

University of New England

Greenhouse Gas Emissions Inventory 2005-2010 & Climate Action Plan



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Table of Contents

Acknowledgements	2
Executive Summary	5
Introduction.....	6
Climate Destabilization.....	6
University of New England.....	6
Greenhouse Gas Emissions Inventory.....	7
American College and University Presidents’ Climate Commitment	7
Climate Action Plan.....	8
Greenhouse Gas Emissions Inventory.....	8
Part I: Inventory Scope.....	8
Reporting Period	8
Organizational Boundaries	8
Operational Boundaries.....	9
Part II: Inventory Methods and Data Collection	9
Scope 1 Emissions	9
Scope 2 Emissions	11
Scope 3 Emissions	11
Offsets.....	14
Part III: Campus Greenhouse Gas Emissions	14
Campus Population.....	14
Campus Building Square Footage	15
Campus Greenhouse Gas Emissions.....	16
Energy and Emissions Trends.....	17
Part IV: Projected Growth and Emissions.....	19
Climate Action Plan.....	21
Climate Neutral and Interim Targets	21
Behavioral Change	21
Recent and Current Initiatives:	21
Future Initiatives:	23
Energy Efficiency	25
Recent and Current Initiatives:	25
Future Mitigation Strategies:.....	26

Renewable Energy.....	28
Recent and Current Initiatives:	28
Future Mitigation Strategies:.....	28
Offsets	29
Recent and Current Initiatives:	29
Future Strategies:.....	29
Financing	30
Strategies:.....	30
Education.....	31
Recent and Current Initiatives:	31
Future Initiatives:	31
Community Outreach.....	31
Recent and Current Initiatives:	31
Conclusion.....	32
Appendix A: Buildings Included in Inventory	33
Appendix B: List of Acronyms	34
Appendix C: American College & University Presidents’ Climate Commitment.....	35

Executive Summary

Climate destabilization signifies one of the greatest threats to environmental and human health the world has ever seen. The leaders of University of New England - administrators, faculty, staff and students alike - take this threat seriously and have committed to reducing the emissions caused by university operations. This report is a summary and analysis of University of New England's greenhouse gas emissions from 2005-2010 and the Climate Action Plan for reducing these emissions over the coming decades to become "carbon neutral".

Data was compiled for the greenhouse gas emissions inventory from existing sources and entered into a spreadsheet developed by Clean Air - Cool Planet. While several carbon calculators exist, the one chosen for UNE's emissions analysis is recommended by the American College and University Presidents Climate Commitment.

University of New England's carbon footprint was 18,706 metric tons of carbon dioxide equivalent (MTCDE) in 2010. The university's scope 1 and 2 emissions (from heating fuels and electricity) in 2010 were 11,780 MTCDE or 2.8 MTCDE per person. For comparison, the Environmental Protection Agency estimates that approximately 4 MTCDE per person are emitted from homes in the US each year.¹ Numerous factors influence individual emission results, however, and this figure is provided only for context. For the five year period studied, general trends for greenhouse gas emissions are relatively steady for UNE as a whole and per community member. Slight decreases in institutional emissions are attributed largely to heating fuel changes on both campuses. Slight decreases in per capita emissions are attributed to the 15% increase in campus population over the four year period. With continued growth of the university, one should expect an increase in both institutional emissions and per capita emissions.

The American College and University Presidents' Climate Commitment (ACUPCC) is a pledge to carbon neutrality. Dr. Ripich, president of University of New England, signed this commitment on November 3, 2008 as an assertion of UNE's Core Value of environmental stewardship. This goal of climate neutrality can only be achieved through blended strategies of increased energy efficiencies, decreased energy consumption, alternative fuel use, the production and use of renewable energy sources and, lastly, the purchase of offsets and renewable energy certificates. The first two methods are the obvious places to start; increasing energy efficiency and decreasing consumption are the socially responsible things to do and can be achieved in a fiscally responsible, budget-neutral or budget-positive manner with modest investments. The bridge between social responsibility and reaping financial rewards is the intangible value of recruiting new students who are concerned with reducing their personal carbon footprint and attending an institution with environmental stewardship as one of its main tenants.

This report is offered as a contribution to the ongoing dialogue about how the aspirations of carbon neutrality can be achieved by University of New England. The Climate Action Plan section of this report outlines interim reduction targets on our path to "carbon zero" which we aim to reach by 2040. Anticipated growth in size and population were considered when determining interim and final targets. The Climate Action Planning Team has compiled "best practices" from other institutions and analyzed UNE's operations to suggest programs, policies and practices that will guide the implementation of a carbon-free future for UNE. University of New England's leadership in education is highly regarded, and expanding our dedication to include environmental health and sustainability is the logical continuation of our mission.

¹ US Environmental Protection Agency. February 25, 2008. Individual Emissions - In the Home.
<http://www.epa.gov/climatechange/emissions/ind_home.html> Accessed March 20, 2011.

Introduction

Climate Destabilization

Scientists have observed and recorded climate variables such as temperature, sea level rise, and precipitation that indicate global climate destabilization, with significant and costly implications for future generations. Global surface temperatures have increased over the past 100 years, with the rate of increase in the last 50 years nearly doubled. Since the Industrial Revolution a significant increase in the concentrations of three main gases, carbon dioxide, methane and nitrous oxide, have resulted from fossil fuel combustion and have built up within the Earth's atmosphere. These gases are referred to as "greenhouse gases" because they help trap the thermal radiation of the sun within our atmosphere. The Intergovernmental Panel on Climate Change (IPCC), the authoritative and collaborative scientific body on climate change asserts the following:

- Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.
- Global atmospheric concentrations of CO₂, methane (CH₄) and nitrous oxide (N₂O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. Human influences have:
 - very likely contributed to sea level rise during the latter half of the 20th century;
 - likely contributed to changes in wind patterns, affecting extra-tropical storm tracks and temperature patterns;
 - likely increased temperatures of extreme hot nights, cold nights and cold days;
 - more likely than not increased risk of heat waves, area affected by drought since the 1970s and frequency of heavy precipitation events.²

The IPCC further emphasizes that this anthropogenic warming and resulting climate destabilization will impact physical and biological systems in the following ways:

- Increased water stress on humans (drought in arid climates and increased water in moist climates)
- Species extinction and range shifting
- Increased wildfires
- Negative impacts on food resource availability
- Increased flood damage in coastal areas
- Increased human morbidity and mortality

With the forecasts about global climate destabilization, climate change has become one of the greatest threats to environmental and human health the world has ever seen.

University of New England

The University of New England is a top-ranked independent university with two distinctive campuses located in the coastal communities of Biddeford and Portland, Maine. UNE provides a highly integrated learning experience that promotes excellence through interdisciplinary collaboration and innovation in education, research and service. With more than 6,800 students, which includes all residential, international and online programs, and more than 40 undergraduate, graduate and

² Intergovernmental Panel on Climate Change, Fourth Assessment Report: Climate Change 2007, (Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change), Core Writing Team, Pachauri, R.K. and Reisinger, A. (Eds.) IPCC, Geneva, Switzerland. pp 104.

professional programs, UNE has been recognized by U.S. News & World Report among the top regional universities in the Northeast. The University of New England is the leading provider of health care professionals in the state of Maine and has recognized strengths in osteopathic medicine; health sciences; biological, marine and environmental sciences; and other select areas of excellence in the liberal arts.³

Greenhouse Gas Emissions Inventory

The University of New England (UNE) hired a Sustainability Coordinator in late April, 2008 to conduct a carbon footprint analysis for the institution and develop campus-wide sustainability initiatives. Established within the Environmental Health and Safety Department, the Sustainability Coordinator partnered with Facilities Management staff to obtain energy use data, building square footage, fertilizer application and solid waste data necessary for the emissions inventory. Travel data was provided by the Business Office and enrollment and employment figures were provided by the Office of Institutional Research and Assessment.

The Sustainability Coordinator, in consultation with the Environmental Council, chose Clean Air-Cool Planet's (CA-CP) *Campus Carbon Calculator* (v5.0)⁴ as the tool for the 2005-2008 greenhouse gas emissions inventory. The Campus Carbon Calculator adheres closely to standards set forth by the World Resources Institute's and World Business Council for Sustainable Development's *Greenhouse Gas Protocol*⁵ and is specifically designed for colleges and universities. The Campus Carbon Calculator is an MS Excel-based spreadsheet, with an accompanying user guide and toolkit, available at no cost online from CA-CP, a science-based, non-partisan, 501(c)3 non-profit, in Portsmouth, New Hampshire. The latest version of the Campus Carbon Calculator (v6.6) was used for this 2005-2010 report and includes the ability to rank proposed projects by emissions and fiscal metrics.

Carbon footprint analyses calculate total carbon emissions as Metric Tons of Carbon Dioxide Equivalent (MTCDE). This is a unit derived from the Global Warming Potential (GWP) of seven greenhouse gases: carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinated carbons and hydrofluorocarbons. While each gas has a detrimental effect on the earth's atmosphere by trapping heat from the sun, the GWP indicates that the last six gases each has a relative detrimental effect in comparison to carbon dioxide. For example, carbon dioxide has a GWP of 1, while methane has a GWP of 23 and nitrous oxide has a GWP of 296.

American College and University Presidents' Climate Commitment

Recognizing that Colleges and Universities play a unique leadership role in our society, a group of 12 presidents came together after the Association for the Advancement of Sustainability in Higher Education (AASHE) conference in October 2006 and agreed to become founding members of the American College and University Presidents' Climate Commitment (ACUPCC). These founding presidents rallied support among their peers for a commitment toward achieving climate neutrality among institutions of higher education. To date 676 presidents and chancellors have signed the commitment. Peer institutions in Maine that have signed the commitment include: Bates College, Bowdoin College, Colby College, College of the Atlantic, St. Joseph's College, University of Maine at Augusta, University of Maine at Farmington, University

³ UNE description provided by Kathleen Taggersell, Director of Marketing and Communications, University of New England, January 27, 2011.

⁴ Clean Air-Cool Planet. 2006. Campus Carbon Calculator. www.cleanair-coolplanet.org/toolkit/component/option.com_frontpage/Itemid,125/ Downloaded June 24, 2008.

⁵ World Resources Institute and World Business Council for Sustainable Development. March, 2004. The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard – revised edition. <<http://www.ghgprotocol.org/standards/corporate-standard>> Downloaded May 6, 2008.

of Maine at Fort Kent, University of Maine at Machias, University of Maine at Orono, University of Maine at Presque Isle and University of Southern Maine.

University of New England President, Dr. Danielle Ripich, joined the list of signatories of the ACUPCC on November 3rd, 2008. (For the complete text of the ACUPCC⁶ please see Appendix C: American Colleges and University Presidents Climate Commitment.) The President established the Presidents' Climate Commitment Action Planning Team with broad campus representation that included faculty, staff, students and administration. This team identified which two of the seven tangible actions outlined in the ACUPCC UNE would commit to and identified the mechanisms that would carry out those initiatives. UNE chose the following tangible actions identified by the ACUPCC: 1 - encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution; and, 2 - participate in the Waste Minimization component of the national RecycleMania competition and adopt 3 or more associated measures to reduce waste. Next, the Climate Action Planning Team became familiar with the process of developing a Climate Action Plan, reviewing elements of peer institutions' plans and discussing components that might be included in UNE's plan.

Climate Action Plan

The American College and University Presidents' Climate Commitment stipulates that signatories develop a Climate Action Plan within two years of signing the commitment which includes:

- A target date for achieving climate neutrality as soon as possible;
- Interim targets for goals and actions that will lead to climate neutrality;
- Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students;
- Actions to expand research or other efforts necessary to achieve climate neutrality;
- Mechanisms for tracking progress on goals and actions.

UNE's Climate Action Planning Team developed this roadmap for guidance in achieving the auspicious goal of carbon neutrality.

Greenhouse Gas Emissions Inventory

Part I: Inventory Scope

Reporting Period

This report is a summary of greenhouse gas emissions for the University of New England for fiscal years 2005-2010. UNE's fiscal year, which begins June 1, closely matches the academic year, which ends mid-May. A report, University of New England Greenhouse Gas Emissions Inventory 2004-2007, summarized Scope 1 and 2 emissions for UNE from 2004-05 to 2007-2008. Scope 3 emissions were included in the greenhouse gas inventory for academic and fiscal years 2008-09 and 2009-10.

Organizational Boundaries

University of New England's Greenhouse Gas Emissions Inventory includes buildings for which it has operational control and reliable data. Building square footages included in the inventory calculations are listed in Appendix A.

⁶ American College and University Presidents' Climate Commitment. 2007-2008. <www.presidentsclimatecommitment.org> Accessed September 4, 2008.

- The Biddeford Campus in Biddeford, Maine includes the Saco Health Clinic in the calculated energy data.
- The Master of Social Work program at the Presque Isle satellite site is not included in enrollment data nor energy data because UNE has no operational control over the facilities at that location.
- The Bachelor of Science in Nursing program hosted by UNE in Israel is not included in the audit because the University has no operational control over the facilities at that location.

Operational Boundaries

Scope 1 – Emissions from Owned or Controlled Sources

- Heating Fuels
- Transportation Fuels
- Agriculture
- Fugitive Emissions

Scope 2 – Indirect Emissions from Purchased Electricity

- Purchased Electricity

Scope 3 – Indirect Emissions from Travel and Waste Management

- Commuting: Faculty, Staff, Students
- Travel: Program and Business
- Solid Waste: Incineration
- Wastewater
- Paper Purchases
- Offsets
- Electrical Transmission and Distribution Losses

Part II: Inventory Methods and Data Collection

Scope 1 Emissions

Heating Fuels:

- Data for gallons of heating fuel (#2 heating oil, # 4 heating oil, kerosene, propane and natural gas) was obtained from the UNE network I:\ drive, which is maintained by Facilities Management.
- The main boilers and furnaces on both campuses have dual capabilities for heating fuels.
- Prior to 2006, #2 heating oil was primarily used for heat on the Biddeford Campus (BC), Kerosene was occasionally used in the Health Center and Housing Park, and #4 heating oil was used in Decary. In 2006 the economics began favoring propane, so BC adopted propane as its primary heating fuel.
- Prior to 2007, #2 heating oil was the main heating fuel for Portland Campus (PC), except in the Grounds Shop, which uses a minor



Figure 1 - central heating plant on Biddeford Campus

amount of propane in the winter. In 2007 the economics began favoring natural gas, so PC adopted this as its primary heating fuel.

- In 2006 the Environmental Council (EC) endorsed a project proposal by College of Medicine (COM) student, Scott McQuilkin, for the use of BioHeat in the Admissions Building (592 Pool Road). In fall 2008 bid prices for BioHeat were favorable, and a contract was negotiated that enabled UNE to burn BioHeat in all buildings with boilers that require heating oil. 74,701 gallons of B20 were used in 2008-09 and a combined 85,531 gallons of B5 and B20 were used in 2009-10.

Transportation Fuels:

- Data for gallons of fleet vehicle fuel (unleaded gasoline, diesel and BioDiesel) was obtained from the UNE network I:\ drive, which is maintained by Facilities Management. This data represents fuel burned in mowers, blowers, tractors, golf carts, fleet vehicles, etc. for university operations.
- BC has a 1,000- gallon unleaded gasoline tank and a 500- gallon diesel tank for fleet vehicles and equipment. PC has two 500- gallon tanks, one for unleaded gasoline and one for diesel road fuel.
- In late 2007, UNE stopped requesting regular deliveries of gasoline for these tanks because it became less expensive to purchase fleet vehicle fuel at the pump. A credit card was procured and procedures were adopted to capture the quantity of gallons of transportation fuels purchased.
- In September 2006, the EC-endorsed BioFuel proposal developed by Scott McQuilkin (referenced above) began for fleet vehicle use as well. Since September 2006, UNE has purchased 8,985.6 gallons of BioDiesel for both campuses.

De Minimis:

- Collectively, emissions from agricultural practices and fugitive refrigerant emissions represents less than 1% of total emissions but disproportionately increases the monitoring, reporting, and recordkeeping burden. Emissions for field fertilizer application and refrigerant leaks in 2007 were calculated, and it was determined that both represent less than 0.1% of total scope 1 and 2 emissions. UNE will specify these as de minimis for subsequent years unless a change in operations alters the de minimis level for either source.
- Data for fertilizer application on the Biddeford Campus was obtained through conversations with the Grounds Manager. The quantity of fertilizers used and percentages of nitrogen in each application for the academic year 2006-07 were provided. Fertilizers are applied to 248,700 square feet at BC on the soccer field, field hockey field, softball field and Alford lawn to mitigate damage from intramural activity use. No fertilizers were used at PC.
- Environmental Protection Agency (EPA) regulations mandate that institutions record escaped emissions from refrigerator units and air conditioning units during repair or recharging or due to mechanical leaks.
 - Records were obtained for air conditioning, refrigerator and freezer unit repair from the maintenance department at UNE. These records indicate minor leaks from small units amounting to less than 10 pounds in 2006.



Figure 2 - chiller plant on Biddeford Campus

- Records for the chiller plant at BC are maintained through a contract with Trane. Trane maintains three chillers at BC. One is a 500-ton centrifugal chiller, with a 950 pound charge of R-123, and two are 200-ton rotary liquid chillers with 670 pound charges of R-22. There were no service records for the 2006-07 academic year.

Scope 2 Emissions

Purchased Electricity:

- Data for purchased electricity, reported in kilowatt hours (kWh), was obtained from the UNE network I:\ drive, which is maintained by Facilities Management.
- Constellation NewEnergy is the contracted supplier of purchased electricity for UNE's medium and large commercial accounts. UNE's smaller buildings are included in the general pool of residential and small non-residential accounts through NextEra Energy Power Marketing, LLC. Central Maine Power is the distributor for both suppliers. Only Constellation NewEnergy's power sources used for electricity generation for October 2008 to September 2009 were readily available for this report. The power sources used by Constellation NewEnergy consisted of 41.17% renewable and efficient in 2008-09. The largest percentage of power source generation for was natural gas at 25.30%, while the largest percentage of renewable power source generation was hydroelectric at 25.5%. Constellation NewEnergy also provided air emission comparisons of all other New England power suppliers. In 2008-09, Constellation NewEnergy emitted 784.66 pounds of CO₂ per Megawatt-hour which was 8% more than the New England average.
- Transmission and distribution losses are reported as scope 3 emissions.

Scope 3 Emissions

Solid Waste:

- Waste Management is the contracted hauler for solid waste on both the Biddeford and Portland Campuses of UNE. Waste Management does not weigh each load they pick up, so is not able to provide accurate historical data. The 2005-2008 Greenhouse Gas Emissions Inventory assumed an average of 70-80 pounds per cubic yard of trash. This figure was used to calculate solid waste based on volume of the dumpsters.
- Solid waste audits over two, three-week periods in April 2009 and October 2009, revealed that 70-80 pounds per cubic yard of trash was not an accurate assumption. Based on the audits, the average weight per cubic yard of trash for UNE was 31 and 40 pounds respectively for the two audits. These average weights were used to recalculate solid waste figures for the 2008-2009 and 2009-2010 school years.
- Waste Management brings the trash from the Biddeford Campus to the Maine Energy Recovery Company (MERC) in Biddeford, Maine. MERC is a Refuse Derived Fuel (RDF) incinerator which uses mechanical processes to shred and sort Municipal Solid Waste (MSW) to increase the fuel value of the waste before incineration. In 2007, MERC received 280,000 tons of MSW from surrounding communities and produced 163,000 megawatt-hours of electricity. In 2008-2009, UNE disposed of an estimated 223 tons of solid waste at MERC.
- Waste Management brings the trash generated from the Portland Campus to Ecomaine in Portland, Maine. A mass burn incinerator, Ecomaine processes up to 550 tons per day of MSW, which is

converted into 100,000 megawatt-hours of electricity per year. In 2008-2009, UNE disposed of an estimated 89 tons of solid waste at Ecomaine.

- For the fiscal years that this report covers, paper, cardboard, returnable bottles and cans, batteries, oil, scrap metal and ink and toner were recycled. Waste Management estimates that the Biddeford Campus recycled approximately 1,559 cubic yards of paper and 1,871 cubic yards of cardboard in 2007-2008. The Portland Campus recycled 727 cubic yards of paper and 831 cubic yards of cardboard for the same time period. These figures are not represented in the emissions inventory for greenhouse gases.

Wastewater:

- UNE owns a wastewater treatment facility on the Biddeford Campus. This facility is operated by Woodard & Curran. Monthly operating reports are available on the network hard drives that provide total gallons of water treated. 25,093,000 gallons of wastewater were aerobically processed in 2010 at this facility, which is a 71.6% increase over the six years that this report covers.

Directly Financed, Outsourced Travel:

- Historical data was not available for air travel prior to 2008. Business air travel data was obtained from the Business Office at UNE beginning in June 2008. Academic air travel data was obtained from the Study Abroad office.
 - Business air travel at UNE is accomplished through booking passage with a travel agency, use of the purchase card, or through personal reimbursement. The Accounts Payable office provided the Sustainability Office with photocopies of travel agency reports and personal reimbursement forms and electronic copies of the purchase card reports on a monthly basis. These reports provide origination and destination airport codes for all flights, including connecting flights. A carbon offset retailer website, www.terrapass.com, was used to calculate air miles between airport codes listed on all reports. Total air miles in FY '09 were 1,670,370 and in FY '10 were 1,835,615 – a 9% increase.
 - Academic air travel was calculated using the Terrapass website to determine distances between airport codes in foreign countries for academic trips taken by UNE students. Distances were calculated as though these were direct flights because connecting flight data were not available, which artificially decreases the actual miles flown. Total air miles in FY '09 were 37,908 and in FY '10 were 256,638. This increase is important to note when examining the projected growth of the university.
- University of New England subsidizes public transportation from its Biddeford Campus to in-town Biddeford through ShuttleBus from September through May. The ShuttleBus's "Nor'easter Express" stops at two locations on campus and has a regular route with four stops in town. The ShuttleBus is operated on Biodiesel fuel (B20) and is outfitted with bicycle racks mounted on the front of the bus. ShuttleBus miles were calculated by using the weekly schedule established.



Figure 3 - ShuttleBus at UNE Biddeford Campus

- The athletic department contracts with Custom Coach and Limousine for travel to athletic competitions. Outsourced bus travel was calculated by obtaining the competition schedules for all sports from the UNE website and computing the distance to the event.
- While some fleet vehicles are available for faculty, staff and student use for UNE business, often personal vehicles are used. The Accounts Payable office in the Business Office provides copies of the mileage reimbursement requests to the Office of Sustainability. Workstudy students enter the mileage reimbursements into a spreadsheet to tally total distances.

Faculty, Staff and Student Commuting:

- Historical data was not available for commuter miles prior to 2009. Both campuses of University of New England are situated such that parking without a permit is not readily accessible. Therefore, parking permit data was obtained from Department of Safety and Security for 2009 and 2010 to calculate commuter miles. A “vehicle owner report” was extracted from The Permit Store database, which provides vehicle owner data broken into categories: Portland Campus commuters, Biddeford Campus commuters, full-time faculty/staff and adjunct faculty/staff.
 - Google Maps was used to calculate distances from home addresses listed in the permit application to either 11 Hills Beach Road in Biddeford or 750 Stevens Avenue in Portland, depending on which campus the permit holder primarily works or attends classes.
 - Roughly 75% of faculty and staff members’ commuter miles were captured with this method. A small portion of the remaining 25% of faculty and staff members either carpool, walk or bike, but a larger portion provided information to the permit application database that made distances unrealistic or impossible to calculate.
 - Student commuter miles calculated to be greater than 80 miles were disregarded due to the assumption that the home address was listed and not the local address on the permit application. 27% of Biddeford Campus and 8.7% of Portland Campus commuter miles were not included in the calculations for this reason, a total of 193 students.

Type of Travel	Miles
Student commuting	6,494,306
Faculty/Staff commuting	4,125,960
Mileage reimbursements	330,799
ShuttleBus	45,030
Extracurricular (athletic)	26,953
Study abroad air travel	370,908
Business air travel	1,835,615

Table 1 - summary of 2010 commuter miles

Paper Purchases:

- Data collection for paper purchases began in 2009 by contacting the paper vendors for UNE. Maine Printing Company produces the stationary, letterhead, Rising Tide research magazine and UNE Magazine. Office Max supplies the university with its copy paper. Stamats prints the brochures and view books for the Admissions Department. 56.5% of UNE’s paper purchases in 2010 contained 30% recycled content, 2.5% contained 100% recycled content, and 41% contained 0% recycled content. Total paper purchases in 2010 amounted to 169,913 pounds, a 3.9% decrease from the previous year.

Transmission and Distribution Losses:

- Electricity produced by power plants and transmitted over the grid to electrical substations and then distributed to customers are subject to losses. The difference between the electricity produced at the power plant and the electricity sold to customers accounts for electrical transmission and distribution losses. In 2010 the transmission and distribution losses amounted to 578 MTCDE, roughly 9.9% of the emissions resulting from UNE’s electrical purchases.

Offsets

Composting:

- On July 11, 2007 the Marine Science Center began a pilot marine mammal composting project with the Department of Environmental Protection to explore the feasibility of carcass disposal in an environmentally preferable way. In 2008, 2.62 tons of marine mammals were composted, while in 2010 approximately 4.5 tons were composted.



Figure 4 - marine mammal composting site

Part III: Campus Greenhouse Gas Emissions

Campus Population

- Campus population data was obtained from the Department of Institutional Research and Assessment. Student enrollment data include full and part-time students and is based on unduplicated, 9-month (fall and spring semesters), headcount enrollment. Summer enrollment was reported separately.
- During the 2009-2010 school year, there were 3,182 full-time students, 184 part-time students, 284 FTE (full-time equivalents) faculty and 499 FTE staff members. This represents a 26% increase in student population, 50% increase in faculty population, and 24% increase in staff population in the six years covered in this report, with an overall increase of 27% in campus population.

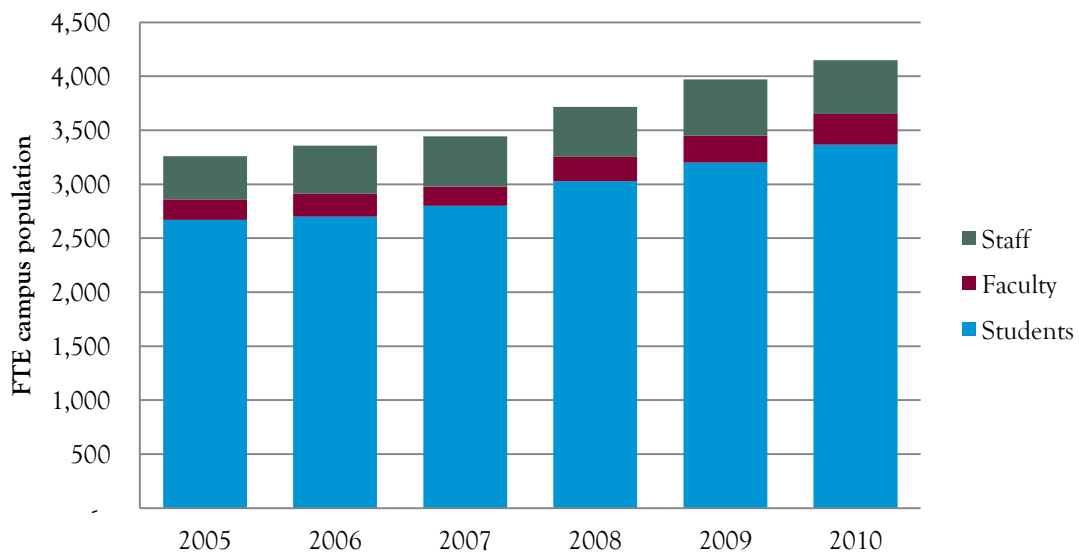


Chart 1- campus population trend

Campus Building Square Footage

- University of New England has experienced significant expansion of physical infrastructure in the past several years:
 - In 2008 a 42,000 square foot residence hall, Featherman, was added.
 - In 2009 the Bush Center came online in October and Morgane Hall came online in January; three-quarters of the square footage of the Bush Center and half of the square footage of Morgane Hall was used in the 2009 data. Additionally, 3 Hills Beach Road received a make-over, the 180 square foot garage was converted to usable, heated space, and the Gregory Annexes were removed from campus.
 - In 2010 the Pickus Biomedical Center became occupied on the Biddeford Campus, and the College of Pharmacy opened its doors on the Portland Campus.
- Appendix A details the square footage of each building and the changes since 2005. Current square footage is 1,064,366. Overall there has been a 15.5% increase in square footage over the six years covered by this report.

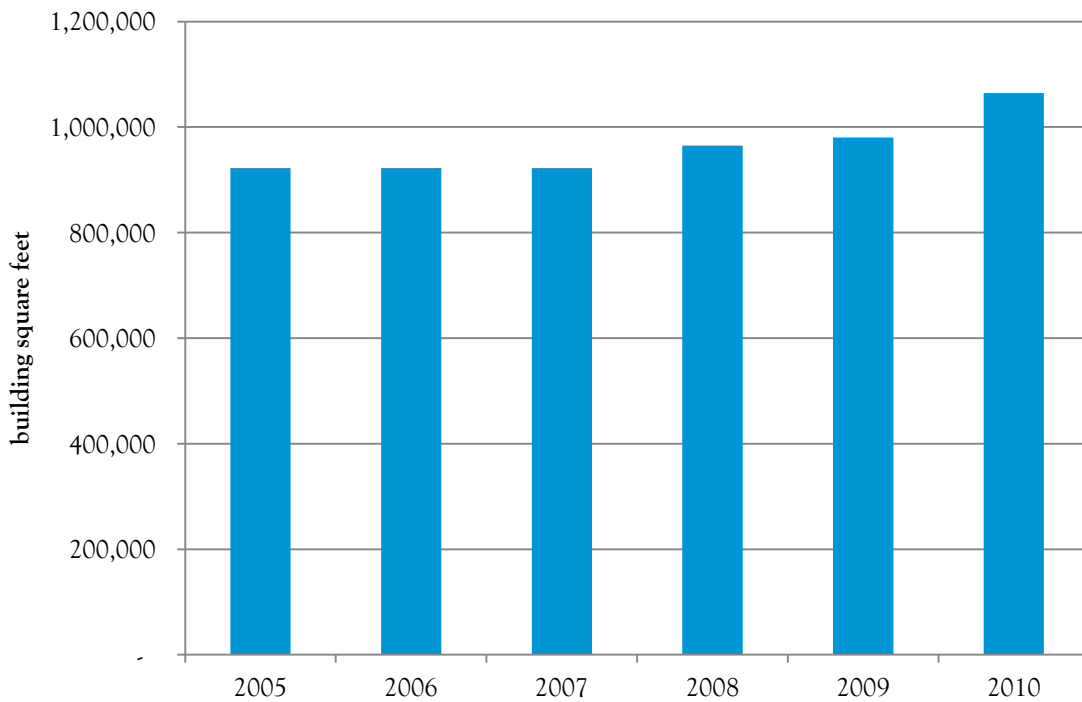


Chart 2 - campus building square footage trend

Campus Greenhouse Gas Emissions

2010 Emissions:

- Table 1 depicts net emissions for each scope in 2010. Scope 1 emissions accounts of 31.7% of total emissions; scope 2 accounts for 31.2% of total emissions; and, scope 3 accounts for 37.0% of total emissions.

Scope	Source	Emissions (MTCDE)
1	On-campus stationary emission sources	5,766
1	Fleet transportation	171
2	Electricity	5,843
3	Faculty/staff commuting	1,667
3	Student commuting	2,624
3	Air travel	1,713
3	Personal mileage reimbursement	141
3	Wastewater	12
3	Solid waste	(10)
3	Paper purchases	201
3	Transmission & distribution losses	578
Net 2010 Emissions		18,706

Table 2 - campus emissions FY 2010

- Chart 3 depicts the breakdown of 2010 scope 3 emissions by source. The largest portion of scope 3 emissions comes from student commuting, with university air travel (business and study abroad) and faculty/staff commuting the next largest portions.

Percentage of Scope 3 Emissions By Source

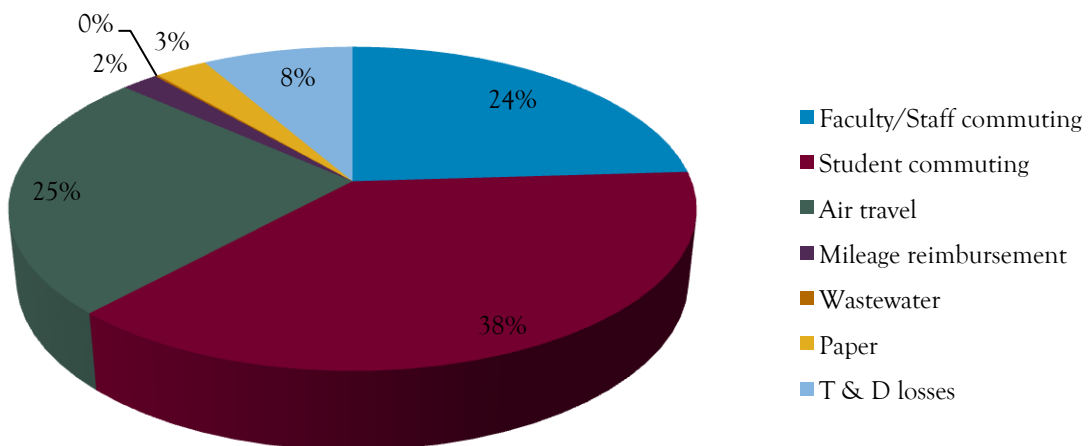


Chart 3 - % emissions by source for scope 3

Energy and Emissions Trends

Fuel Trends 2005-2010:

- Roughly 62% of UNE’s emissions result from on-campus stationary sources (heating and fleet fuels) and electricity purchases. These emissions are most directly under the control of the university. There was a 30.4% increase in the total MMBtu (million British thermal unit) consumption for heating fuels over the six-year period, and a 27.5% increase in MMBtu consumption for electricity.

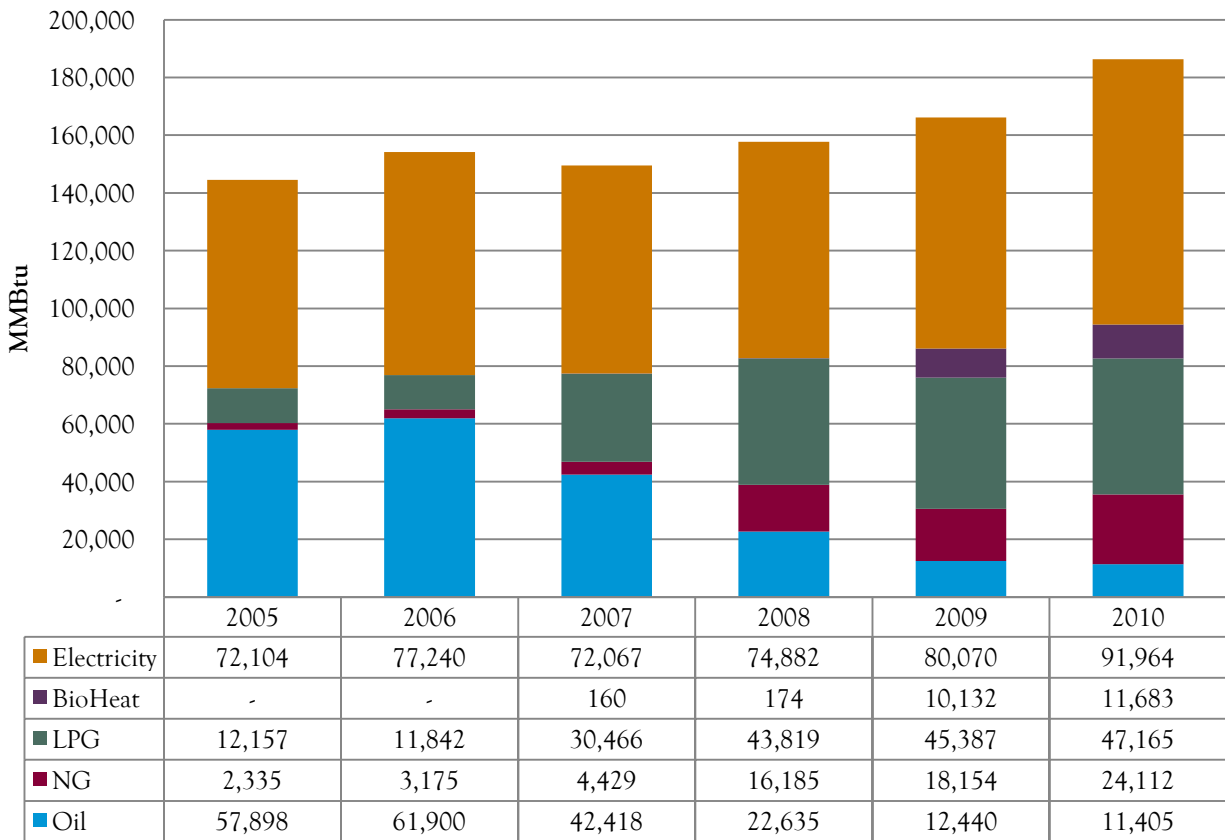


Chart 4 – MMBtu consumption by fuel source per year

Emissions Trends 2005-2010:

- Charts 4 and 5 clearly illustrate the effects of fuel switching on both campuses. While UNE experienced a 28.9% increase in heating fuel MMBtu consumption over six years, there was only a 17.9% increase in greenhouse gas emissions attributable to those sources (scopes 1 and 2).
- Table 3 shows the kilograms of the three greenhouse gases emitted for heating fuels, per MMBtu of each heating fuel type used by UNE, as determined by CA-CP’s Campus Carbon Calculator. When the Global Warming Potential of each gas is taken into consideration, the relative detrimental effect can be ascertained and it is clear that the “greenest” fuel is natural gas and the “brownest” fuel is heating oil.

	1 MMBtu of Oil	1 MMBtu of Propane	1 MMBtu of Natural Gas
kg CO ₂ GWP=1	71.3571	58.9519	52.8
kg CH ₄ GWP=23	0.0104	0.11517	0.00528
kg N ₂ O GWP=296	0.00064	0.000545	0.00011

Table 3 - kg CO₂, CH₄ and N₂O per MMBtu of each fuel type

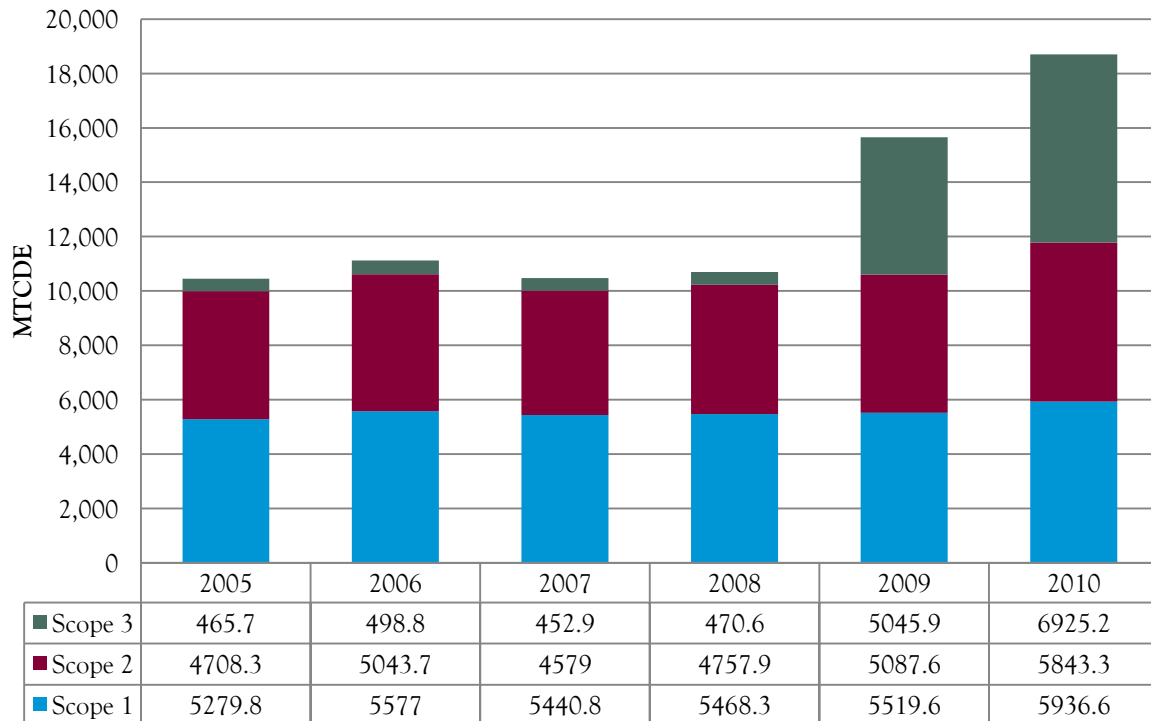


Chart 5 - UNE annual emissions by scope per year

- Again, the significant rise in scope 3 emissions in 2009 and 2010 are due to the data collection capabilities for commuting, air travel, solid waste, wastewater, and paper purchases.

Part IV: Projected Growth and Emissions

- In September 2010, Sokokis Hall, a 100,000 square foot, suite-style, 300-bed residence hall, opened on the Biddeford Campus. The 5-year Master Plan has several building projects conceived, however the Climate Action Planning Team has chosen to focus only on the most realistic and likely growth outlined in the Master Plan. This includes a 105,000 square foot athletic complex and a second, suite-style, 300-bed residence hall on the Biddeford Campus.
- On the Portland Campus, renovations are planned for Goddard Hall for administrative offices for the College of Dental Medicine in 2011. Goddard Hall has not been occupied since 2001, but the square footage is included in the inventory because minimal heat has been provided to the space and it is contiguous with Hersey Hall. Emissions for the building will increase after the renovations without an increase in overall square footage. The purchase or lease of a 25,000 square foot clinical space is proposed in downtown Portland for the College of Dental Medicine as well.
- It is important to note that with an increase in residential buildings, UNE’s scope 1 and 2 emissions will increase, but the student commuting component of scope 3 emissions will decrease. The advantage to this shift is that scope 1 and 2 emissions are more easily controlled by university operations. Student commuting accounts for 38% of scope 3 emissions and scope 3 emissions account for 37% of total organizational emissions.
- Chart 6 depicts the anticipated rise in emissions by 2040 under a “business as usual” scenario. While there is significant uncertainty about these predictions, it provides a framework for understanding the potential for environmental impact with growth. The assumptions used to create this chart include linking scope 1 and 2 emissions to the rise in square footage. 2010 metric tons of carbon dioxide equivalent per square foot (MTCDE/sf) were extrapolated and applied to anticipated growth until 2017, and a 2% per year increase in square footage was used from 2018-2040. Scope 3 emissions were linked to an increase in student population and the 2010 metric tons of carbon dioxide equivalent per student calculation was applied. Assumed student growth was 2% per year, reaching 5,000 students by 2030.

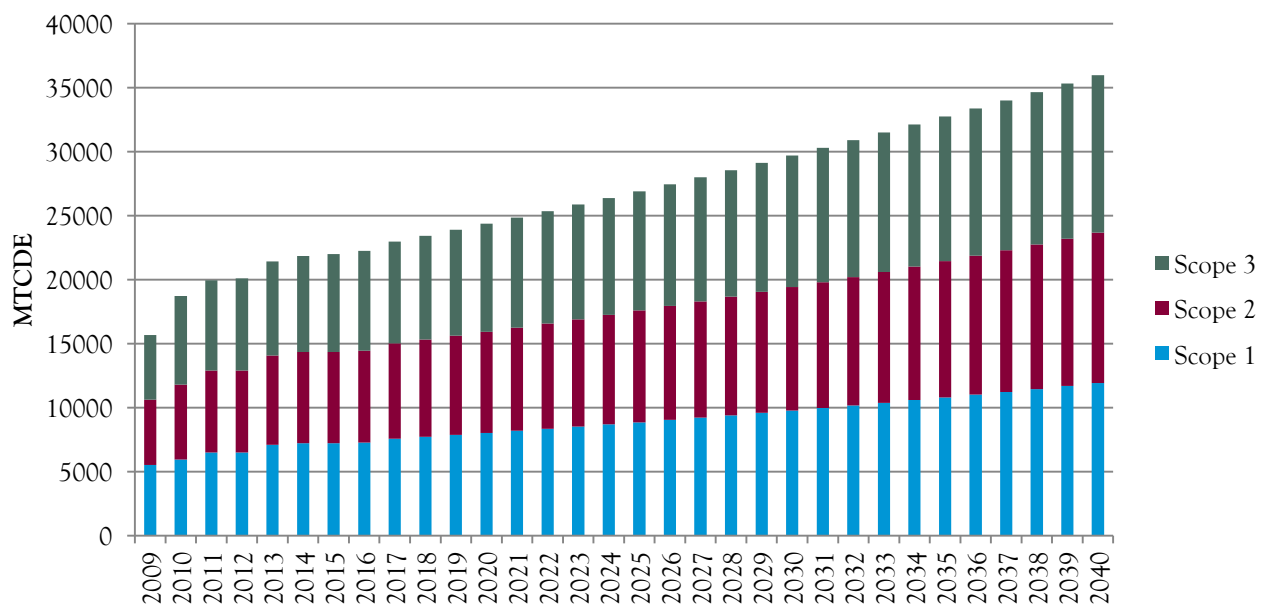


Chart 6 - projected growth under 'business as usual' scenario

- On-line growth has increased over the past six years, as depicted in chart 7. While this portion of student enrollment does not increase the carbon footprint of the university, the student increase lowers the overall “emissions per student” figures. This should be viewed as a mitigation strategy for avoiding the cost of increased emissions with continued growth.

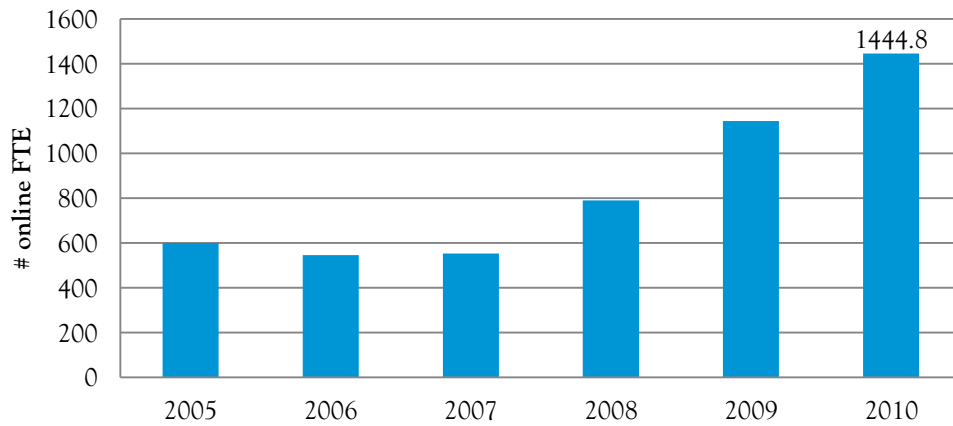


Chart 7 - increase in online student enrollment (as full-time equivalents)

- The Office of International Education at UNE promotes the goals of international cooperation and understanding through rigorous academic programs, overseas study opportunities, student-faculty research projects and a host of special programs designed to address current issues in international relations and cultural studies. The Office aims to increase opportunities for 20-25% of students to engage in international study experiences in the next five years. Scope 3 emissions will rise as air travel miles are linked directly to this objective.

Climate Action Plan

University of New England is a growing institution. It is the university's intent to approach this growth in the most responsible way possible, both environmentally and fiscally. To accomplish this, a four-pronged tactic will be utilized. Behavior change is the least expensive method of lowering energy demand and emissions, and will be given priority, in conjunction with other strategies. Improving the energy efficiency of our buildings and automobiles will occur simultaneously as this will lower energy demand. Renewable energy solutions will be implemented when grant funding allows or when the internal rate of return for a project is positive. Finally, renewable energy credits and offsets will be evaluated as a means of compensating for emissions that are not able to be mitigated in a cost effective manner.

Climate Neutral and Interim Targets

The ACUPCC and Environmental Protection Agency's (EPA) Green Power Partnership conducted a review of 50 colleges and universities, early signatories to the Presidents' Climate Commitment, and found an average climate neutrality date of 2038. This review also identified best practices in developing Climate Action Plans and, among these practices, emphasized the importance of setting interim target dates.

University of New England has set a climate neutral target date of 2040 with interim goals that address the anticipated growth and four-pronged approach identified above and described in detail below. Starting with a baseline year 2010 and 18,706 MTCDE, the interim goals are as follows:

- By 2016 – Mitigate scope 1 and 2 emissions by 20% and scope 3 emissions by 5% - a total reduction of 3,280 MTCDE of projected emissions.
- By 2022 – Mitigate scope 1 and 2 emissions by 40% and scope 3 emissions by 10% - a total reduction of 7,505 MTCDE of projected emissions.
- By 2028 – Mitigate scope 1 and 2 emissions by 60% and scope 3 emissions by 15% - a total reduction of 12,678 MTCDE of projected emissions.
- By 2034 – Mitigate scope 1 and 2 emissions by 80% and scope 3 emissions by 20% - a total reduction of 19,029 MTCDE of projected emissions.
- By 2038 – Mitigate scope 1 and 2 emissions by 100% and scope 3 emissions by 25% - a total reduction of 26,740 MTCDE of projected emissions.

As required by the ACUPCC, UNE will track emissions with a full greenhouse gas inventory every two years. Further, an abridged emissions inventory will be conducted on scope 1 and 2 emissions annually for the purpose of monitoring and reporting to the Climate Plan Team.

Behavioral Change

Recent and Current Initiatives:

In recent years, University of New England has begun to cultivate a culture of sustainability. Recent and current behavior change initiatives that show this trend toward greater awareness and commitment are described below.

Recycling

- Single-sort program - In 2008 the Portland Campus adopted a single-sort recycling program that included plastics #1-7, metal, glass and paper. The Biddeford Campus adopted a single-sort recycling program in fall 2010. The basis for the system is the color-coded stations, which are easily recognizable and uniform throughout both campuses. Once a campus member is accustomed to the colored bins

and matching colored signs, it doesn't matter where on campus they encounter a recycling station, they'll know what material belongs in each bin.

- SWOOP days – Since 2007 the Biddeford Campus has implemented a spring campus collection program during the week of final exams when students are moving out. Students collect furniture and clothing that might otherwise end up in the dumpsters and donate it to the local shelter.
- A group of students in the Green Learning Community Laboratory, a hands-on, campus sustainability focused class, engaged the Biddeford Campus in RecycleMania, a national, intercollegiate recycling and competition, in 2009-10. They estimated the amount of trash and recycling that left the campus for a 10-week period and encouraged waste minimization with social-marketing strategies.



Figure 5 - recycling workstudy student

Energy Conservation Campaigns

- Biddeford Campus recently engaged students in some energy conservation campaigns with the help of first-year students in the Green Learning Community Laboratory. In 2009-2010 the students did a CFL bulb exchange in the residence halls to promote 350 day in October. Two final project teams collaborated during the spring semester to raise awareness of energy consumption and unnecessary lighting use. The residence hall energy competition did not result in a statistical difference in electricity consumption over the two weeks studied, but enthusiasm was generated with the incentive prizes, and the “Do It In The Dark” logo and campaign materials that were developed positions UNE for greater success in the future.

Transportation Initiatives

- Faced with a parking shortage in 2008 and the possibility of paving an additional parking lot, UNE reframed the conversation to look at transportation as a whole. With a combination of incentives and disincentives, the university was successful in reducing the number of cars on campus by more than 200, while the student population increased. The incentives included free ZipCar hours (BC), free taxi vouchers (PC), or a free bike to first-year students who pledged not to bring a car to campus. The disincentive was an increase in the price of parking permits to \$300. The program was an overwhelming success and has continued with incoming first-year students.
- The ShuttleBus that travels between UNE's Biddeford Campus and downtown Biddeford is also part of UNE's transportation solution for students, faculty and staff. While ridership is still low, it has steadily increased over the past three years.
- The Health and Wellness Department spearheads initiatives related to “Commute Another Way Day” each spring. In the coming years, UNE may build on this activity and provide support for multiple opportunities throughout the year for students, faculty and staff to walk, run, peddle or paddle to campus.



Figure 6 - UNE's transportation initiative - bike giveaway

Dining Services Changes

- Sodexo Food Services partnered with UNE on several occasions to implement environmentally friendly changes and spearheaded some as well. Waste reduction efforts include: food waste is currently given to a local pig farmer; single-sort recycling was implemented for the kitchens; “To Go” and “For Here” packaging was changed to recyclable material; and, signage was provided to encourage recycling.
- Trays were removed from the cafeteria for a week last year and water and energy savings were calculated. The savings were minimal, but the impact was significant for environmentally-minded community members. The decision was made to bring the trays back, but they are located out of the way, available for those who feel they really need one, but not convenient.

Future Initiatives:

Strong commitment to reduce environmental impacts of operations is shown through campus-wide behavior change. Effective behavioral change campaigns consist of multi-faceted approaches; providing information alone is not enough. Best practices in community-based social marketing involve strategies that provide incentives, or barrier removal, for the desired behavior, and disincentives, or increased barriers, for the undesired behavior. The identification of barriers and benefits for any given behavior change is the first step in crafting an effective social marketing campaign. The strategies employed to address those barriers and benefits can be in the form of memory prompts, policy development, public commitments, communication of social norms, and material incentives. Some select, prospective initiatives that have significant potential for affirming our culture of sustainability are further outlined.

Eco-Rep Program

- A peer-to-peer educator program has been proven highly effective at many institutions nationally. The objective is to train student leaders to promote sustainable behaviors, such as increased participation in the recycling program, lower energy consumption in residence halls, and increased interest in and demand for further sustainability initiatives throughout campus. Students can be recruited for this work-study program through the Sustainability Office, Residence Life, the Environmental Studies Department and environmental clubs. Offering the program for credit through the Department of Environmental Studies will also be investigated.

Institutionalizing sustainable practices through policies

- A coordinated approach to sustainability will produce a more effective and efficient way to utilize resources and funding. Institutionalizing practices across departments will decrease fragmentation and provide a framework for sustainable behaviors to become unconscious habits, or simply, “the way we do business”. Each of the following four strategies provides a significant hidden value to the university by leveraging our process inputs, which will maximize the product outputs.
 - Redefine position descriptions, performance evaluations and training programs to include sustainability;
 - Adopt new financial and project approval requirements to include a sustainability litmus test;
 - Integrate sustainable practices into all contracts and specifications;
 - Implement a reporting procedure where department sustainability milestones and successes are captured and able to be publicized and emulated.
- Consider a simple example of the first strategy. If all employees have waste reduction written into their job description and are responsible for performing those environmental stewardship duties, recycling, double-sided printing and office supply reuse will all increase. These behaviors will become second-

nature, and the university will realize cost-savings, lower emissions, and an amplified culture of stewardship.

Transportation

- A significant portion of UNE's emissions result from transportation fuels, mostly through induced travel from student and employee commuting. While UNE has received national attention for its innovative transportation initiatives in recent years, further steps could be taken to reduce this impact. An ad-hoc transportation committee will be formed to investigate the following strategies that could be employed:
 - Right use – right vehicle purchasing policy – closely examines the increased marginal costs of purchasing alternative transportation vehicles for its fleet. This includes the purchase of a Safe Ride Van that is capable of running on used vegetable oil.
 - Car-pooling technology – conduct a study to determine high concentrations of commuter residences and interest in carpooling options, technologies that would remove barriers to employees and students making connections with each other, and incentives that could be provided to increase the frequency of carpooling.
 - Expanded use of “virtual meeting” technology – provide training to employees on videoconferencing capabilities and conduct an audit to determine if there is a need to purchase more videoconferencing hardware, software or internet subscriptions.
 - River Ferry – sponsor a feasibility study for providing a river ferry service from Camp Ellis across the Saco River to the Biddeford Campus. A student project in 2010 revealed that there is significant interest, ample parking, and a significant commuter transportation savings potential.
 - Low-emissions vehicle incentives – negotiate the logistics of providing incentives for low-emissions vehicle use. This may include reduced parking fees, more convenient and designated parking areas and electric car recharging stations.
 - No-idling policy – disseminate communication to the UNE community and include in the university -required van training about the contributions of vehicle emissions to the university's carbon footprint and enforce a no-idling policy.

Environmental Council Initiatives

- The purpose of the Environmental Council is to help the Vice President of Academic Affairs assess UNE's progress in 'greening' the campus. The EC is a focal point for increasing awareness and understanding of environmental issues both on campus and in the extended community. It is also charged with recommending initiatives and mechanisms that might support these and similar goals. Thus, the EC acts in both an advisory and an advocacy capacity. Current and future initiatives that the EC is engaged in include:
 - Collaborating with Sodexo to make tap water the default choice for catering events to reduce the use of bottled water on campus; and,
 - Developing a “Green Office” rating system, through which departments or offices can be assessed on identified criteria and recognized for strategies that promote environmental stewardship. This would further the institutionalization of a “culture of sustainability” at UNE.

Energy Efficiency

Recent and Current Initiatives:

Electricity sub-metering

- All of the buildings on main electrical loops on the Biddeford Campus have recently been sub-metered for electricity. This was essential for the energy competition in 2009-2010 and for future energy competitions. There is an old adage, “You can’t manage what you don’t measure.” The electrical trends for individual buildings are captured and reported through an on-line system and available for Facilities and Sustainability personnel.

2010 Grant projects

- Building automation controls grant - Efficiency Maine Trust approved a 50% matching grant award for a \$308,320 project to upgrade the building automation controls on the Biddeford Campus. Anticipated annual savings include 528 tons of MTCDE, 550,000 kWh, 26,500 gallons of propane, 6,750 gallons of heating oil, and \$133,000 in utility expenses. The mechanical control upgrades include:
 - Demand controlled ventilation through occupancy CO₂ sensors and night set-backs in Alford, Decary, Stella Maris, and the Campus Center;
 - Variable speed drive installation in Alford, Featherman, MARC (Marine Animal Rehabilitation Center), Bush Center, Chiller Plant, Decary, Ketchum, and Marcil;
 - Direct digital control upgrades in Alford, Campus Center, Ketchum, Marcil, MARC, Stella Maris, Featherman, and the Bush Center;
 - Mixing valve modification in the Bush Center, Chiller Plant, Champlain, and Ketchum; and,
 - Hot water reset modifications in East, West, Champlain, Ketchum, and Decary.
- LED parking lot lights - Efficiency Maine Trust, with flow-through funding from the American Recovery and Reinvestment Act, approved 50% grant funding for a \$68,695 parking lot light retrofit. High pressure sodium and a few metal halide fixtures will be replaced with LED street lights. Anticipated annual savings are approximately 83,000 kWh and \$12,500. Expected annual carbon emissions reductions are 42.5 tons.



Figure 7 - building automation control work

CAP-DM projects

- Three walk-in coolers in the Decary kitchen, which were 35 years old and inefficient, were replaced with a larger, single unit. This increased the electrical efficiency of the operation and removed the domestic water demand for the condensing system by nearly 1.5 million gallons per year.
- The controls were replaced in the McDougal boiler, resulting in a greater ability to efficiently run the central heating plant. Leaking steam valves were also repaired, significantly reducing the energy demand of the central heating plant.
- Two old boilers were removed from Frederick Hall and replaced with one HB reconditioned boiler, appropriately sized for the application. Two 80-gallon boiler mates were installed to tie into the new boiler to service the domestic hot water needs of the building.

- Air leaks in the building control system in Alford were repaired, resulting in reduced compressor running time and increased efficiency.
- An estimated three million gallons of water per year were saved by installing a split air conditioning system to replace two water-cooled air conditioning units in Stella Maris Hall. This reduced water supply and treatment demand, as well as provided better temperature control for laboratory areas.
- Another estimated 1.5 million gallons of water per year were saved by installing a second split air conditioning system in the Decary phone rooms. This further reduced water demand and burden on the university's wastewater treatment plant.
- \$625,000 from the 2010-11 Capital and Deferred Maintenance budget was allocated for window replacements in the following locations: Decary Hall, Proctor Hall, Coleman Hall and Blewett Hall.

Future Mitigation Strategies:

Building Standards

- The last two buildings that UNE has constructed, the College of Pharmacy building and Sokokis Hall, were built to LEED Silver standards and are awaiting certification. Both buildings were constructed under ideal economic conditions to go through the third-party, green-building standard certification process. While UNE recognizes that third-party verification is important, it is sometimes more fiscally prudent to direct dollars toward enhanced energy-savings technologies or equipment. To that end, UNE commits to the following goals for future building projects:
 - Build to LEED (Leadership in Energy and Environmental Design) standards or greater, certification submission will be assessed on a building-by-building basis;
 - Design and build structures that are at least 36% more energy efficient than comparable building stock, verified with third-party energy modeling (this will provide the university with 13 points out of a possible 19 for Energy Performance criteria on the new building rating system for LEED version 3.0);
 - Include sustainability and energy efficiency as a criteria in construction RFQs (Request for Qualifications);
 - Continue to implement integrated design theory into all construction projects; and,
 - Evaluate building system components on a “life cycle cost” basis, taking into account lifetime fuel consumption as well as initial capital during decision-making process.

Energy Efficiency

- Lighting is often a “low-hanging fruit” when considering efficiency upgrades. UNE will undertake a full lighting audit on both campuses within the next three years and develop a plan for a full retrofit, taking into account life-cycle costs and marginal cost increase in deciding which fixtures to replace.
- The Capital and Deferred-Maintenance project list is developed annually within the Department of Campus Services. A request for project submission is sent to all departments, along with a matrix for prioritizing projects. Once received, Campus Planning and Facilities Management compile the lists, rank the projects with priority and attach costs. Currently the prioritization matrix includes a criterion for “cost-effective measure”. UNE will commit to including “carbon emissions reduction” and “energy efficiency” criteria to the prioritization matrix within the next year. Additionally, the current CAP-DM project list has several potential energy savings-projects identified which UNE will commit to

- reevaluating within the next two years. If the rate of return is positive, UNE will commit to undertake those projects immediately.
- While UNE's purchasing is decentralized, most energy consuming equipment is purchased by research faculty and the Facilities Department. UNE will develop a purchasing policy for energy consuming appliances and equipment that requires consideration of life-cycle costs and marginal cost increase in equipment and appliance purchasing and replacement.
 - Within the next year, UNE will contract with a building automation controls vendor to develop an energy efficiency project on the Portland Campus, similar to the grant-funded project currently underway on the Biddeford Campus. A process will be used, similar to the one undertaken to submit the grant application for the BC project, to determine Btu/\$ saved, and project specifics will be worked out so that the rate of return for the overall building controls upgrade is positive for the university.

Human Capital

- The growth that UNE is experiencing, coupled with our adopted commitment to lower greenhouse gas emissions, necessitate additional duties within Campus Planning, Facilities Management and Sustainability.
 - As new buildings are constructed and old buildings are renovated, systems are installed and expected to perform optimally. The dynamic nature of our campus does not lend itself to performance guarantees, where a company guarantees financial savings based on occupancy and energy demand. Continuous commissioning of building systems is the only way that the university can be sure that the systems are performing as they were intended, as efficiently as possible. Continuous commissioning will enable the university to realize energy and budget savings.
 - Developing a comprehensive energy strategy will provide greater value to the university by weighing capital investment costs against energy, labor and carbon savings. Additionally, a comprehensive energy strategy will guide the university in choosing the procurement plan that is right for UNE.
 - Conducting regular energy audits will allow the university to pursue grant funding opportunities as they arise and take advantage of energy rebates, as well as assist in developing a comprehensive energy strategy that provides greater value to the university.
- Establishing a Carbon Monitoring Task Force would provide great benefit to the university by providing guidance toward the development of a comprehensive energy strategy. This would result in lower energy demand, decreased exposure to risk by volatile energy prices, and reduced greenhouse gas emissions. The Carbon Monitoring Task Force will be charged with making recommendations on energy demand, procurement, production, renewable technology implementation, emissions reductions and conservation. Short and long-term energy needs of the UNE community would be considered in addition to funding sources, budgetary constraints, cost and benefit analysis of renewable energy production, best practices in higher education energy consumption, projected growth, energy regulations, and the mission of UNE. This task force would be comprised of the Provost, VP of Campus Services, Facilities Director, Director of University Budgeting, Sustainability Coordinator, Environmental Studies Department faculty member, Environmental Council member, and a student government representative. The UNE Carbon Monitoring Task Force will also assume responsibility for monitoring progress toward the accomplishment of the Climate Action Plan.

- While HVAC (Heating, Ventilation and Air Conditioning) technicians and electricians are trained within their fields to maintain and replace equipment, further professional development will enable them to utilize best practices in tuning and maintaining building systems for optimal equipment efficiency. Efficiency training will also alert UNE’s mechanical technicians to the latest technological developments in their field. By investing in mechanical and electrical maintenance training for our staff, UNE will leverage experience and familiarity of our systems for greater financial returns and carbon reductions.
- Development of Building Operations Manuals will further enhance the proficiency of mechanical and electrical staff. Training time and cost for new hires will be reduced, as will risk of building system malfunction or failure. Additionally a manual with a database of equipment, listing model numbers, energy demand, hours of operation, installation date, and current condition will assist Facilities Management staff and the Carbon Monitoring Task Force with development of the comprehensive energy plan and improve the Capital and Deferred Maintenance budgeting process.

Renewable Energy

Recent and Current Initiatives:

- Solar Thermal project on the Campus Center – Efficiency Maine Trust, with flow-through funding through the American Recovery and Reinvestment Act, approved a \$50,000 award to UNE for a \$102,640 project for the installation of 21 solar panels on the roof of the Biddeford Campus Center to heat the domestic water for the building’s sinks and showers. Anticipated annual propane savings are 3,720 gallons with a corresponding estimated avoided 23.5 MTCDE. The system is a closed loop, indirect solar water heating system with antifreeze protection, utilizing 21 American-made flat plate solar thermal collectors, five super-insulated 105-gallon solar storage tanks and a custom-built solar pump station.



Figure 8 - solar thermal installation on Biddeford Campus Center

Future Mitigation Strategies:

- With the first installation of solar panels on the Biddeford Campus Center, UNE is anxious to see the impact on energy consumption as well as community support and excitement over the implementation of a renewable energy source. Further analyses need to be conducted to determine the feasibility of other renewable energy projects. Location, availability of adequate natural resource supply and appropriateness of technology are all factors that will be evaluated in the analysis. UNE recognizes the intangible values that a portfolio of renewable energy projects offers, including recruitment, retention, campus pride and teaching/learning opportunities. Renewable energy sources will be evaluated by the Carbon Monitoring Task Force as funding, demand and feasibility allows. The renewable projects include:
 - Solar thermal and photovoltaic
 - Biomass
 - Geothermal
 - Wind
 - Tidal

- The newest building on the Biddeford Campus, Sokokis Hall, was constructed with a vision for future summer use, and space was designated in the basement for water tanks for installation of a solar thermal system. UNE commits to installing this renewable energy system when summer occupancy reaches 80% to maximize the annual solar resource for environmental and financial benefit.

Offsets

Recent and Current Initiatives:

- The natural gas supplier for the Portland Campus, Hess Corporation, offered UNE a Carbon Amendment to the contract for 2010-2012. 187 tons of carbon have been offset for that time period with Green-e Climate Certification; this is an offset roughly equivalent to 10% of the emissions from natural gas combustion on the Portland Campus. The Green-e Climate certification means that these carbon offsets are real, verified, enforced, permanent and additional. The offset is partially funding the methane capture project at the North Antelope Rochelle Coal Mine located in Wyoming.

Future Strategies:

- Currently the marine mammal composting program averts 3-5 tons per year of carcasses from the rendering process. The location of the compost facility can be expanded to accommodate kitchen waste from the Biddeford Campus. This would involve developing the site to house windrows and purchasing equipment to turn the piles on a regular basis. It would necessitate work-study coordination to transport the food waste and possible part-time employment to operate the mixing and turning equipment. A cost/benefit analysis is necessary and avoided costs of disposal should be taken into consideration. Currently a local pig farmer removes the waste from campus, but this is not a long-term solution on which the university can rely. The Biddeford Campus supplies him with roughly 1,200 pounds of food waste daily. Approximately 220 tons per year could be added to the on-campus composting, resulting in approximately 85 tons of MTCDE offsets with this project.
- The university funded or induced approximately 2,206,500 miles in air travel in 2010. This accounted for 25% of all scope 3 emissions, roughly 1,734 MTCDE, for which the only elimination strategy is purchasing offsets. The cost of this practice would have been roughly \$20,800 for 2010. With the anticipated increase of emissions associated with international study experiences, a reasonable interim goal would be to offset study abroad and faculty-led travel only, at first. The Office for International Education will work with the Carbon Monitoring Task force to develop a mechanism for purchasing these offsets.
- Constellation NewEnergy, UNE's electricity supplier, currently offers renewable energy mixes for purchase. An evaluation of the incremental cost increase needs to be done as well as an assessment of the type of renewable electricity generation potential available to UNE. The same is true for the purchase of Renewable Energy Certificates (REC), which is a tradable commodity that represents the environmental attributes of one megawatt hour (MWh) of electricity generation. RECs provide direct financial support of renewable electricity production. Each MWh of renewable power generated supplants the consumption of a non-renewable power source. Recommendations about the purchase of renewable electricity or RECs will be made by the Carbon Monitoring Task Force and implemented after energy efficiency strategies have reduced the university's demand.

Financing

Strategies:

- Funding energy reduction projects is a major hurdle for most institutions. There are many projects that have significant rates of return on investment, but identifying an initial funding source is challenging. The Carbon Monitoring Energy Task Force will develop a portfolio of projects to increase energy efficiency of buildings and systems. Elements of this portfolio will be implemented when the return on investment of a project is positive, as this is fiscally responsible. Having this portfolio prepared in advance strategically positions the university to take full advantage of grant opportunities and other external funding sources, such as donor gifts or sponsorships, when they arise. The Carbon Monitoring Task Force and Sustainability Coordinator will collaborate with Institutional Advancement regularly to describe funding needs.
- The university will establish a Nor'easter Energy Fund, which may be operated as a revolving loan fund. An initial sum will be set aside for financing sustainability projects that have a quantifiable return on investment. A portion of the savings from these projects will be reinvested into the fund until the project outlay has been paid back. The funds are then available to support other projects. The Carbon Monitoring Task Force will be charged with developing the fund parameters to include: sources of seed money, return-on-investment timeframes, usage of funds, and allocation of savings. As outlined in "Creating a Campus Sustainability Revolving Loan Fund" by AASHE (Association for the Advancement of Sustainability in Higher Education), potential funding sources may include:
 - Student government – When a student-controlled source of funding is provided, the students have a vested interest in being involved in project idea generation and implementation, additionally it leverages funds from other sectors of the university because energy savings initiatives are seen as a student priority.
 - Student green fees – Many institutions have held successful student referendums to approve student fees ranging from \$3 to \$10 per year which are characterized as a participatory investment by the student body. There are many options for student green fees: they could be in the form of an annual mandatory fee, or as an opt-in or opt-out voluntary fee. They could be on a per-credit or per-semester basis. They could also be instituted for a defined period of time in order to seed the fund initially and then discontinued.
 - Academic departments – Gaining support through the Department of Environmental Studies and other departments is important in demonstrating broad support of initiatives from all stakeholder groups.
 - Administration – Leadership shown by administration in supporting emissions reductions are further exemplified by contributions to a revolving green fund.
 - Grantmakers – If the university structures grant funding for a specific project such that the savings are reinvested into the revolving loan fund, the project may be more appealing to a grantmaker because their investment carries a long-term financial multiplier, thereby making the project more attractive with which to associate themselves.
 - Alumni – Providing a novel initiative for alumni to support may prove an asset to the fundraising efforts of Institutional Advancement, as environmental protection and climate change are issues that may connect with alumni who have previously been harder to reach.

Education

Recent and Current Initiatives:

- Graduation requirement - As part of UNE's core distribution requirements for the College of Arts and Sciences, all undergraduate students must enroll in ENV 104: Introduction to Environmental Issues. This class educates students about modern environmental issues locally and globally, and offers the chance for students to become involved in environmental initiatives on campus.
- Green Learning Community (GLC) - First-Year Environmental Science, Studies, and some Marine Science students enroll in the GLC, where environmental issues are examined through biology, literature, economics, and policy. Each student also carries out a year-long project that deals with sustainability at UNE, many of which are meant to reduce greenhouse gas emissions. Past projects include the RecycleMania competition, a turn-off-the-lights campaign, a feasibility study of a parking lot removal, and a feasibility study of greening the Learning Assistance Center.

Future Initiatives:

- Develop a concentration or minor in Climate Science - Climate Change is a significant environmental issue human society currently faces. While UNE students learn the basics of climate change in ENV 101 and 104: Introduction to Environmental Issues, students can gain a more in-depth understanding of the issue with classes geared towards the science and policies dealing with climate change. Currently, students in the Environmental Studies Department may major or minor in Environmental Science or Studies, and minor in Geographic Information Systems. Offering a concentration or minor in Climate Science will give students the option to learn about the chemistry, biology, economics, and laws surrounding climate change. Like the other majors and minors in the Department, this concentration or minor has potential for collaboration with other departments, such as Biological Sciences, and with groups such as the Center of Land-Sea Interactions; Human, River and Ocean Health. The new Dean of the College of Arts and Sciences will be tasked with exploring the development of this concentration in conjunction with the Chair of the Department of Environmental Studies.
- The Provost will provide direction to each college's Deans to develop and implement components of environmental sustainability across the curriculum. Professional development opportunities will be sought out to prepare instructors for integrating sustainability into their academic subjects.
- Westbrook College of Health Professions does not require an Introduction to Environmental Issues course for graduation. Opportunities to build upon what is currently offered in the curriculum will be explored with the Dean and faculty members with input from the Chair and faculty of the Department of Environmental Studies.

Community Outreach

Recent and Current Initiatives:

- Saco River Project - A \$125,000 EPSCoR (Experimental Program to Stimulate Competitive Research) grant has allowed for a team of faculty and undergraduates to study the ecology of the Saco River estuary, as well as the policies, regulations, and economics surrounding the region. Faculty and undergraduates from the departments of Environmental Studies, Biological Sciences, Business Administration and Marine Science, together with the research director from the nearby Wells Estuarine Research Reserve, are collaborating on this project.
- Center for Sustainable Communities - The Center for Sustainable Communities is an internship and service learning program that creates mutually beneficial partnerships between students and environmental organizations in the communities surrounding the Biddeford campus. This program allows students to learn

outside the classroom and gain valuable knowledge through hands-on work with non-profits, local governments, and community groups.

- Partnership with Wells Reserve - The Wells Reserve at Laudholm Farm manages 2,250 acres of coastal habitat where research is often conducted by faculty, staff, and interns from UNE. Several Environmental Studies professors work at the Wells Reserve, and teach classes such as Introduction to Geographic Information Systems and Environmental Communication.
- Paul D. Merrill Business Ethics Lecture series - The Business Ethics Lecture series takes place annually on the Portland Campus. Invited speakers create opportunities for future business leaders from UNE and the broader community to learn about and reflect upon the important role that ethical considerations play in our daily choices, and the impact these choices have on our communities. A recent notable speaker was Matt Simmons, co-founder of the Ocean Energy Institute, who lectured on the stability of the U.S. energy system, and what may be done to make energy usage more sustainable.

Conclusion

University of New England is a fast-growing institution with quality programs in the Liberal Arts, and the Health Professions. The current and future building expansion and enrollment growth bring an increase to the organization's carbon footprint as well. UNE is positioned to address the environmental impacts of this growth as the organizational leadership is committed to stewardship of its own and the earth's resources, as evidenced by the pledged goal of carbon neutrality through the Presidents' Climate Commitment.

This Climate Action Plan lays the groundwork for mitigation strategies: it addresses the anticipated growth in physical space, programs and enrollment. It organizes these strategies by behavioral changes, building energy efficiencies, renewable energy sources and offsets. Elements of the strategies are open to refinement, as collaboration with stakeholders necessitates room for modification and enhancement. The next step for UNE in accomplishing the objectives of this plan and its inherent goal of reducing carbon emissions is to develop an implementation plan to adequately resource the outlined strategies.

David Orr wrote "What Is Education For?" in 1991 and stated that, "All education is environmental education. By what is included or excluded we teach students that they are part of or apart from the natural world." University of New England is situated in beautiful natural settings on both campuses: the Biddeford Campus is bordered by river, ocean and wooded expanses; the Portland Campus is nestled in wooded privacy amid an active city. Teaching our students that they are part of this natural world is of critical importance when considering the consequences of climate destabilization. This curriculum is as much the "how" and "where" we educate UNE's students, as it is the "what". UNE endeavors to teach environmental stewardship by example and throughout all aspects of campus life.

Appendix A: Buildings Included in Inventory

Biddeford Campus:

592 Pool Road (Art Building) – 5,120 sf
 588 Pool Road (Business Office) – 4,300 sf
 3 Hills Beach Road – 1,745 sf
 Alford Center for Health Sciences – 79,000 sf
 Assisi Hall – 16,293 sf
 Avila Hall – 20,760 sf
 Boat House – 2,500 sf
 Campus Center – 55,000 sf
 Central Cooling Plant – 2,675 sf
 Decary Hall – 83,300 sf
 East Residence Hall – 58,410 sf
 Facilities Management Building – 18,000 sf
 Frederick Hall – 12,156 sf
 Gregory Hall – 478 sf
 Housing Park, Unit N – 920 sf
 Ketchum Library – 31,688 sf
 Learning Assistance Center – 3,100 sf
 Marcil Hall – 21,420 sf
 Marine Science Education & Research Center – 26,000 sf
 Padua Hall – 13,363 sf
 Petts Health Center – 9,040 sf
 Saco Health Clinic – 26,950 sf
 Saco Barn – 8,500 sf
 Siena Hall – 13,363 sf
 Champlain Hall – 64,000 sf
 Stella Maris Hall – 32,450 sf
 Waste Water Treatment Plant – 4,300 sf
 West Residence Hall – 40,339 sf

Featherman Hall – 42,000 sf (added Fall '07)
 Gregory Annex A – 5,257 sf (removed Summer '08)
 Gregory Annex B – 696 sf (removed Summer '08)
 Welcome Cottage addition – 180 sf (added Summer '08)
 Bush Center – 12,422 sf (added October '08)
 Morgane Hall – 25,800 sf (added January '09)
 Pickus Biomedical Center – 22,086 (added July '09)

Portland Campus:

1 College Street – 2,250 sf
 31 College Street – 2,129 sf
 79 College Street – 720 sf
 746 Stevens Avenue – 5,056 sf
 750 Stevens Avenue – 2,250 sf
 Abplanalp Library – 26,636 sf
 Alexander Hall – 13,912 sf
 Alumni Hall – 9,809 sf
 Art Gallery – 2,809 sf
 Blewett Hall – 31,650 sf
 Coleman Hall – 10,718 sf
 Finley Recreation Center – 20,000 sf
 Ginn & McDougal Halls – 34,091 sf
 Goddard Hall – 12,697 sf
 Grounds Shop – 12,000 sf
 Hersey Hall – 22,170 sf
 Linnell Hall – 12,762 sf
 Ludcke Auditorium – 9,676 sf
 Maintenance Shop – 2,300 sf
 Parker Pavilion – 6,600 sf
 Proctor Hall – 31,074 sf

 College of Pharmacy – 46,380 sf
 (added August '09)

Appendix B: List of Acronyms

ACUPCC - American College and University Presidents Climate Commitment

AASHE - Association for the Advancement of Sustainability in Higher Education

BC - Biddeford Campus

Btu - British thermal unit, the quantity of heat required to raise one pound of water by one degree Fahrenheit (MMBtu = one million Btu, kBtu = one thousand Btu)

CA-CP - Clean Air - Cool Planet

CAP-DM - Capital and Deferred Maintenance

Ccf - hundred cubic foot, unit of measure for natural gas

CFL - Compact Fluorescent Light bulbs

GLC - Green Learning Community

GWP - global warming potential, a measure of the relative contribution of each gas to climate change

HVAC - Heating, Ventilation and Air Conditioning, all of the systems used to maintain the indoor climate conditions of a building

KWh - kilowatt hour

LED - Light Emitting Diode

LEED - Leadership in Energy and Environmental Design, a certification that is bestowed on buildings that meet specific environmental impact and energy efficiency standards outlined by the U.S. Green Building Council

MERC - Maine Energy Recovery Center

MSW - municipal solid waste

MWh - megawatt hour

MTCDE (eCO₂) - metric ton carbon dioxide equivalent, a measure to indicate the global warming potential of each greenhouse gas in relation to one unit of carbon dioxide

PC - Portland Campus

RDF - refuse derived fuel, a result of shredding and sorting Municipal Solid Waste (MSW) to increase the fuel value of the waste before incineration

REC - Renewable Energy Certificate

RFQ - Request for Qualification

SF - square foot

Appendix C: American College & University Presidents' Climate Commitment⁷

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.
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

⁷ American College & University Presidents Climate Commitment. December 2006.
<<http://www.presidentsclimatecommitment.org/html/commitment.php>> Downloaded July 2008.

- 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,

*The Signatories of the American College & University
Presidents Climate Commitment*