UNIVERSITY of NEW HAMPSHIRE

WildCAP: The University of New Hampshire's Climate Action Plan

SEPTEMBER 15, 2009

UNH Energy Task Force 107 Nesmith Hall, 131 Main Street Durham, NH 03824 **T** 603.862.4088 **F** 603.862.0785 energy.taskforce@unh.edu
http://www.unh.edu/etf/

Acknowledgements

American College & University Presidents' Climate Commitment Signatory

Mark Huddleston, President

UNH Energy Task Force

Chair

Paul Chamberlin, 2009–

Taylor Eighmy, 2008–2009

John Aber, 2006–2008

Chief Sustainability Officer

Tom Kelly

Subcommittee Leaders

David Gillum

Nancye Jenkins

Beca Lehr

Joyce Massicotte

Matt O'Keefe

Brett Pasinella

Steve Pesci

Lisa Pollard

Beth Potier

Cameron Wake

Members

Jake Aho

Sara Cleaves

Kevin Gardner

Filson Glanz

Mary Faucher

Michelle Hayes

Bill Hurd

Carolyn Kirkpatrick

Dwain Lozier

Jahnay Pickett

Ross Seavey

Erin Thesing

Stacy Vandeveer

P. T. Vasudevan

Table of Contents

Executive Summary

Background

The University of New Hampshire has had a long-standing commitment to leadership in sustainability, energy efficiency, and transportation demand management. This Climate Action Plan (CAP) consolidates the work and planning that has long been underway across the campus into a coherent framework for strengthening and expanding those efforts over the next quarter-century. With those long-term goals in mind, this plan focuses on planning for the next 10 years, so as to integrate with existing long-range planning activities at the university, such as the Campus Master Plan and others.

At the heart of the plan are a series of targets for reducing overall campus greenhouse gas emissions, and a series of recommended actions—university-wide policies as well as specific projects—which will allow the university to meet these targets.

The university has adopted a strategy of implementing change, either in the way campus activity is conducted or in the built environment, to achieve greenhouse gas reductions. We challenge ourselves by taking this more difficult path than the alternative of purchased credits which allow business as usual to persist.

This plan is the result of a two-year process coordinated by the UNH Energy Task Force (ETF). In response to the signing the the American College & University Presidents' Climate Commitment (ACUPCC) in 2007, the ETF was charged with responding to the requirements of commitment of which this plan is the most significant.

Targets

The following set of targets for future reductions of the university's greenhouse gas emissions were developed by the ETF and accepted by the President's Cabinet at the end of the first year of developing this plan. All targets are measured against a 1990 baseline—the first year for which the university has collected data on its emissions in addition to being the benchmark for international actions related to climate change.

Planning Target

This target was set in the near-term to serve as the focus of current planning activities related to greenhouse gas mitigation. The date of the target was chosen to correspond to the general 10-year planning horizon of the Campus Master Plan. The level of the target was chosen after conducting a preliminary analysis of the reductions possible from the list of projects described in the recommended actions section (see below) as well as the projected reductions from the EcoLine™ landfill gas project. The planning target is: **50% reductions by 2020.**

Mid-term Target

This target was set in light of the latest scientific research into the global levels of emissions reductions needed to avoid significant disruption to the climate system. It will serve as a guideline for the next phase of planning in the university's development beginning in 2020. The mid-term target is: **80% reductions by 2050**.

Aspirational Goal

Both of these targets place the university firmly on the path to minimizing the impact of its operations on the climate system. UNH should aspire to achieve "climate neutrality"—elimination of any emissions—by the end of the century.

Recommended Actions

In order to achieve these targets, the ETF has developed a series of recommended actions for the university to undertake which, when implemented, will reduce emissions to the required levels. Actions are divided into two broad categories: policies and projects. Policies are university-wide administrative directives which will facilitate implementation of specific projects or influence behaviors in members of the university community which will lead to emissions reductions. Projects are specific interventions in university operations—generally improvements to campus infrastructure—which will directly cut emissions. Projects and Policies are further categorized by their area of impact, e.g., renewable energy, energy efficiency, procurement, etc. A full listing and description of all recommended actions is contained in the Recommended Actions section of this plan and are summarized in the table in Appendix A.

Implementation

Implementation of recommended actions will require coordination across all units of the campus. Priority actions have been identified through the development of this plan by the ETF and specific actions will be selected for implementation in a given fiscal year based on those priorities and in light of related actions already taking place in that year. Actions selected for that year will be brought to the President's Cabinet for approval to proceed. The ETF will develop a campus-wide team made up of members from the relevant operating units to refine the action and facilitate its development and adoption through the normal channels of policy creation, shared governance, and facility improvement project management as appropriate.

Financing

Actions will be financed through two primary mechanisms. First, the university's new energy efficiency fund will be used as a primary source for on-going funding of energy savings projects with a significant cost savings that can be recouped by the fund. Additional funding will need to be prioritized within existing internal funding mechanisms and external sources as available as part of implementation.

Tracking & Reporting

The university's greenhouse gas emissions will continue to be tracked annually by the University Office of Sustainability (UOS) and presented to the university in a biannual report developed by the ETF. This report will serve as the basis for UNH's reporting requirements to the ACUPCC.

Additionally, the implementation status of individual actions will be tracked by the implementation teams using the template contained in Appendix B of this plan and reported to the ETF on an annal basis.

Integrating Across the "CORE"

A further goal of the ACUPCC is to encourage signatories to integrate climate neutrality and sustainability into the educational experience of students, research activities, and public outreach. This plan identifies mechanisms for building on the university's existing commitments to integrate sustainability throughout its curriculum, operations, research, and engagement (CORE). In relation to climate change, these activities have been the explicit mission of UOS's Climate Education Initiative (CEI), since it's founding in 1997. The activities of CEI will be further enhanced by the development of the UNH Sustainability Academy.

Priorities for Action

The following actions were determined to be top priorities in the first year of implementation of the climate action plan. The first group of actions constitutes as yet unfulfilled commitments under the ACUPCC. The second group were selected from among the actions identified in this plan.

APUCC Commitments to be Completed

On signing the ACUPCC, UNH committed to five of seven possible "immediate actions" to reduce greenhouse gas emissions. Two of these actions—a commitment to waste minimization through participation in the Recyclemania competition and support of public transit—have been achieved. Three additional actions need to finalized:

- LEED Silver-Equivalent Building Standards: UNH is in the process of updating its existing design and construction standards and developing a scorecard to document that future projects have achieved the minimum target that would be the equivalent of LEED Silver certification.
- ENERGY STAR Purchasing Requirement: In 2006, UNH adopted an energy efficient purchasing standard which "strongly encourages the purchase of products that meet the specifications of ENERGY STAR". This standard should strengthened to meet the requirements of the ACUPCC.
- Tracking of university-funded long-distance travel (including air travel): A system of reporting travel reimbursements and purchases should be developed that would record the mode of travel (plane, train, auto, etc.) and the distance traveled. This data will provide the basis for estimating greenhouse gas emissions associated with faculty, staff, and student travel.

Recommended Priorities for Action in Year One

Of the more than forty actions discussed in this plan, the following four were identified as the best candidates for implementation in the first year. These projects were selected not only because of their energy and costs savings, but because they build the framework needed to facilitate other future actions.

- Energy Efficiency Fund: The remaining administrative tasks required to establish the functioning of the energy efficiency fund should be completed and the first round of cost-saving projects determined and initiated.
- Building Representatives: A network of volunteers should be established representing each of the major buildings on campus to act as liaisons with the ETF and the Energy Office. These coordinators would be provided energy use data for their building to pass to occupants and would assist by reporting conservation related information and identifying systems which are in need to modification to improve efficiency.
- Clean Fleet Program: Establish a system to facilitate the procurement of fuel efficient and alternative fuel vehicles as university vehicles are replaced though attrition.
- Network Power Management: Establish an annual network registration of computers to enable implementation of power management features.

Background

Overview of Climate Action at UNH

UNH had been advancing sustainability in some way, shape or form over the last 35-plus years. Since 1997, this work has been lead by UNH's University Office of Sustainability (UOS), the oldest endowed sustainability program in higher education in the US. UOS brings together administrators, faculty, staff, students and external partners to integrate sustainability across the university's curriculum, operations, research and engagement (referred to as the "CORE") through four initiatives designed around four key systems that underpin the ability of a community or society to define and pursue quality of life – biodiversity, climate, food, and culture. When we maintain integrity within and across these four systems and the CORE, we promote quality of life for generations. We call this model the "sustainable learning community".[1]

The sustainable learning community integrates sustainability into the fabric of an institution of higher learning in order to achieve the educational goal of cultivating a critical and creative global sustainability outlook in our students and ourselves. More than just "the environment" or even the intersection of environment, economy, and equity, sustainability is about seeing things whole and acting accordingly. And while this model was developed by UNH's chief sustainability officer and founding director of UNH's endowed sustainability program, in order to be successful the entire university must work together continually to transform itself into a sustainable learning community.

While energy conservation and efficiency work has been ongoing at UNH since the 1970's[2], this work took on expanded meaning when UNH's Climate Education Initiative (CEI) was developed in 1997–1998 under direction of UNH's then-newly endowed sustainability program. CEI, built around one of the four foundational systems of sustainability, integrates with the 3 other UOS initiatives in biodiversity, food and culture.

Under CEI, UNH is committed to being a model climate protection campus that pursues a sustainable energy future through emissions reduction policies, practices, research, education, and engagement. The overarching goal of CEI is to

---

[1] Kelly, T. (2009). "Sustainability as an Organizing Principle for Higher Education." *The Sustainable Learning Community: One University's Journey to the Future*. Aber, Kelly and Mallory (eds). University Press of New England: Hanover, NH; Kelly, T. (November 2003). "Building a Sustainable Learning Community at the University of New Hampshire." Association of University Leaders for a Sustainable Future, 6(2), www.ulsf.org/pub_declaration_othvol62.htm.

[2] Aber, Kelly and Mallory, 2009; APPA. (March 2007). "Energy Benchmarking Study and Evaluation University and College Campus Energy Consumption Profiles Phase 1 Summary Report." Prepared for the University of New Hampshire; Goral, T. (March 2007). Transportation Trends: institutions of higher education (IHEs) take the lead in reducing auto pollution and vehicle overpopulation." University Business, http://www.universitybusiness.com/viewarticle.aspx?articleid=703&p=1#0.; MacDonald, M., U.S. Department of Energy Oak Ridge National Laboratory, and the Association of Higher Education Facilities Officers. (August 2000). "Higher Education Energy Performance Indicators 1997–98." APPA / Rebuild America Strategic Partnership, http://eber.ed.ornl.gov/commercialproducts/CCAS9798.htm.; U.S. Environmental Protection Agency and U.S. Department of Transportation. (Accessed December 2008). "List of Best Workplaces for Commuter's by State", http://www.bestworkplaces.org/pdf/BWC-Employer-A-to-Z.pdf.

help administrators, faculty, staff, students, and community partners increase their knowledge of and effectiveness in advancing greenhouse gas emission reductions in their civic and professional lives, while integrating the ethics, science, technologies, and policies of emissions reductions into the university's identity, policies and practices. CEI unifies the campus community in working to:

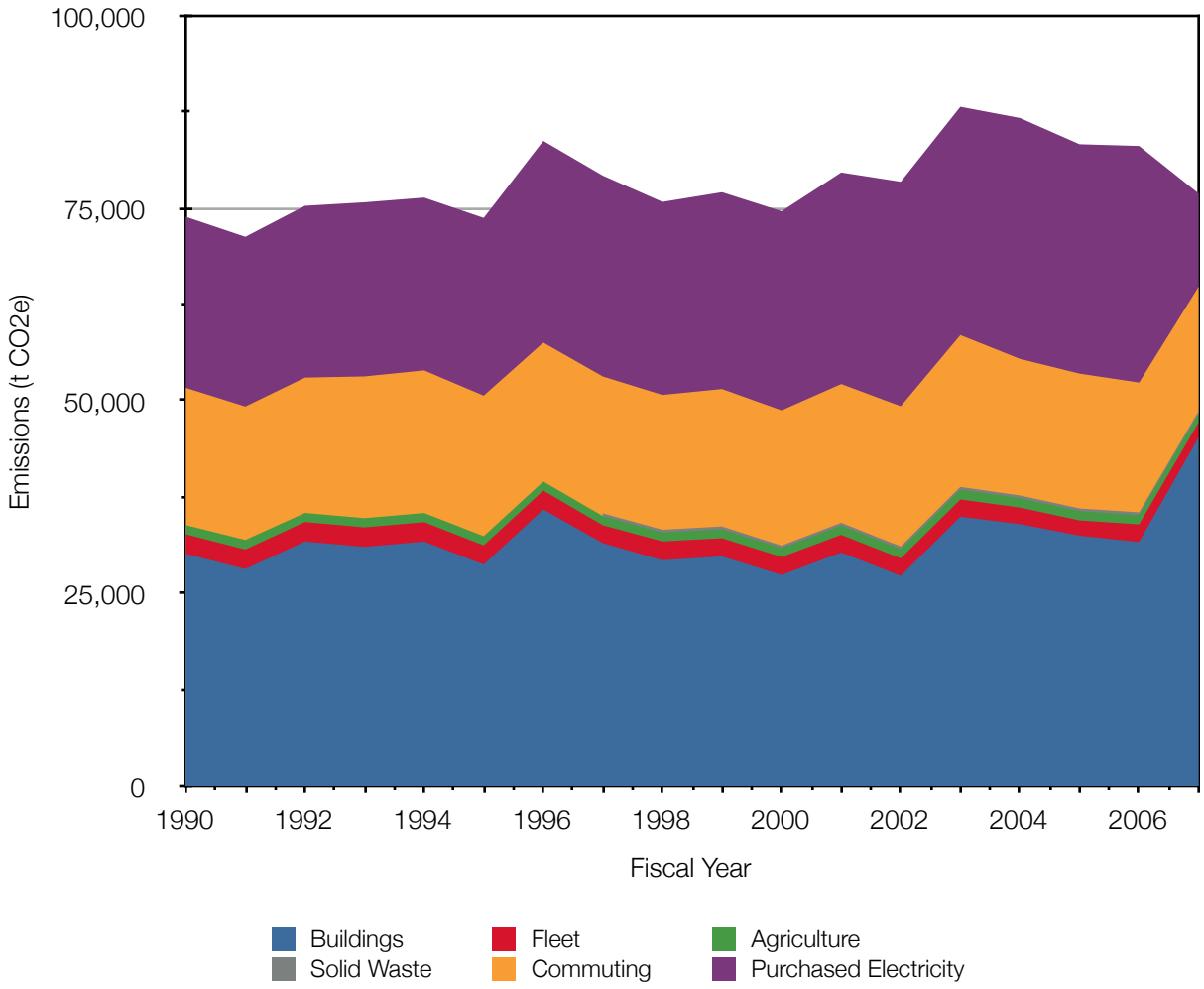
- Reduce carbon dioxide and other greenhouse gas emissions, as well as other air pollutants.
- Reduce potential climate change and improve (among other things) air quality.
- Research, develop and demonstrate innovative solutions to energy challenges.
- Foster climate and air quality prediction and public health issues related to climate change.
- Educate students in all fields about the relationship between human activities, climate, energy, health and appropriate civic and professional actions.
- Educate public health students to address the risks associated with climate change and variability.
- Develop as a community model for the state and region.

The first action of CEI was to form a cross-campus working group of faculty, staff, and students to plan and implement the vision, mission, goals, and initial projects of the initiative. One of the first projects instituted was the development of a greenhouse gas emissions (GHG) inventory tool designed to meet the unique needs of a higher education institution.[3] The CEI Working Group determined that the university could not meet any of the stated goals of the CEI without knowing the university's emissions and monitoring progress on a regular basis. The Campus Carbon Calculator™–the planning backbone behind the CEI and downloaded by over 2,300 institutions to date for their own use–has been refined and improved in partnership with Clean Air–Cool Planet since 2000, and is now being used in the next phase of UNH's climate planning–the development of a climate action plan.

UNH Greenhouse Gas Inventory

In the winter of 2000, the University of New Hampshire's University Office of Sustainability developed a partnership with the Portsmouth-based, non-profit Clean Air-Cool Planet to produce a greenhouse gas inventory tool that adapted national and international inventory methodologies to the unique scale and character of a university community. Combining financial and intellectual resources, the partners hired a UNH graduate student who developed the tool and gathered data, with support from UNH faculty and staff. Using the inventory tool, UNH's greenhouse gas emissions were documented beginning in 1990 and the fist version of the greenhouse gas emissions inventory was published in the spring of 2001.

[3] Pasinella, B. (2009). "UNH Greenhouse Gas Inventory." The Sustainable Learning Community: One University's Journey to the Future. Aber, Kelly and Mallory (eds). University Press of New England: Hanover, NH; Andrews, J., Hough, I., Kowalski, J., and Pasinella, B. (November 2008). "Developing a Climate Action Plan with the Campus Carbon Calculator." Presentation given at "AASHE 2008: Working Together for Sustainability – On Campus and Beyond": Association for the Advancement of Sustainability in Higher Education, Raleigh, NC.



UNH Greenhouse Gas Emissions Inventory 1990–2007

Following publication of the UNH's inventory, the partners continued work together in order to package the inventory methodology in to a generic tool that could be used by other campuses. By the fall of 2001, the "Clean Air-Cool Planet Campus Carbon Calculator" became available, and over the next 18 months, was employed by about 10 other Northeast campuses. UOS and CA-CP then hosted a series of several technical meetings to continue to refine and simplify the calculator which lead to the development of a revised calculator. As the calculator was adopted by more and more campuses over the subsequent years, the revisions continued. Today, the calculator is in it's fifth version and a new version is planned for 2008. It have been adopted by more than 500 campuses and that number continues to rise quickly due to its adoption by the American College & University Presidents Climate Commitment (ACUPCC) as the recommended tool for campuses not already participating in another GHG inventorying program.

UNH has continued to use the latest version of the calculator to update its own greenhouse gas inventory, and since 2001 has published two more updates to its inventory in summer of 2004 and again in the fall of 2006. Both updates were conducted primarily by UNH graduate students working under the direction of UOS with support from UNH faculty and staff.

With the expanded role of the UNH Energy Task Force and the signing of the American College & University Presidents Climate Commitment, it is becoming increasingly important to maintain and update the inventory more frequently. In the

summer of 2007, a group of UNH staff members who have been providing the data for past inventories meet to discuss plans for future updates. At that meeting it was decided to form a new sub-committee of the ETF for the task of maintaing the inventory on an annual basis. Each member of the new sub-committee would report the necessary data to UOS at the end of each fiscal year, and the new inventory results published biannually. Longer, more detailed, reports, similar to the first three versions of the UNH inventory will continue to be published, but on a less frequent (mostly likely 5-year) schedule. Currently, the data for the 2006–2007 financial years are being submitted and the first biannual report is in progress. It is expected to be completed, along with a comprehensive review of all historical data by the summer of 2008.

Formation of the Energy Task Force

Chaired by the Assistant Vice President for Energy and Campus Development and coordinated by the University Office of Sustainability and the UNH Energy Office, the UNH Energy Task Force (ETF) is the formalized version of the former CEI Working Group. Initially developed in 2005 by the then-UNH president to develop new ways to reduce energy consumption in response to fast-rising energy prices, the mission of the ETF soon broadened to serve in an advisory capacity to the UNH president and cabinet by making recommendations on the full range of issues that relate to climate and energy. These issues include everything from energy generation, demand management, efficiency, and conservation, to greenhouse gas mitigation policy and action, participation in energy and carbon markets, and curriculum, research, and outreach opportunities related to climate and energy. The overarching goal of the ETF is to guide the university toward a systemic and integrated energy policy that emphasizes health and integrity, climate protection, efficiency, cost-effectiveness and stability, fairness for all university constituents, and consistency with priorities set by the UNH Academic Plan and UNH Campus Master Plan.

Signing of the ACUPCC

The ETF's role in advising the campus administration on climate and energy issues took on even greater prominence when UNH became the first land grant university in New England to sign the ACUPCC in February 2007, becoming a member of the leadership circle of ACUPCC signers. The ETF is charged with taking the actions necessary to implement the ACUPCC

Development of the Climate Action Plan

On the signing of the ACUPCC, the ETF was charged with fulfilling the requirement of the commitment. Development of a Climate Action Plan called "WildCAP"–named after the university's wildcat mascot – to reduce UNH's greenhouse gas emissions. The goals are to:

- Maximize emissions reductions as soon as possible to reduce climate impacts.
- Maximize cost savings through reduced energy consumption.
- Develop a plan with broad-based support across the UNH community to ensure smooth implementation, willingness to invest in energy saving projects, and participation in energy-saving behavioral changes.
- Maintain UNH's leadership position in campus climate action.
- Develop opportunities to highlight UNH climate action to internal and external stakeholders and funders.
- Integrate operational and behavior savings efforts with existing or new curricula and research where possible.

The proposed process UNH is following to develop WildCAP is following two broad phases:

Analysis Phase

During the analysis phase of WildCAP's development, which began in winter 2008, the ETF discussed and agreed upon recommended long-term emissions reduction targets, an associated timeline for meeting these targets, and a database

of emissions reduction projects (listing initial capital costs, emission reduction potential, energy savings, and cost savings) for the UNH president and cabinet to consider. Working groups led by ETF members were formed to focus on estimating emissions reductions and costs associated with projects in several key areas that were chosen based on the results of previous versions of the GHG inventory. For example, after UNH's landfill gas pipeline (called EcoLine™) comes online in early 2009 to fuel the on-campus cogeneration heat and power plant, heating/cooling/electricity production will no longer be the largest contributor of emissions on campus. Working groups instead focused their attention on estimating the emissions reduction potentials and costs associated with projects in other larger areas of emissions – namely effeciency, conservation, transportation, and renewables.

The working groups included:

- Efficiency: This group is focusing primarily on capital improvements to structures and equipment in campus buildings that would improve efficiency.
- Renewables: This group is focusing on the utilization of new technologies to minimize the use of carbon-intense energy sources.
- Conservation: This group is focusing on policies and educational efforts to encourage conservation behaviors by members of the university community.
- Transportation: This group is focusing on equipment and policies designed to minimize emissions due to operation of the university fleet, commuter vehicles, and university-sponsored air travel.

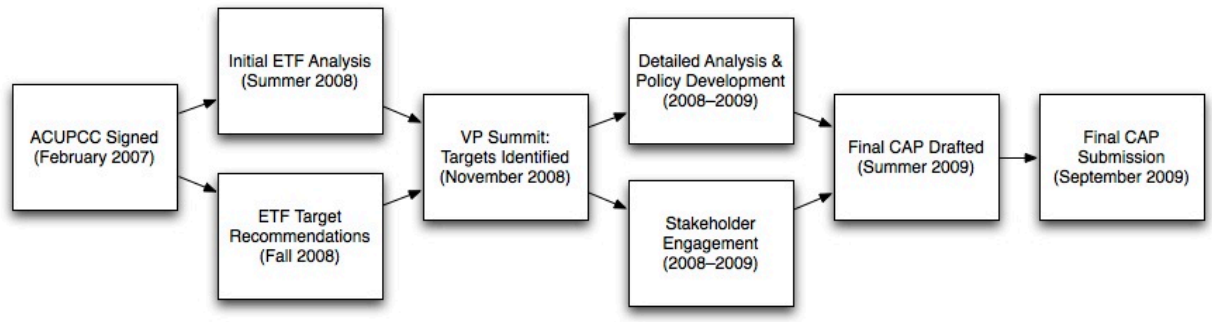
While the areas of focus of the working groups overlapped, they were useful in ensuring that as many possible emission reduction strategies were considered and estimated as was feasible. New groups, such as communications and fundraising working groups, will be added during the second phase of WildCAP's development and during its implementation as the emissions profile of the university changes over time.

The ETF member leading each working group worked with other staff on campus to gather data related to energy use and costs of as many potential projects related to the focus of their group as feasible. Data were entered into the new planning module of the Campus Carbon Calculator™ so that projects could be evaluated on the basis of the amount of carbon reduced, the cost of implementation, and the cost benefits. While final project decisions will be driven in large measure by emissions avoided or reduced, costs of each project, and ease of implementation, the educational mission of the university will always be taken into account.

While the working groups were gathering initial data, the full ETF developed recommended campus-wide targets and a timeline for emissions reductions that are consistent with national and international calls for reductions in greenhouse gas emissions (e.g., Hansen et al., 2008). The requirements of the ACUPCC state that UNH's climate action plan must include a date by which UNH will become carbon neutral, as well as interim targets in the process of meeting that date.

To build internal ownership, institutional commitment, and stakeholder input into WildCAP, in the fall of 2008 the ETF hosted a summit for key administrators to review the initial findings of the working groups in the context of the ETF's recommended targets and timeline. A list of projects necessary to meet the proposed targets, prioritized by cost, was discussed with the administrators. The particular goals of the summit were to work with key decision-makers to identify strategies for further study and to develop consensus on proposed emissions targets and timelines.

After review by the UNH president and cabinet, the results of the Analysis Phase, including the final emissions reduction targets and timeline UNH will adopt, will be announced and the UNH community strongly encouraged to participate in the Collaboration Phase of WildCAP.



WildCAP Development Process

Collaboration Phase

In the second phase of WildCAP's development, which will extends from November 2008 through September 2009, ETF members will be presenting and discussing the targets, timelines, and potential emissions reduction projects with the broader UNH community in order to refine estimates, familiarize all levels of faculty, staff, and students with what would be required of them to insure successful implementation of the plan, and gather from them their ideas and suggestions for emissions reduction strategies – either elaborations of strategies already listed in the plan or new strategies. Along with hosting a number of open meetings, feedback will be solicited through groups such as the Faculty Senate, Student Senate, three staff councils, Graduate Student Organization, and other individual operating units, departments, or organizations. The goals of these outreach efforts are to solicit new ideas for projects, identify areas where the initial estimates for projects need to refined, build support necessary for successful implementation of the final plan, and ensure that all campus stakeholders have a voice in WildCAP's development.

Simultaneously with these outreach efforts, key decision-makers in each of the working groups will be further analyzing the initial data presented by them to the ETF and working with staff members in their operating units to verify and refine the estimates in each of the projects of interest identified during the administrator's summit. During this process, assumptions related to costs or energy reductions of proposed projects will be reviewed by the staff members who will be responsible for their eventual implementation in order to provide expert review in each area.

Making use of feedback garnered from the outreach sessions and detailed analyses by the working groups, the ETF will assemble a complete WildCAP and offer it to UNH's President and his Cabinet for their review and approval in advance of the ACUPCC's deadline of September 15, 2009. WildCAP will then be reported to the ACUPCC following any guidelines they require, made available to the public, and published in a form useful for dissemination to UNH stakeholders.

Targets

Targets

Through the efforts of the ETF, the University has already made significant progress towards reducing its institutional greenhouse gas "footprint". To build upon this work and to help focus future efforts, a specific target level for greenhouse gas emissions and a timeframe for reaching that goal should be set. Setting such a target would:

- create a mechanism for evaluating possible greenhouse gas reduction strategies,
- provide a focus for communicating the outcome of such efforts to the wider community,
- further formalize the University's institutional commitment to climate change mitigation.

With a tangible goal in mind, future greenhouse gas reduction efforts could be evaluated and prioritized in terms of their contributions to achieving the target, to ensure that mitigation efforts are undertaken in the most efficient manner possible.

A useful framework for examining reduction strategies is the "stabilization wedges" idea developed by the Carbon Mitigation Initiative at Princeton University. No single activity or technology will eliminate all carbon emissions, but a variety of different policies (the "wedges") can work in conjunction to first stabilize, and then reduce aggregate emissions. Each wedge represents a policy, activity, or technology that reduces carbon emissions and is currently available but not fully utilized at present. The potential emissions reductions of the various projects contained in the Recommended Actions section and of the EcoLine™ landfill gas project were analyzed and used to help determine a achievable near-term target.[4]

"Wedge" Title	Reduction ($t CO_2e$)
EcoLine pre-2015 (selling RECs)	14,194
EcoLine post-2015 (no REC sales)	36,982.9
Renewables	903.1
Efficiency	2,567.2
Conservation	2,984.9
Transportation	1,277.2
TOTAL	**44,715.3**

[4] EcoLine™ will sell Renewable Energy Credits for the first 5 years of its operation to help offset the capital investment in the project and to raise fund for the energy efficiency fund (see Implementation section). Due to the sale of RECs, UNH cannot claim any emissions reductions from the electricity generated in the cogeneration facility but does retain rights to the steam generated in the process which heats campus buildings and offsets the use of natural gas which is normally used for heating.

The following set of targets for future reductions of the university's greenhouse gas emissions were developed by the ETF and accepted by the President's Cabinet at the end of the first year of developing this plan.

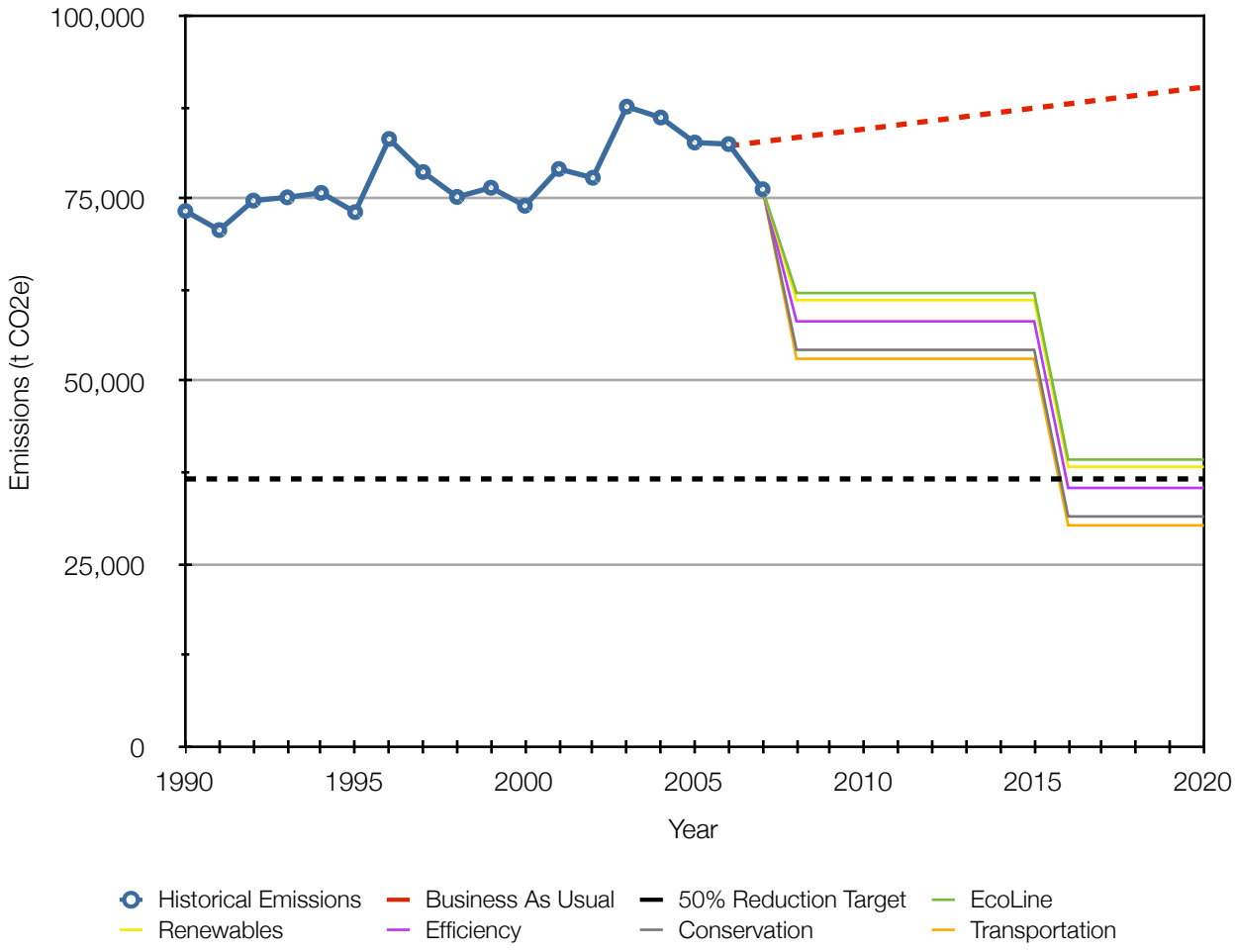
Baseline Year

All targets are measured against a 1990 baseline—the first year for which the university has collected data on its emissions in addition to being the benchmark for international actions related to climate change.

Planning Targets

This target was set in the near-term to serve as the focus of current planning activities related to greenhouse gas mitigation. The date of the target was chosen to correspond to the general 10-year planning horizon of the Campus Master Plan. The level of the target was chosen after conducting a preliminary analysis of the reductions possible from the list of projects described in the recommended actions section (see below) as well as the projected reductions from the EcoLine™ landfill gas project.

This target has been set at: **50% by 2020**



Projected Greenhouse Gas Reductions 1990–2020

The above graph details the projected reductions in campus emissions generated by the projects identified in the Recommended Actions section as well as from the EcoLine™ landfill gas project. UNH's historical emissions are shown though 2007. The step-down trajectory is created by the sale of RECs from EcoLine as detailed above.

Midterm Targets

This target was set in light of the latest scientific research into the global levels of emissions reductions needed to avoid significant disruption to the climate system. It will serve as a guideline for the next phase of planning in the university's development beginning in 2020.

This target has been set at: **80% by 2050**

Carbon Neutrality Goals

Both of these targets place the university firmly on the path to minimizing the impact of its operations on the climate system. UNH should aspire to achieve "climate neutrality"—elimination of any emissions—by the end of the century.

Achieving climate neutrality is an on-going process best thought of as a continual improvement through constant emission reductions.[5] The university has adopted a strategy of implementing change, either in the way campus activity is conducted or in the built environment, to achieve greenhouse gas reductions. We challenge ourselves by taking this more difficult path than the alternative of purchased credits which allow business as usual to persist.

[5] Dave Newport. Sustainability: The Journal of Record. August 2009, 2(4): 193-193.

Recommended Actions

Introduction

In order to achieve the targets outlines in this plan, the following series of recommended actions have been developed for the university to undertake which, when implemented, will reduce emissions to the required levels. Actions are divided into two broad categories: policies and projects. Policies are university-wide administrative directives which will facilitate implementation of specific projects or influence behaviors in members of the university community which will lead to emissions reductions. Projects are specific interventions in university operations—generally improvements to campus infrastructure—which will directly cut emissions. Projects and Policies are further categorized by their area of impact, e.g., renewable energy, energy efficiency, procurement, etc. A full listing and description of all recommended actions is contained in the Recommended Actions section of this plan and are summarized in the table in Appendix A.

In order for the savings projected by these actions to be achieved, they would need to be adopted and implemented by the university based on the recommendations of the plan as described in the implementation section which outlines the process that would take the recommendations in this section and develop them into achievable mitigation strategies. This section outlines potentials for projects and the resulting impacts on capital investment, cost savings, energy savings, and greenhouse gas reductions. Based on the analysis provided in this section, actions can be evaluated and prioritized for action over the initial 10-year time frame of this plan.

Policies

The following set of policy options are recommended for further development as part of the implementation of this plan. These recommendations are the starting point for a full policy development process as part of the implementation process (described in the next section), not fully developed policies in themselves. The highlight an area of current university practice that could be altered in order to enhance energy savings and emissions reductions. Where possible, the energy savings and costs were identified and modeled as a project (see below). Some of the policies described here are necessary to ensure the successful implementation of particular project. Additional policies were developed since they would in general support mitigation strategies across the university, even though those savings would not be easily tracked or associated directly to an identified project.

Policies are categorized broadly by the aspect of the campus that they will impact. This does not necessarily correspond to any specific operating unit or department on campus, as all policies would be campus-wide. These categories are computers, procurement, residence halls, space utilization, and transportation. An additional categories represents those policies that are not recommendations but requirements of the ACUPCC.

ACUPCC Commitments

On signing the ACUPCC, UNH committed to five of seven possible “immediate actions” to reduce greenhouse gas emissions. Two of these actions—a commitment to waste minimization through participation in the Recyclemania competition and support of public transit—have been achieved. Three additional actions need to finalized in the first year of implementation of this plan in order to ensure compliance with UNH’s commitments under the ACUPCC.

LEED Silver-Equivalent Building Policy

UNH is nearing completion of its first formal LEED certified building renovation project. Using the lessons learned from this experience and working with the project team, we are updating our existing design and construction standards to add sustainability criteria that have proven appropriate to the UNH climate, geographical location and campus architecture and building standards. A scorecard will also be developed to be completed by project teams to document that future projects have achieved the minimum target that would be the equivalent of LEED Silver certification.

ENERGY STAR/EPAT Purchasing Requirement

- The University's current ENERGY STAR policy should be strengthened as follows:
  - In all areas for which ENERGY STAR/EPEAT[6] ratings exist, the products that UNH purchases will be ENERGY STAR/EPEAT certified or meet the performance requirements for certification.
  - In areas for which guidelines are not available, UNH will seek energy efficient products.
  - For cases where it can be demonstrated that the available ENERGY STAR/EPEAT products are not adequate for the task that is needed, an exception may be granted.

Tracking of university-funded long-distance travel (including air travel)

A system of reporting travel reimbursements and purchases should be developed that would record the mode of travel (plane, train, auto, etc.) and the distance traveled. This data will provide the basis for estimating greenhouse gas emissions associated with faculty, staff, and student travel.

Computer Policies

These policy recommendations are directed towards two categories: individual computers (desktops, laptops, netbooks, etc.), and enterprise computers (servers)

Individual Computers

Network Power Management

- Require network registration of computers for both students and faculty/staff on an annual basis, effective immediately, to enable implementation of:
  - Phase 1: monitor power management during registration process
  - Phase 2: both monitor and desktop power management during registration process

ENERGY STAR/EPAT Purchasing Requirement

- The guidelines for ENERGY STAR Purchasing requirements detailed in the ACUPCC commitments section will be followed.
- The UNH Computer Store will sell computers that adhere to the above

Expand Power Down

- Power off computers, monitors, and printers when not in use
  - Do not turn on peripherals unless needed
  - Administrative computers: power off at night and on weekends; enable sleep mode during normal workday

[6] EPEAT is a system to help purchasers evaluate, compare and select electronic products based on their environmental attributes. The system currently covers desktop and laptop computers, workstations and computer monitors. EPEAT is based on the IEEE 1680 family of standards for electronic product environmental assessment. Desktops, laptops and monitors that meet 23 required environmental performance criteria may be registered in EPEAT by their manufacturers. Registered products are rated Gold, Silver or Bronze depending on the percentage of 28 optional criteria they meet above the baseline criteria. EPEAT operates an ongoing verification program to assure the credibility of the registry.

- Student computing clusters: set monitors to power off and hard drives to spin down during periods of inactivity; enable automatic shutdown at closing hours
- Kiosks: enable sleep mode for both monitors and computers

Eliminate Screen Saver Usage
Do not use screen savers unless monitor is CRT

Default Printing Settings
- Default settings should be for double-sided printing, draft quality, if possible (requires education for both students and faculty who may require simplex printing)
- Enable printer power management, if possible

Networked Printers
Encourage use of networked printers rather than local printers wherever possible

Enterprise Computers

Energy Monitoring
Monitor and implement energy efficiency in purchases and infrastructure as technology advances:

- Data Centers must adhere to best practices for energy efficiency, such as: thermal management, server blanking panels, storage consolidation, power distribution units, hardware decommissioning
- Server Virtualization should be the first consideration when replacing or purchasing new equipment
- EPA's ENERGY STAR and Data Center Efficiency Initiative should be monitored for enactment

Data Center Management
- Strive toward consolidation of data centers where appropriate
- Strive toward relocation of all local departmental servers to data centers where appropriate
- Use KVM switches for servers (eliminate individual keyboard, video, mouse)
- Identify servers that can be powered down during nights, weekends and off-peak periods and/or enable power management features wherever possible and appropriate

Networked Printers
- Configure default settings for double-sided, draft quality printing
- Enable printer power management

Procurement Policies

ENERGY STAR/EPAT Purchasing Requirement
The guidelines for ENERGY STAR Purchasing requirements detailed in the ACUPCC commitments section will be followed.

Purchasing Training Program
Staff and Faculty responsible for any type of buying decisions, should be asked to incorporate sustainable purchasing practices into any work-related purchases they are involved in. This will be incorporated into both Procurement Card (P-card) training conducted with cardholders when a card is issued, and also as part of the Purchasing Essentials training offered by USNH Purchasing monthly. Information will be disseminated verbally and incorporated (in a shorter format) in the handouts already provided at both training sessions. Additionally it should include something in HR orientation/ handouts also or have it sent out to staff members who may have already been to training.

Computer Purchases

See Computer Policies section for purchasing requirements for individual and enterprise computers

Vehicle Purchases

See Clean Fleet Program under Transportation and Mobile Emissions Policies for details.

Office Products

The university should strongly encourage the purchase of products with high recycled content.

- The OfficeMax-USNH contract website www.officemaxsolutions.com has an option to sort items by recycled content.
- Cost of recycled products has come down significantly in the last 5-10 years, so the recycled product is usually comparably priced.
- USNH has a contract with OfficeMax for 100% post consumer recycled copy paper.

Green Cleaning Supplies

The university should strongly encourage the purchase of "green" cleaning products.

- USNH has options for "green" cleaning/janitorial products built into the current janitorial supplies contracts.

Packaging & Delivery

All UNH operating units should be encouraged to place less frequent, larger orders to cut down on overall packaging, fuel consumption, and emissions from delivery vehicles. (Including Fed Ex/UPS deliveries). Buying locally whenever possible cuts down on emissions from delivery vehicles as well.

End of Life Management–Reduce, Reuse, Recycle

UNH Surplus Program – Found at http://www.unh.edu/purchasing/surplus/index.html has avenues for scrapping, selling, transferring, and donating, unused items to others. Using the program ensures that the items are not unnecessarily going into the landfill, that any rules and regulations are followed for disposal, and allows others to take advantage of our extra items.

Residence Hall Policies

Residential Life and Housing should work with the Student Senate to enact the following policies for students living in UNH-owned housing.

Guidelines for Refrigerators

- Refrigerators brought to campus must meet the ENERGY STAR requirement. This would apply to new students starting in the first year of implementations, and carry over through their 4 years at UNH (i.e., in year 1 it would only apply to 1st year students, in year 2 to 1st and 2nd year students, etc.).
- A limit should be placed on the number of refrigerators allowed in each room based on the number of occupants

Room Size	Number of Refrigerators
Single	1
Double	1
Triple	2
Quad	2

Lighting Requirements

- Prohibit incandescent light-bulbs in student-owned lighting (CFLs or LEDs only).

Space Utilization Policies

In order to effectively reduce energy consumption on campus, we must use our buildings as efficiently as possible. Effectively using the space by departments, campus organizations, students, staff, and faculty, we can minimize our energy consumption and further reduce our greenhouse gas emissions.

Temperature Setpoints

- Establish campus setpoints that all end users must adhere to:
  - 68°F during the heating season
  - 78°F during the cooling season
- Setpoints will be administered globally through the campus building automation system and through local thermostat controls with lockout settings.

Space Programming/Scheduling

- Utilize fewer buildings during breaks to minimize equipment operations.
- Require all summer classroom scheduling to go through the registrar's office.
  - Classroom scheduling will be more evenly spread out for the 5 day week to use fewer buildings that would already be in operation.
- Encourage summer conferences to use fewer residence halls to allow more buildings to be completely offline all summer.
- Look at new construction facilities to utilize specific end uses
  - Separate offices from labs and classrooms, etc.

Building Representatives

- Assign volunteers to represent each core building on campus to act as liaison with the ETF for broadcasting information to their building:
  - Display information regarding energy consumption
  - Contact occupants during break powerdowns and other initiatives
- Work with occupants to offer assistance with heating/cooling controls, window a/c units, shutting lights and windows, etc.
- Train to use auditing tools and conservation practices to teach occupants

Fume Hood Management

- Enforcing better lab space operations:
  - Requiring all fume hoods to be off when not in use, as feasible.
  - Requiring all fume hood sashes be lowered when left in operation.
- Requiring the use of high-efficiency, low-flow fume hoods whenever practical.

Space Heater Prohibition

- Restricting any personal space heaters use.
- Requiring facilities operations to fully assess area before allowing a space heater to be used TEMPORARILY until permanent solution is identified.

Transportation and Mobile Emissions Policies

The following policies influence the University-owned fleet and related transportation infrastructure and programs. They should enable the continued incremental changes in parking eligibility, flexibility and pricing strategies in coordination with Transportation Policy Committee and Campus Master Plan policies and enhance sustainable transit, transportation demand management (TDM) and alternative mode expansions in coordination with Transportation Policy Committee and Campus Master Plan policies and maximizing federal and state funding partnerships.

Clean Fleet Program

UNH should Institutionalize a comprehensive program to affect procurement of new vehicles and improve fuel and emissions efficiency of existing on-road and off-road vehicle fleet. The program would encourage overall motorized fleet reduction/improved utilization and right-sizing, through proactive promotion of high efficiency, low emission vehicles to replace existing fleet. The University will adopt coordinated polices and practices affecting procurement and operations which ensure UNH meets or exceeds all federal and state fleet emissions rules and demonstrates a leadership role in the use, management and growth of clean and alternative fueled fleet vehicles. This program will include expansion of EcoCat, rightsizing and efforts to maximize fleet efficiency and minimize operations cost, petroleum fuel use, motorized vehicle-miles-traveled (VMT) and emissions.

The program will require reallocated UNH resources to support a coordinator familiar with fleet management and efficiency technologies, EPA, DOE and DOT funding programs and state air quality and energy initiatives.

The coordinator would ensure UNH meets or exceeds all state and federal policies and goals regarding fleet energy and emissions and demonstrates best practices in the introduction of alternative fuel technologies. The program will also seek to identify underutilized fleets for culling and or replacement with non-motorized mobility or transport options for goods and people.

Working with Energy and Campus Development identify new or modified infrastructure needs for continued expansion of a mixed alternative fuel fleet portfolio. Also, in conjunction with UOS and Campus Planning, develop standardized data metrics for fuel efficiency, fleet mpg and other statistics used for national and comparator benchmarking.

Employee Telecommuting

The UNH Employment policy should updated to allow for flexible work alternatives, including an option to allow designated employees the ability to telecommute from an appropriate location up to two days per week. The University System of New Hampshire (USNH) is currently in the process of developing such a policy and UNH should work with the system institutions to finalize and implement this policy.

Additionally, UNH should define the scope and nature of such a policy for the UNH campus, taking into consideration the progress of the USNH process, the experience of UNH operating units that already have experience with informal telecommuting arrangements, and any other specific considerations for the Durham campus. A UNH specific policy, either in advance of a USNH policy, or as a modification of the USNH policy should be considered as an option.

Lastly, the conditions of implementation should be developed.

Complete Transition to Low-Sulfur B20

Modify UNH operations and construction standards for diesel vehicles, mandating 100% UNH and on-site contractor vehicle/equipment utilization of low-sulfur B20 (or higher bio content) fuel. Pursue all available funding partner resources to retrofit emissions of such UNH vehicles.

Strengthen Anti-idling Provisions

Strengthen anti-idling Initiatives and enforcement in coordination with NHDES. Determine targeted internal and external client education campaign to increase compliance with no-idle rules for state vehicles. Campaign will include directed outreach, signage and enforcement. Modify 10 minute parking signs to say: “engine off – blinkers on”.

Support Ongoing & Planned TDM Efforts

UNH should work with the Transportation Policy Committee (TPC) and Energy Task Force (ETF) to support and improve the transportation options available to community including but not limited to:

- Carsharing (ZipCar)
- Expanded bike and pedestrian routes and infrastructure
- Ridesharing (GoLoco)
- Hosting expanded intercity transit connections
- RailCat: RailCat is a pending proposal to the Northern New England Passenger Rail Authority (NNEPRA) which would permit UNH faculty, staff and students to commute weekdays between Dover or Exeter and Durham. This would create a virtual extension of the current free-fare Wildcat Transit system. UNH would pay NNEPRA a negotiated fee for this new service.
- South Drive Transitway and walking campus
- Transit Information Systems
- Cat Courier Revitalization

Projects

The following series of recommended actions are specific project that could be undertaken to directly reduce camps greenhouse gas emissions. The majority of the actions specify are particular improvement to campus infrastructure which would lead to reductions in energy consumption or substitute an energy a low-carbon energy source for an area of fossil fuel consumption. The project have been placed in four categories: conservation, efficiency, and renewables.

All cost and emission reductions were calculated using the latest version (v6.3) of the Clean-Air Cool Planet Campus Carbon Calculator. This tool was originally developed at UNH for the conducting of greenhouse gas emissions inventories at the scale of college or university campus and has since been expanded to included a projection module that allows for the modeling of future emissions, energy costs, and can use that data to estimate the potential savings in costs and emissions compared to those business-as-usual scenarios. In all cases in this plan the project were evaluated using the default settings of the Campus Carbon Calculator in terms of cost projections, emissions growth, inflation and discount rates. This was done to produce the least complicated and most transparent set of projections that would be broadly comparable to mitigation strategies modeled by other signatories of the ACUPCC. As part of the implementation of any given action, an early step should be a review of these assumptions and the adoption of any modifications deemed necessary.

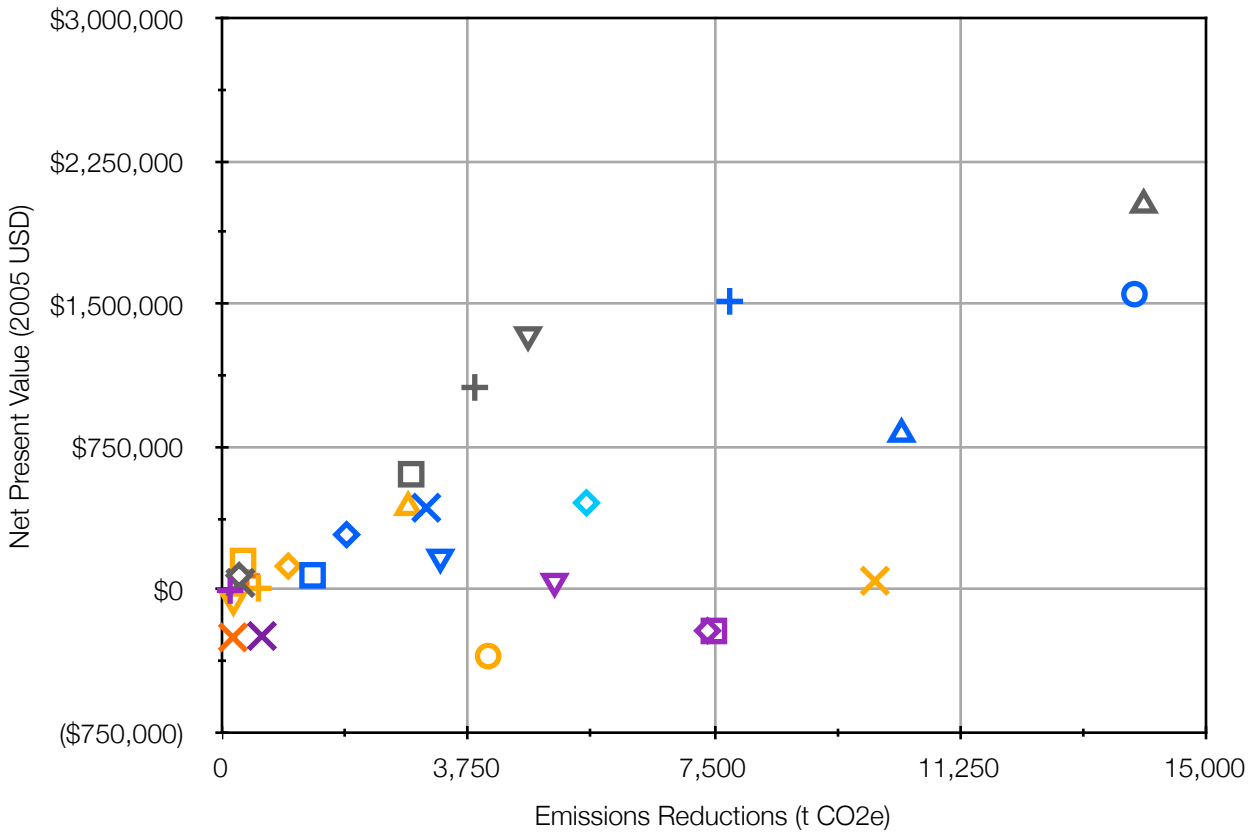
The following project descriptions give a brief overview of the project, the method by which it will generate emissions savings, and any assumptions that went into the data for the project that was used in the Campus Carbon Calculator.

The graph below summarizes the cost and emissions data from all projects described in this sections. The vertical (y) axis shows the Net Present Value (NPV) of the project over its lifetime (which varies from project to project). This is a method of discounting future cost savings so that they can be evaluated against current investments. Project with positive NPV will save money over the lifetime of project and will lead to a return on the initial investment into the project.

The horizontal axis shows the total emissions savings of the project over its lifetime.

The projects displayed on the graph are colored according to category: renewable energy projects in violet, energy efficiency projects in blue, conservation projects in grey, and transportation projects in orange.

Projects in the upper-right quadrant of the graph have both the largest return on investment and emissions reductions making them particular priorities for implementation. It should be noted that this method of analysis is imperfect when applied to transit projects. In those cases, costs that are currently being borne by individual members of the university community would become institutional costs to the university itself. This frequently results in a negative NPV, but may still represent an overall economic benefit to the university community if institutional costs are lower than the sum of all individual costs.



Projected Lifetime Cost Savings and Greenhouse Gas Reductions

Each category below contains a summary table of the projects in that section listing some of the key economic and emissions data estimate in this analysis.

Conservation

The following set of projects have been classified as related to conservation. Their primary focus is around reducing the demand for energy though changing the way energy is used on campus either through changes in standard operating procedures or in individual behaviors taken by member of the university community. They differ from efficiency projects in that they less reliant on equipment for energy reductions. These projects are excellent candidates for the focus of campus outreach initiatives and in many cases there success is enhanced or dependent on the success of such outreach efforts.

Projected Economic and Emissions Reduction Data for Conservation Projects

Project Name	Duration (years)	Total Capital Cost	Average Discounted Annual Cash Flow	NPV	Discounted Payback Time (years)	Annual Reductions (t CO_2e)	Total Lifetime Reductions (t CO_2e)
Network Power Management	5	-	$ 176,904	$ 1,061,422	<1	-770.7	-3,853.3
Power Down Expansion	10	-	$ 3,246	$ 35,708	<1	-28.2	-281.8
Real-time Energy Monitoring in Residence Halls	10	$ (220,000)	$ 55,093	$ 606,025	2.58	-288.4	-2,883.7
Refrigerator Guidelines in Residence Halls	10	-	$ 6,798	$ 74,774	<1	-26.1	-261.0
Space Programing/ Scheduling	10	-	$ 121,494	$ 1,336,434	<1	-466.6	-4,665.5
Temperature Setpoints	10	-	$ 183,591	$ 2,019,501	<1	-1,405.0	-14,050.5

Temperature Setpoints

This project would reduce the amount of energy used for heating and cooling buildings by setting thermostat set-point in campus buildings with currently functioning Building Automation Systems (BAS) one degree cooler in the winter and one degree warmer in the summer than current levels. See the policy section for additional details.

Space Programing/Scheduling

This project would decrease overall demand for energy by minimizing the amount of space on campus that would need to be heated or cooled at any given time by centralizing the scheduling of classroom and meetings to improve building utilization rates.This is particularly important in the summer when many buildings on campus are underutilized. By consolidating most summer programs into a few buildings, some buildings would no longer be needed and could would not need cooling.

Real-time Energy Monitoring in Residence Halls

Research suggests that individuals are more likely to conserve energy when they are aware of how much energy they are consuming at any given time. The UNH Energy & Utilities Office is currently undertaking a radio-metering project for utility meters across campus. These meters would provide real-time data on energy consumption across the campus. By placing this data in a visible location in campus buildings occupants would have a real-time feedback mechanism allowing them to see the results of any conservation activity such as turning off lights, powering down computers, etc. This project used data from studies conducted at Oberlin College on amount of energy students saved when exposed to energy use information to calculate similar savings in UNH student residence halls. This project could also be deployed in academic and office buildings on campus, but no data is available to estimate how much energy could be saved. James Hall, which is currently under construction and slated to receive LEED certification, will have an kiosk in the entry way displaying current levels of energy use in the building. Information gathered from this project could be used to model further deployment of this type of project outside of a residence hall setting.

Residence Hall Refrigerator Guidelines

This action would replace general industry refrigerators ENERGY STAR rated refrigerators in student rooms. It assumed each double room currently uses 2 mini-fridges which would be replaced with a single ENERGY STAR-rated mini-fridge. See the policy section for more details.

Power Down

Since 2003, UNH has conducted a Power Down campaign during the Thanksgiving and Winter breaks. Student, Faculty, and Staff are encouraged to turn off computer and other office equipment and to switch off power-strips or unplug them to eliminate phantom load. This project assumes that a more robust and coordinated outreach campaign could achieve an additional 5% in energy savings then has been observed in the past. This effort could additional be expanded to be standard procedure at the end of a work day or on weekends in office buildings and not a special occurrence over breaks. See the policy section for more details.

Network Power Management

This project would use an annual network registration process to ensure that all computers on the UNH network were set up to use an energy saving sleep mode for both the computer and monitor. Standard data on sleep mode energy savings from the U.S. EPA was used to estimate the potential energy savings from approximately 10,000 computers on the uNH network. Currently UNh uses a one-time network registration process to ensure that virus protection software is installed on machines connected to the UNH network. This system to could expanded to take place annually and to include setting of sleep mode features automatically. See policy section for more details.

Efficiency

The following set of projects have been classified as related to efficiency. Their primary focus is around reducing the demand for energy though improvements to camps infrastructure and equipment. They differ from conservation projects in that they less reliant on individual actions and campus outreach.

Projected Economic and Emissions Reduction Data for Efficiency Projects

Project Name	Duration (years)	Total Capital Cost	Average Discounted Annual Cash Flow	NPV	Discounted Payback Time (years)	Annual Reductions (t CO_2e)	Total Lifetime Reductions (t CO_2e)
Absorption Chillers	25	$ (264,000)	$ 11,122	$ 289,177	12.11	-76.0	-1,899.1
Building Automation Systems	15	$ (450,000)	$ 94,574	$ 1,513,188	3.38	-515.9	-7,739.1
Chiller Plant Conversion in Philbrook Hall	25	$ (2,200,000)	$ 31,436	$ 817,336	18.37	-414.3	-10,358.6
Heat Distribution Insulation	10	$ (200,000)	$ 15,406	$ 169,466	5.37	-332.9	-3,329.0
Improved Motor Efficiencies	10	$ (320,000)	$ 6,861	$ 75,470	8.10	-138.1	-1,380.6
Lighting Upgrades	10	$ (461,710)	$ 39,122	$ 430,337	5.15	-311.4	-3,114.1
Low-Flow Fume Hoods in Parsons Hall	25	$ (2,374,588)	$ 59,648	$ 1,550,840	15.30	-556.4	-13,909.5
Wood-frame Building Insulation	25	$ (190,000)	$ 17,540	$ 456,029	7.70	-222.2	-5,555.4

Absorption Chillers

This project would replace electric air conditioners in Pettee and Hewitt Halls with adsorption chillers which would run on steam produced in the campus combined heat and power plant. Currently, during the cooling season, more steam than can be utilized is produced by the cogeneration plant as part of the electricity generation process. This project would make use of that steam for cooling, which is more efficient than electric AC, uses a currently unused resource, and further reduced the demand for electricity on campus. The project assumes a the purchase of a 70 ton chiller unit for Pettee hall and a 150 ton unit for Hewitt. Both unit would be tied into the existing central chiller node on campus. The resulting systems would save 200,000 kWh annually with no additional use of landfill gas or natural gas in the cogen facility.

Building Automation Systems

This action is upgrading the building automation systems. This system automatically regulates airflow and affects the amount of cooling or heating needed in a building; it can also control the lighting in a building depending on expected occupancy times. Occupancy sensors regulate air flow based on the number of occupants in a room or building. This system is more efficient because it regulates air flow by area in a building, only the parts of the building being used will have increased air flow. With a more efficient system in place, regulating air flow and using less energy to heat/cool areas that are unoccupied, the university can use its energy system more efficiently. Controls will typically save 20–30% of the buildings energy compared to current operations.

Chiller Plant Conversion in Philbrook Hall

This project would convert a large chilled water system that serves several adjacent buildings with cooling from electricity to steam generated in the cogeneration plant. It is similar to above adsorption chiller project but much larger in scale and would not utilize existing steam resources. It is estimated that such a project would save 1 Million kWh annually.

Heat Distribution Insulation

This project would upgrade and repair the insulation on the existing hot-water pipes that distribute heating water from the central cogeneration plant to campus buildings. Many of the pipes are not well insulated or are older and in need of repairs to the existing insulation.

Improved Motor Efficiencies

The project would upgrade various motors across campus to more energy efficient models. Most of the motors are used for air circulation in campus buildings. It was assumed there are 100 motors in need of upgrade and that on average about 3,300 kWh would be shaved annually by each.

Lighting Upgrades

This action upgrades lighting in the following UNH campus buildings; Field House, Hood House, Leavitt Center, Paul Creative Arts Center (PCAC), Zais Hall, Nesmith Hall, Health Services and Child Study and Development Center (CSDC). Savings are based on 60% savings estimated from upgrading to Super T-8 Lamps and Electronic Ballasts, lighting controls, HID lamps, CFL's, etc.

Low-Flow Fume Hoods in Parsons Hall

This project would substitute high efficiency chemical fumes hoods in approximately 100 laboratory facilities which are slated to be renovated for the standard hood models. Cost and savings data are based on similar hood designs currently in place on campus.

Wood-frame Building Insulation

This project would install new insulation in several campus buildings such as 11 Brook Way, Elizbeth Demerritt, Grant House, Craft Cottage, Ritzman.

Renewables

These project seek to cut emissions by replacing the use of fossil fuels with renewable energy sources. With 85% of campus energy needs currently being supplied by renewable energy from the EcoLine™ project, additional project much be considered in light of that project and seek to supplement EcoLine™ rather then duplicate its efforts.

Projected Economic and Emissions Reduction Data for Renewable Projects

Project Name	Duration (years)	Total Capital Cost	Average Discounted Annual Cash Flow	NPV	Discounted Payback Time (years)	Annual Reductions (t CO_2e)	Total Lifetime Reductions (t CO_2e)
Geothermal Heating in Gregg Hall	25	$ (1,000,000)	$ (8,275)	$ (215,137)	N/A	-296.1	-7,402.0
Solar Panels, 50 kW	25	$ (420,000)	$ (9,336)	$ (242,732)	N/A	-24.3	-608.6
Solar Thermal in Parsons Hall	25	$ (546,989)	$ 1,638	$ 42,589	23.35	-202.8	-5,069.9
Wind Turbines, 10 kW	25	$ (40,000)	$ (146)	$ (3,792)	N/A	-5.0	-124.3
Wood Pellet Substitution in Oil Boilers	20	$ (400,000)	$ (10,301)	$ (216,331)	N/A	-374.9	-7,498.4

Geothermal Heating in Gregg Hall

Gregg Hall is not connect to the central heat distribution network and therefore cannot be heated or cooled with energy from the congregation plant and EcoLine. This project would replace the current boiler system with a geothermal heat pump to provide heating and cooling.

Solar Panels, 50 kW

This project would place a small photovoltaic panel array somewhere on campus. The electricity generated could be used to supplement the electricity generated in the cogeneration plant.

Solar Thermal in Parsons Hall

This project would install a solar thermal hot water system as part of the upcoming renovation of Parsons Hall. This system would provide domestic hot water to the building and would reduce the demands the building places on the cogeneration facility allowing additional steam and hot water to used in other locations that cannot currently produce them as efficiently.

Wind Turbines, 10 kW

This project would locate a small wind turbine on campus to be used for generating electricity. This would be a single tower similar to the type used at the UNH facility on the Isles of Shoals or by the nearby Town of Kittery, ME.

Wood Pellet Substitution in Oil Boilers

The University of New Hampshire has an excess of biomass that is not currently used for energy production on campus. This biomass is a by-product of the Woodland Office managing university lands; the forested lands are sustainably managed by thinning the forest to allow for healthy growth. This by-product is any part of the trees harvested that cannot be sold as lumber. It could replace fossil fuel energy sources in buildings that are not connected to the cogeneration plant for energy. This biomass, in the form of wet wood, dry wood or wood pellets, can be burned in wood burning boilers for heating.

Transportation

These project seek to cut emissions by reducing the use of fossil fuels for mobility. These project consist of both projects to reduce the use of individually owed private vehicles on campus by increasing transit options offered by the university as well as reducing the overall consumption of fuel used by the university fleet though high efficiency and alternative fueled vehicles.

Projected Economic and Emissions Reduction Data for Transportation Projects

Project Name	Duration (years)	Total Capital Cost	Average Discounted Annual Cash Flow	NPV	Discounted Payback Time (years)	Annual Reductions (t CO_2e)	Total Lifetime Reductions (t CO_2e)
Biodiesel (Low-Sulfur B20) Transition	5	$ (2,000)	$ 1,267	$ 7,600	<1	-111.0	-554.8
Campus Connector Expansion	10	$ (50,000)	$ (22,727)	$ (250,000)	N/A	-16.6	-166.2
Cat Courier Expansion	10	$ (15,000)	$ 6,631	$ 72,941	1.60	-37.8	-378.4
Clean Fleet Program	15	$ (5,000)	$ (3,438)	$ 432,628	<1	-189.2	-2,837.6
Employee Tele-commuting	25	-	$ 1,810	$ 47,070	<1	-398.1	-9,952.2
Infrequent Parking Permits	25	$ (1,000)	$ 4,769	$ 124,000	<1	-40.4	-1,009.5
RailCat	10	$ (500)	$ (13,682)	$ (150,500)	N/A	-32.1	-321.2
Transit Marketing Expansion	5	$ (5,000)	$ (9,167)	$ (55,000)	N/A	-34.5	-172.6
WildCat Service to Rochester	10	$ (100,000)	$ (31,638)	$ (348,022)	N/A	-405.7	-4,057.3
WildCat Tranist Frequency Increase	10	-	$ (72,030)	$ (792,329)	N/A	-11.8	-117.9

Biodiesel (Low-Sulfur B20) Transition

Funding for final transition to use of B20 for all UNH diesel fleet vehicles. See Policies section for additional detail.

Campus Connector Expansion
Re-design Campus Connector service to provide improved Madbury Road corridor coverage.

Cat Courier Expansion
Provide funds to expand marketing and services. Expand to weekday on-call, on-campus courier service for people and packages at a per trip fee.

Clean Fleet Program
Requires re-assigned or new staffing to oversee Eco-Cat and Clean fleet vehicle replacement program. Integrated position with Purchasing, ETF and Fleet Manager.

Employee Telecommuting
This project assumes that 10% of all FTE staff would take advantage of a telecommuting policy (see Policy section) one day per week. Emissions reductions are generated in two areas: lower commuting emissions and reduced electricity use. The reduction in commuting vehicle-miles-traveled was estimated by reducing the number of commuters and the number of days per week in the model used to track commuter emissions for the GHG inventory. Additionally, it was also assumed that each telecommuting employee would have a desktop computer consuming 70W of power that would be shutdown for an additional 8 hours per week.

Infrequent Parking Permits
Implement program for those who opt out of annual permit. Service would provide 12 single-day passes for campus lots in exchange for opt out.

RailCat
Fiscal Agreement with Rail Authority to permit UNH ID holders weekday non-reserved transport between Durham and Dover or Durham and Exeter.

Transit Marketing Expansion
Increased UTS allocated funding for UTS annual marketing program of transit and other non-SOV alternatives.

WildCat Service to Rochester
Restore historic route from Rochester to UNH via NH 125.

WildCat Transit Frequency Increase
Increase existent route frequency to hourly service during academic year.

Implementation

Overall Implementation Strategy

Implementation of recommended actions will require coordination across all units of the campus. Priority actions have been identified through the development of this plan by the ETF and specific actions will be selected for implementation in a given fiscal year based on those priorities and in light of related actions already taking place in that year. Actions selected for that year will be brought to the President's Cabinet for approval to proceed. The ETF will develop a campus-wide team made up of members from the relevant operating units to refine the action and facilitate its development and adoption through the normal channels of policy creation, shared governance, and facility improvement project management as appropriate.

UNH has established procedures for the development of institutional policy already in place.[7] These guidelines can serve as the basis for implementation teams working to develop one of the the recommended actions in the previous sections into an instituted policy. Additionally, the university has process in place for the review of constructions projects, submission of projects for funding under the repair and renovation budget process, and other mechanisms that can be utilized by an implementation team to help bring a recommended policy to completion.

At the beginning of each academic year, the ETF will review the list of recommended actions and select priority items for implementation in that year. A subcommittee, consisting of ETF member as well as key faculty, staff, and students, essential to implementing the action, will be established for each action to be implemented in that year. In addition to the overall emissions reductions and cost saving potential, actions should be evaluated on ease of implementation, relation to other campus activities (e.g., a building renovation would prioritize any actions associated with that building), and other criteria which may speed the implementation of the project. In this way, the maximum number of projects can be completed by selecting the most advantageous projects for early implementation and building on those successes to facilitate completion of more complex actions.

Subcommittees will report monthly at the ETF meetings until the action is completed. Actions that will require a long implementation process should be broken into definite, achievable goals which can be completed over the course of one academic semester.

Financing

Actions will be financed through two primary mechanisms. First, the university's new energy efficiency fund will be used as a primary source for on-going funding of energy savings projects with a significant cost savings that can be recouped by the fund. Additional funding will need to be prioritized within existing internal funding mechanisms and external sources as available as part of implementation.

UNH Energy Efficiency Fund (EEF)

Starting in fiscal year 2010, UNH will begin funding energy efficiency projects through its new Energy Efficiency Fund (EEF). The intent of the fund is to capture ALL energy cost savings associated with energy efficiency retrofits through an

[7] http://usnholpm.unh.edu/UNH/III.Admin/E.Guidelines.htm

internal collection mechanism similar to a systems benefit charge (SBC) that are common within electric and gas utilities in the country. The captured savings, as collected through the SBC, will be returned to the EEF fund balance to further invest in retrofit projects that would yield energy savings.

UNH has two types of end users on campus: the first is the larger set of buildings used for academic and research purposes and the second group serve the student population for dining and housing. Since the student service organizations collect their funding from fees, they are charged a consumption based fee for all utilities. The academic facilities (the larger percentage of buildings, as well as the more inefficient) are funded through research grants and tuition, making it difficult to recover costs across departments and schools. These groups, therefore, are charged for utilities on a square foot basis. This is a deficiency in the school's accounting system that is being addressed, but is not seen as changing in the near term.

With the student service organizations paying for utilities based on consumption, there is a direct incentive for conservation. That does not exist in the square footage methodology, as all costs are spread across all end users. Therefore, the EEF will fund efficiency projects in these buildings to lower operating costs and save energy. The tracked savings will be forecast for the following fiscal year and applied to an average BTU (British thermal unit (general energy unit that can be traced to all energy consumed on campus)) rate to determine the total funding required for the EEF in that upcoming fiscal year. That budget amount will be allocated evenly across all academic buildings through the existing square footage allocation methodology. The true savings will be reconciled over the next year and added/subtracted from the EEF balance. The captured savings for each project will be tracked over the lifetime of each project's expenditure.

Although only the student service organizations are charged based on actual consumption, ALL buildings on campus are metered for end use energy consumption. This metering (over 600 meters campus-wide) allows us to track the impacts of each project to modify what the projected savings were during budget development. Using the International Performance for Measurement and Verification Protocol (IPMVP) standards, UNH will only recover quantified savings from its investments.

The establishment of this fund allows for investment in energy efficiency, which has been lacking in this past decade, to further our campus goals of greenhouse gas reductions but also becomes a dedicated funding mechanism that need not seek funding approval each budget cycle. The savings generated have provided its needed revenue stream. It also becomes an established fund that others (grants, gifts, etc.) can contribute to knowing that a successful return on investment will be achieved.

Renewable Energy Credits (RECs)

The landfill gas utilized by the EcoLine project is classified as a renewable resource and therefore electricity generated from it can be sold as Renewable Energy Credits for purchase by entities needing to purchase renewable energy to meet regulatory or voluntary commitments for emissions reduction or renewable energy development. The purpose of Renewable Energy Credits is to further the development of renewable energy and reduce overall energy consumption in the region.

The RECs generated by EcoLine will be sold for a 5-year period ending in 2015. Revenue from these sales will help finance the development cost of the project. Additional revenues will be added to the energy efficiency fund to finance additional projects on campus.

Tracking & Reporting

The university's greenhouse gas emissions will continue to be tracked annually by the University Office of Sustainability (UOS) and presented to the university in a biannual report developed by the ETF. This report will serve as the basis for UNH's reporting requirements to the ACUPCC.

Additionally, the implementation status of individual actions will be tracked by the implementation teams using the template contained in Appendix B of this plan and reported to the ETF on an annal basis.

After 5 years, the list of actions will be reassessed to ensure that the targets can be met by implementing the remaining actions. New actions will be added as needed to meet the targets.

Integrating Across the "CORE"

A further goal of the ACUPCC is to encourage signatories to integrate climate neutrality and sustainability into the educational experience of students, research activities, and public outreach. This plan identifies mechanisms for building on the university's existing commitments to integrate sustainability throughout its curriculum, operations, research, and engagement (CORE). In relation to climate change, these activities have been the explicit mission of UOS's Climate Education Initiative (CEI), since it's founding in 1997. The activities of CEI will be further enhanced by the development of the UNH Sustainability Academy.

The UNH Sustainability Academy is a university-wide initiative to significantly increase the impact of UNH's curricular, research, and engagement programming in sustainability. The Academy will build upon UNH's strengths across the sciences, humanities and campus practices to offer a range of integrated educational, research and engagement experiences that respond to the challenges and opportunities of sustainability.

Over the past year, a series of focused workshops and broader strategic planning sessions has brought together more than 200 faculty, staff and students to plan the next phase of sustainability and UNH strategic priorities including the development of the UNH Sustainability Academy (UNHSA). UNHSA will be unique in its conception and role within the university. Rather than proposing a new school or department with sustainability majors, UNHSA will be designed to connect more faculty, students and stakeholders with the challenges and opportunities of sustainability and, in the process, enlarge the community of inquiry engaged in collaborative innovation and creative problem solving. UNHSA will extend the innovative and collaborative approach to sustainability that has garnered UNH recognition and will increase the number and quality of students, faculty and staff who choose to come to the university to take advantage of unique opportunities to engage in integrated scholarship for sustainability.

The Academy's programmatic and administrative organization will build directly upon more than a decade of UNH leadership in sustainability that has resulted in national recognition. Four task forces and an executive committee will integrate faculty, staff, student and stakeholder knowledge and perspectives that will guide Academy programming and development. The Academy will facilitate integrated scholarship for sustainability that drives collaboration and connectivity across research centers and academic programs on campus to contribute to the development of a new generation of interdisciplinary scholars and practitioners working at the intersection of ecology and society.

Appendix A: Actions Summary

Actions Summary Table

The following table summarizes all actions, both projects and policies, described in the "Recommended Actions" section of this document and rates them according to several criteria–which are explained below:

Action Title

The name recommended policy or project.

Project/Policy

Indicates whether the action is a project, policy, or both.

Carbon Reduction Potential

Indicates the relative emission reductions of this action compared to other actions.

Rated: Very High, High, Moderate, or Low.

Cost Savings Potential

Indicates the relative cost savings of this action compared to other actions.

Rated: Very High, High, Moderate, or Low.

Implementation Potential

Rates the relative ease of undertaking this action compared to other actions taking into consideration upfront capital costs, required staff time, administrative structures, impact on the university community life, and other factors.

Rated: Very Good, Good, Fair, or Poor.

Level of Interest

Rates the overall merit of the action based on the other factors on the table and additional factors such as integration with the University's Curriculum, Research, and Engagement, overall community utility and benefit, etc. Higher rated actions should be pursued before lower rated actions.

Rated: Very High, High, Moderate, or Low.

Summary of All Recommended Actions

Number	Action Title	Project	Policy	Carbon Reduction Potential	Cost Savings Potential	Implementation Potential	Level of Interest
1	Absorption Chillers	✓		Very High	High	Very Good	Very High
2	Biodiesel (Low-Sulfur B20) Transition	✓	✓	High	Moderate	Very Good	Very High
3	Building Automation Systems	✓		Very High	Very High	Good	Very High
4	Building Representatives		✓	Moderate	Moderate	Very Good	Very High
5	Chiller Plant Conversion in Philbrook Hall	✓		Very High	High	Fair	High
6	Clean Fleet Program	✓	✓	Very High	High	Good	Very High
7	Data Center Management		✓	High	Moderate	Good	High
8	Default Printing Settings		✓	Low	Low	Very Good	High
9	Eliminate Screen Saver Usage		✓	Low	Low	Fair	Low
10	Employee Telecommuting	✓	✓	High	Moderate	Fair	High
11	End of Life Management		✓	Low	Low	Fair	Low
12	Energy Monitoring		✓	Moderate	High	Good	High
13	Fume Hood Management		✓	High	High	Fair	High
14	Geothermal Heating in Gregg Hall	✓		High	Low	Fair	Moderate
15	Green Cleaning Supplies		✓	Low	Moderate	Good	Moderate
16	Hallway Motion Sensors	✓		Moderate	Moderate	Good	Moderate
17	Heat Distribution Insulation	✓		High	High	Fair	Moderate
18	Improved Motor Efficiencies	✓		High	High	Good	High
19	Infrequent Parking Permits	✓	✓	High	Moderate	Very Good	Very High
20	Lighting Requirements in Residence Halls		✓	Moderate	Moderate	Fair	Moderate
21	Lighting Upgrades	✓		Very High	Very High	Good	Very High

Number	Action Title	Project	Policy	Carbon Reduction Potential	Cost Savings Potential	Implementation Potential	Level of Interest
22	Low-Flow Fume Hoods in Parsons Hall	✓		High	High	Very Good	High
23	Network Power Management	✓	✓	High	High	Good	Very High
24	Networked Printers		✓	Moderate	Low	Fair	Moderate
25	Office Products		✓	Low	Low	Good	Moderate
26	Packaging & Delivery		✓	Moderate	Low	Good	Moderate
27	Power Down	✓	✓	High	Moderate	Good	High
28	Purchasing Training Program		✓	Moderate	High	Fair	Moderate
29	RailCat	✓	✓	Moderate	Low	Very Good	Moderate
30	Real-time Energy Monitoring in Residence Halls	✓		High	High	Good	High
31	Refrigerator Guidelines in residence Halls	✓	✓	High	High	Good	High
32	Solar Panels, 50 kW	✓		Moderate	Low	Fair	Low
33	Solar Thermal in Parsons	✓		Moderate	Moderate	Good	High
34	Space Heater Prohibition		✓	Moderate	Moderate	Poor	Low
35	Space Programing/ Scheduling	✓	✓	Moderate	Moderate	Fair	Moderate
36	Strengthen Anti-idling Provisions		✓	Moderate	Low	Fair	Moderate
37	Support TDM Efforts	✓	✓	High	Moderate	Good	High
38	Temperature Setpoints	✓	✓	Very High	Very High	Good	Very High
39	Transit Marketing Increase		✓	Low	Low	Very Good	Moderate
40	WildCat Transit Frequency Increase	✓		Moderate	Low	Very Good	High
41	Wind Turbines, 10 kW	✓		Moderate	Low	Poor	Low
42	Wood Pellet Substitution in Oil Boilers	✓		Moderate	Moderate	Good	Moderate

Appendix B: Implementation Template

Using the Implementation Template

The following template can be used by the team that has been delegated to execute a particular action to evaluate and summarize the steps required for successful implementation. It should consolidate all the relevant information discovered by the implementation team for a given action into a 1–2 page summary for decision-makers. On completion of implementation the template can be used for tracking and reporting overall WildCAP goals.

Action Title

Action Description

A brief description of the action, taken from the Recommended Actions section of this document.

Mechanism/Implementation Plan

An explanation of how the action would be implemented and how it would lead to emission reductions.

Parties Affected

A list of the operating units on campus which would be charged with implementation and which segments of the campus community which could be impacted by the action.

Related Actions

A list of other actions in the plan that could have similarities to this action or are in other ways connected to it.

Implementation Timeline

How long will the action take to implement from the time a group is formed to work on it until emissions reductions begin to occur.

Action Lifetime

Once emissions reductions are underway, how long will the continue before additional investments or interventions become necessary. This could be the expected lifetime of a piece of equipment purchased for the action, for example.

Action Evaluation

Scenario Description & Assumptions

What data, assumptions, and studies were used to make any emissions reduction or costs calculations for the action. This should be a description of the data that will be entered into the CA-CP Campus Carbon Calculator Project Module to make estimations of cost savings and emissions reductions.

Total Lifetime Greenhouse Gas Reductions

Total emissions reductions for the action as calculated by the CA-CP Camps Carbon Calculator.

Operations Impacts

1. Total Capital Costs: The total upfront non-fuel cost of implementing the project.
2. Annual Operating Costs/Savings: The Average Discounted Annual Cash Flow as calculated by the CA-CP Camps Carbon Calculator.

Curriculum, Research, and Engagement Impacts

A description of ways in which the action can enhance or contribute to the university's classroom teaching, co-curricular learning, research, public outreach, extension education, or interaction with other local, state, regional, or national organizations.

Summary of Implementation Results

A description of the work completed by the group charged with implementation of the action and the impacts of the action.

Team Members

A list of the people involved in the implementation of the action, including their title, affiliation, and contact information.