that receive truck traffic for deliveries. Physical Plant has also instructed their staff to turn off their vehicle while working around campus rather than allowing them to idle as they have in the past.
	Centre Lodge	Replace both condenser units with improved efficiency
	Grafton Hall	New ventilation system, heating system, Energy Recovery System, and showers.
	Hyde Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
2007	Langdon Woods	Installed a waterless urinal for public restroom.
	Mary Lyon Hall	Building renovations including by not limited to the heating system, roof, lighting upgrade, exterior wall installation, exit light replacement, low flow water closets, showers & faucets, automatic temperature controls, energy recovery air intake, etc. Residential Life has completed the replacement of the older top loading washing machines with water conserving, high efficiency front load washers. Individual electrical metering installed in order to be able to better measure electrical consumption in the future. High efficiency LED exit light systems have been installed in 32 fixtures. Retrofitted with 32 new 2.5 GPM showerheads for energy savings in hot water. Individual steam metering installed to better measure steam consumption in the future. Green cleaning products and procedures.
	Memorial Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	P.E. Center	Replace hot water tank with more efficient semi-instantaneous water heater (in process).
	P.E. Center	High efficiency LED exit light systems have been installed in 39 fixtures.
	Rounds Hall	Replacement of original windows with energy efficient thermal windows will save energy and increase occupant comfort.
	Silver Center	High efficiency LED exit light systems have been installed.
	Silver Center	Installed 5 waterless urinals in public restroom.
	StApt New Complexes Code	Exterior building apartment lights replaced with new light fixtures and photocell for better control.
	StApt New Complexes Code	Started a "Curb Side" waste & recycling program.
	StApt Original Complexes Code	Exterior building apartment lights replaced with new light fixtures and photocell for better control.
2008	1 High Street	ECO House project - Phase 1
	16 Merrill	High efficiency LED exit light systems have been installed in 12 fixtures.
	34 Highland Street	replace all windows with energy efficient (47)
	Campus - General	Fleet - purchase an additional Toyota Prius for fleet rental for a total of 4 (four).
	Campus - General	The new shredding service we use sends the shredded material out to be made into shop paper towels. In only 1 ½ months we have saved (according to the vendor) 35 trees by recycling 2,940 pounds of paper.
	Campus - General	Organic fertilizers are used on all landscaping including athletic fields.
	Campus - General	Snow and ice removal use of Ice Ban Product reduces amount of sand/salt.
	Centre Lodge	installed waterless urinals
	Counseling Center	High efficiency LED exit light systems have been installed in 3 fixtures.
	Draper Maynard	upgrade track lighting in paint studio and art gallery to energy efficient
	Draper Maynard	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Ellen Reed House	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Ellen Reed House	High efficiency LED exit light systems have been installed in 2 fixtures.
	Grafton Hall	installed motion sensors in all bathrooms
	Hartman Union Building	upgrade lighting to energy efficient including motion sensors and day lighting sensors throughout

Appendix II – Completed Energy Projects

	Hartman Union Building	Added insulation around the windows to save on heating in the Snack Bar.ption
	Holmes House	High efficiency LED exit light systems have been installed in 2 fixtures.
	Human Resources	High efficiency LED exit light systems have been installed in 2 fixtures.
	Hyde Hall	High efficiency LED exit light systems have been installed in 28fixtures.
	Lamson Library	installed waterless urinals
	Memorial Hall	replace T12 lamps and ballasts with T8 and electronic ballasts
	P.E. Center	replace 3,000 gallon DHW tank with semi-instantaneous hot water heater
	Prospect Dining Hall	Installed 6 low "E" windows to replace the single pane windows for a heat savings
	Purchasing Office	High efficiency LED exit light systems have been installed in 1 fixture.
	Rounds Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Rounds Hall	Roof was replace and added insulation in attic to minimize heat loss
	Russell House	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Speare Hall	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	University Computer Store	High efficiency LED exit light systems have been installed in 2 fixtures.
	University Police	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
2009	1 High Street	ECO house project and install a new Green foundation on the building .
	Belknap Hall	Installed new exhaust system, showers, T8 light fixtures above the showers and motion sensors in all bathrooms in Belknap Hall.
	Campus - General	Replaced (537) 2.5 GPM showerheads with 1.5 GPM showerheads throughout the campus
	Campus - General	80% of the cleaning products are Green and used campus wide
	Facilities Services Building	Enabled double-sided printing on network printers to reduce the use of paper
	Hartman Union Building	Installed 5 VFD's on 5 AHU's for a net annual savings of 39,000 KWH
	Mary Taylor	Relighting with T8 energy efficient fluorescents and electronic ballasts in 29 fixtures.
	Prospect Dining Hall	install motion sensors for the Winni & Big Squam rooms
	Prospect Dining Hall	Installed a melink intelli-hood system for the lower cooking hood fans and make-up air handling unit #1 to variable frequency drives on the motors
	Prospect Dining Hall	Install motion sensors for the Newfound room
	Purchasing Office	Relighting with T8 energy efficient fluorescents and electronic ballasts in 12 fixtures.
	Robert Frost House	New roof installed
	Robert Frost House	Relighting with T8 energy efficient fluorescents and electronic ballasts in 44 fixtures.
	Russell House	New roof installed
	Silver Center	Individual electrical metering installed in order to be able to better measure electrical consumption in the future.
	Speare Hall	Installed a VFD and a NEMA Premium Efficiency Motor on AHU 1 for a net annual savings of 6,000 KWH