



Second Update – June 30, 2014 including financial results from FY 2012-2013



1.0- Introduction

Bowdoin College has made a commitment to become carbon-neutral by the year 2020. This report is the second update to the Climate Neutrality Implementation Plan issued in fall 2009. The first update was issued in 2011 and can be found at:

<http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/final-climate-neutrality-implementation-plan-update.pdf>

In 2007, Bowdoin President Barry Mills signed the American College and University Presidents' Climate Commitment (ACUPCC)—a pledge that has now been signed by leaders of more than 680 colleges and universities to move their campuses toward carbon neutrality and build new academic pathways for addressing sustainability issues.

After a year of intensive study, the College developed a detailed implementation plan for becoming carbon neutral by 2020.

Bowdoin's Climate Neutrality Implementation Plan was developed by a team of Bowdoin staff, faculty, students, trustees and consultants from Competitive Energy Services who evaluated a wide range of strategies for increased energy efficiency, transportation adaptations, renewable-energy generation, and carbon offset options that will be necessary in order to erase our carbon footprint. Download the full 2009 Climate Neutrality Implementation Plan at:

<http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/implementationplan.pdf>.

Bowdoin also developed a concise summary of the Climate Neutrality Implementation Plan called the Blueprint for Carbon Neutrality. The Blueprint for Carbon Neutrality is an overview of the basic goals and strategies of that plan, with an explanation of the rationale, costs, and outcomes associated with these important steps. Download the 2009 Bowdoin Blueprint for Carbon Neutrality at: <http://www.bowdoin.edu/sustainability/carbon-neutrality/index.shtml>.

The Climate Neutrality Implementation Plan is dynamic and is intended to be revisited and updated every two years so that Bowdoin community members can measure the effectiveness of strategies, evaluate the financial feasibility of specific projects, and incorporate new technological advances. Thank you to the following individuals who provided the necessary information to update this report:

Catherine Longley, chair, Sr. VP for Finance and Administration & Treasurer

Don Borkowski, Director of Capital Projects

Eileen Johnson, Program Manager for Environmental Studies

Keisha Payson, Coordinator for a Sustainable Bowdoin

Andrew Price, Senior Energy Analyst, Competitive Energy Services

Theodore Stam, Director of Facilities Operations and Maintenance

Delwin Wilson, Director of Finance and Campus Services

We are pleased to report that as of the end of Fiscal Year (FY) 2013, the College was on track to achieve carbon neutrality by 2020, as a result of campus-wide conservation efforts, specific initiatives in the Climate Neutrality Implementation Plan, and other factors which are detailed in the following sections.

2.0- Greenhouse Gas Emissions: Inventory, Trends, Mitigation, and Targets

2.0.1- Greenhouse Gas Inventory

Bowdoin's greenhouse gas (GHG) emissions in FY 2013 were 14,920 metric tons.¹ **This is 22% lower than the FY 2008 baseline total of 19,153 metric tons.** Scope 1 emissions made up 59% of the total; the remaining 41% is from Scope 2 and Scope 3 emissions.² The following table provides Bowdoin's detailed GHG inventory for each of the past six years.

Scope 1	2008	2009	2010	2011	2012	2013	% Change
Stationary, On-site Fuel Combustion	8,660	9,430	8,056	8,938	7,477	8,402	12%
College Vehicle Use	340	392	391	444	431	399	-7%
Fugitive Refrigerants	62	62	130	8	120	148	23%
Agriculture Sources	0	0	0	0	0	0	
SCOPE 1 TOTAL	9,062	9,884	8,577	9,390	8,028	8,949	11%
Scope 2							
Purchased Electricity	7,264	7,287	6,837	4,968	4,534	4,411	-3%
Purchased Cogeneration	0	0	0	0	0	0	0%
Purchased, District Cooling	0	0	0	0	0	0	0%
SCOPE 2 TOTAL	7,264	7,287	6,837	4,968	4,534	4,411	-3%
Scope 3							
College Travel	534	534	421	349	469	546	16%
Employee Commute	1,722	1,722	1,628	1,466	1,489	1,114	-25%
Student Commute	0	0	0	0	0	0	0%
Transmission Loss from Electricity	464	465	410	298	272	265	-3%
Transmission Loss from Cogeneration	0	0	0	0	0	0	
Transmission Loss from District Cooling	0	0	0	0	0	0	
Waste	108	108	7	-385	-325	-365	12%
SCOPE 3 TOTAL	2,828	2,830	2,467	1,728	1,905	1,560	-18%
OVERALL TOTALS	19,153	20,001	17,881	16,085	14,467	14,920	3%
GOALS	19,153	18,724	18,305	17,895	17,494	17,102	-2%

¹ Short tons were used throughout the fall 2009 Climate Neutrality Implementation Plan to match the units of the Regional Green House Gas Initiative (RGGI). However, a decision was subsequently made to use metric tons. Using the International System of Units allows for easier comparison to other ACUPCC respondents and is more commonly used by the international scientific community. Hereafter "metric tons" or simply "tons" are used interchangeably and are equivalent to 2,204.62 pounds.

² For a more detailed discussion of Scopes and how the six greenhouse gases accounted for in this inventory are equated to common units of carbon dioxide equivalent (CO₂e) please refer to the 2009 Climate Neutrality Implementation Plan.

A brief discussion of each emission source included in the 2013 GHG inventory is provided below. Significant changes in calculation methodologies are noted as are changes in emissions relative to the 2008 baseline.

2013 GHG Emissions

Scope 1 emissions account for 8,949 metric tons of CO₂e, approximately 60% of the total. Nearly 94% of Scope 1 emissions are associated with on campus fuel combustion of natural gas, #2 distillate oil and propane for heating purposes. Smaller contributions came from fuel consumed by College-owned vehicles and the inadvertent release of refrigerants, which contributed 4.5% and 1.5%, respectively.

Scope 1 emissions were 1.25% lower in 2013 than in the 2008 base year, a 113 metric ton decrease.

A concerted effort to shift from #2 heating oil to cleaner natural gas at satellite facilities contributed to the decrease in Scope 1 emissions between 2008 and 2013. Oil usage declined 84% (100,000 gallons) compared to FY 2008. As expected, the use of natural gas was up 13% (17,170 MMBtu) as it was used to displace oil. The use of natural gas instead of heating oil reduces GHG emissions by about 30% per Btu consumed. Some of the increase in natural gas usage was weather related. As measured by heating degree days³, FY 2013 was 1% colder than the FY 2008 base year.

Two smaller portions of Bowdoin's Scope 1 emissions experienced an increase in FY 2013, college vehicle use (3% of total emissions) and fugitive refrigerants (1% of total emissions). Gasoline and diesel fuel use in college vehicles rose 17% (59 metric tons) compared to FY 2008. The increase in college vehicle use has been in large part due to a change in the College's fleet vehicle usage policy. Instead of renting vehicles to accommodate academic field research or community service trips, departments are now encouraged to use a College-owned vehicle. Fugitive refrigerants increased 140% (86 metric tons) compared to FY 2008.

Scope 2 emissions were associated with Bowdoin's purchase and consumption of 19,057 MWhs of electricity. The total GHG emissions from electricity consumption amounted to 4,411 tons of CO₂e, about 29% of the total GHG emissions in 2013. Bowdoin's scope 2 calculations used average power generation emission factors for the state of Maine as published by the United

³ Heating degree days (HDD) are a rough measure of the amount of energy needed to heat buildings in a certain location. HDDs are derived from measurements of outside air temperature. One HDD indicates that the average outside temperature for a single day was one degree below 65 degrees Fahrenheit.

States Environmental Protection Agency (EPA).⁴ While electricity usage was down only 6% in 2013 compared to 2008, scope 2 emissions were 39% lower in 2013 than in 2008, a 2,853 metric ton reduction. A large factor in the decrease of electricity use was the first full year of operation of the College's cogeneration system. A 630 kW backpressure turbine was installed at the central heating plant and began making power in February 2012. The turbine produced 1,076,000 kWh during FY 2013. Continued reductions in electricity-specific emissions factors published by the EPA, and used in Bowdoin's emissions modeling, accounted for the majority of the 39% Scope 2 emissions reduction. Electric emissions factors are updated periodically by the EPA, and a gradual improvement is expected over time for Maine as a higher percentage of renewable energy is integrated into the State's portfolio of power plants.

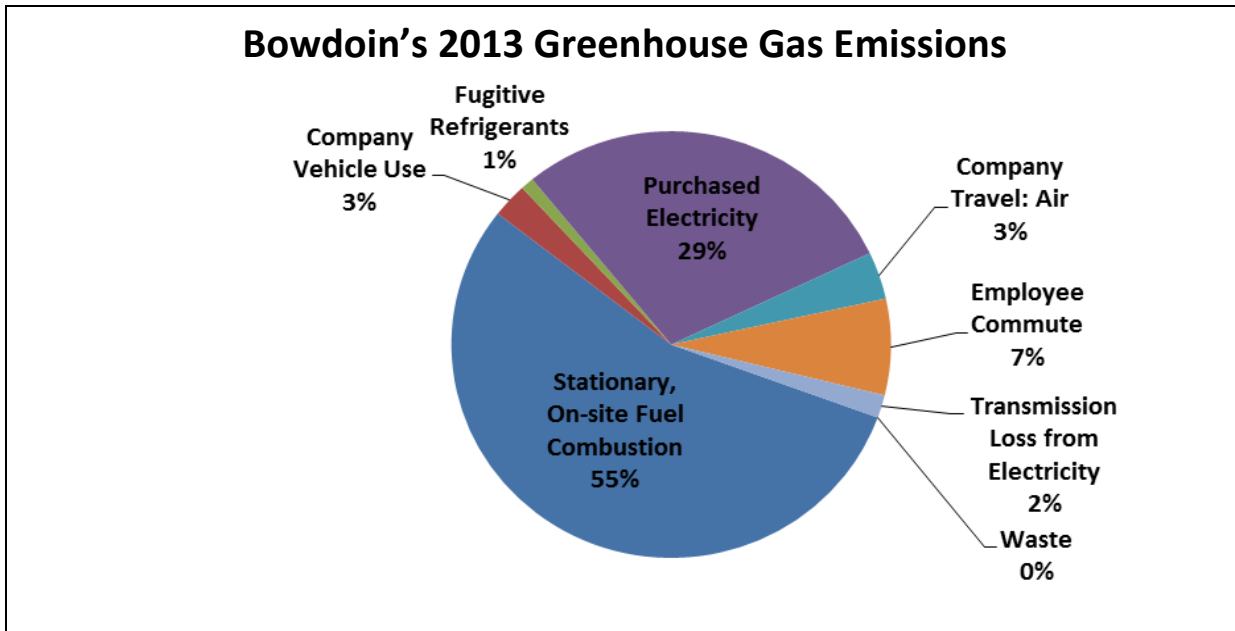
Scope 3 emissions at Bowdoin result from employee travel and commuting, the loss of purchased electricity through the transmission and distribution process, and the disposal of solid waste. These activities were responsible for the release of 1,560 tons of CO_{2e}, 10% of total GHG emissions in 2013.

Employee commuting makes up the majority of Scope 3 emissions at 71% or 1,114 tons. Transmission line losses were 17% of the Scope 3 total or 264 tons. College travel, which consists primarily of air travel by College employees, made up 35% of the Scope 3 totals or 546 tons. Bowdoin generated approximately 623 tons of solid waste in 2013. About 35% of this, or 220 tons, was recycled. Of the remaining 403 tons, 72 tons was sent to a landfill that does not currently use gas recovery systems while 331 tons was sent to a waste-to-energy facility. Waste-to-energy facilities and recycling both have negative GHG emissions factors and more than offset the emissions associated with the waste that was sent to a landfill. In total, waste emissions were calculated to be *negative* 365 tons of CO_{2e}, a 19% reduction of the Scope 3 total, using factors from Environmental Protection Agency's Waste Reduction Model (WARM).⁵

⁴ Emissions from purchased, electrical power were calculated using state emissions factors in EPA eGRID v2.1..

⁵ www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

A breakdown of the estimated 14,920 metric tons of CO₂e emissions for 2013 is shown by major category in the following chart.



2.0.2 Greenhouse Gas Mitigation Strategies

Bowdoin's progress towards completing the initiatives identified in the fall 2009 Carbon Neutrality Implementation Plan are summarized in the following table along with the projected impact on carbon emissions and relative cost.⁶ Projects highlighted in light yellow are completed, while projects highlighted in light orange are underway or partially completed. Projects with no highlighting have not been started. Several projects have changed relative to what was suggested in the 2009 plan, such as the "heating plant co-gen", which has been completed as a 630 kw unit rather than a 400 kw unit, the "Navy Base PV" system is underway and planned as a 1,300 kw system rather than a 2,000 kw system, and the Coles Tower windows are being repaired rather than replaced due to cost. As can be seen by the amount of highlighting in the table, Bowdoin has successfully begun or completed implementation on the majority of the suggested projects from the 2009 Climate Action Plan. It will be the charge of the next Sustainability Implementation Committee, which is comprised of students, faculty and staff, to update and suggest new projects that will help further our efforts towards the goal of carbon neutrality.

⁶ The last two columns of this table show how the expected carbon reduction relates – as a percentage – to both the 2008 baseline inventory emissions and the expected 2020 business-as-usual emissions. Business-as-usual GHG emissions are the expected emissions that would occur if Bowdoin took no action to mitigate emissions and grew according to its long term master plan.

Scope	Item Name	Description	Annual Offset (tons CO2e)	Cost/ton CO2e	Online Date	% of 2008 Base Case	% of 2020 Business As Usual Case
Energy Conservation							
2	Computers	Setting 600 public & shared PCs to sleep mode	4	-263	2009	0.02%	0.02%
2	Lighting - CFL Bulbs	Change 3,874 incandescent 60w bulbs to 15w CFL - replace CFLs every 2 years	406	-150	2009	2.12%	1.89%
2	Lighting - Super T8	Change 4,953 T12 lamps at 82w per lamp to 50w Super T8 - replace every 6 years	369	-87	2010	1.93%	1.72%
2	Lighting - LED Bulbs	Change 3,874 15w CFL to 6w LED - replace every 11 years	81	-76	2013	0.42%	0.38%
2	Lighting - LED Tubes	Change 4,953 Super T8 lamps at 50w per lamp to LED - replace every 11 years	231	-144	2015	1.20%	1.08%
1 & 2	Energy Star	Use Only Energy Star rated equipment and appliances	461	0	Ongoing	2.41%	2.15%
<i>Energy Conservation Subtotal</i>			1,551			8.10%	7.24%
Physical Plant							
1	OLC Boiler	Replace boiler at the Schwartz Outdoor Leadership Center	6	-76	2009	0.03%	0.03%
1	Steam Line	Phased replacement of old steam line	172	308	2011	0.90%	0.80%
1	Central Plant Boiler	Replace oldest boiler at central heating plant	311	6,053	2011	1.63%	1.45%
1	Heating Plant Cogen	Install 400 kw + backpressure steam turbine in central heating plant	544	-65	2013	2.84%	2.54%
1	H&L Windows	Replace all single pane windows with thermal pane low-e argon or better	62	201	2016	0.32%	0.29%
1	Coles Tower Windows	Replace all single pane windows with thermal pane low-e argon or better	118	315	2016	0.62%	0.55%
2	Coles Tower Elevator	Replace elevator at end of its useful life with Otis Gen2 with regeneration or better	7	TBD	2019	0.04%	0.03%
<i>Physical Plant Subtotal</i>			1,221			6.38%	5.70%
Fuel Switching							
1	Fuel Oil Conversion 1	Conversion of satellite facilities from #2 oil to natural gas	372	-64	2014	1.94%	1.73%
1	Vehicle Fleet	Transition Vehicle Fleet First to 100% Hybrids	141	-95	2020	0.74%	0.68%
<i>Fuel Switching Subtotal</i>			513			2.68%	2.39%
New Construction & Renovation							
1 & 2	New Building Improvements	New building improvements: 20% by 2009 and 46% by 2020 compared to 2008	753	-134	Ongoing	3.93%	3.51%
Behavioral Changes							
1 & 2	Behavioral Changes	Sustained and increasing behavioral changes by staff, faculty and students	541	N/A	Ongoing	2.82%	2.52%
Onsite Renewables							
1	OLC Solar Thermal	Solar thermal Installation on the Schwartz Outdoor Leadership Center	1	364	2009	0.00%	0.00%
1	Solar Thermal II	Farley complex and Thorne Hall solar thermal system	93	TBD	2012	0.48%	0.43%
2	Farley PV	100 kW solar PV system at Farley Field House	69	272	2017	0.36%	0.32%
2	Navy Base PV	2,000 kW PV system on dual axis tracker on 10 acres at former Naval Air Station	1,863	0	2020	9.73%	8.69%
1 & 2	Geothermal	Expand use of geothermal for heating and cooling	225	TBD	Ongoing	1.17%	1.05%
<i>Onsite Renewables Subtotal</i>			2,250			11.75%	10.50%
Total			6,830			35.66%	31.87%

Additional detail is provided below on each of the initiatives that were identified in the 2009 Carbon Neutrality Implementation Plan. We have continued to divide these initiatives into two categories: (1) projects that are underway currently, ongoing, or expected to be completed by 2020; and (2) projects that are planned or under consideration for implementation by 2050, but which are currently cost prohibitive or technologically unfeasible.

- By 2020 achieve a 100% reduction from the business as usual scenario from all sources. (From 19,153 metric tons to 0 tons of CO₂e)
 - Status Update 2011: Bowdoin is on track to achieve its goal to become carbon neutral by 2020. Bowdoin intends to achieve, at a minimum, a 28% reduction in own source emissions, an important component of our carbon neutrality plan.
 - Status Update 2014: *Unchanged*
 - Cost: N/A
- Improve metering, tracking and auditing capabilities of GHG emissions and energy usage on campus.
 - Status Update 2011: The College has greatly expanded its Web-based Building Dashboard®, which makes Bowdoin's energy use visible, engaging, and easily understood by students, faculty, staff and guests. Between 2009 and 2011 Bowdoin

- installed a total of 51 electric meter points covering most buildings on the main campus and 10 steam meters on buildings of varying sizes and uses.
- *Status Update 2014: Between 2011 and 2014 the College added 3 additional electric meter points and 17 steam meter points. The Web-based Building Dashboard® can be viewed at: <http://buildingdashboard.net/bowdoin/#/bowdoin>*
 - **Cost and Funding Source:** The College phased in the implementation of meters between FY 2010 and FY 2012, spending roughly \$248,000 from the annual operating budget.
 - **Status Update 2011:** In 2011 the College implemented a new GHG project tracking template that captures the key metrics of the many physical projects that take place each year. The intent of the tracking template was to incorporate GHG considerations into the initial project planning process and to memorialize project details, including cost, throughout the year. This has aided the College in tracking actual spending on projects related to the Carbon Neutrality Implementation Plan.
 - *Status Update 2014: The College continues to use the tracking template to quantify the expenditures and impacts of GHG reduction projects.*
 - **Cost and Funding Source:** N/A
- **Complete the repair and upgrade of the underground steam distribution system.**
 - **Status Update 2011:** Approximately two-thirds of the plan to excavate and replace 1,551 feet of old and leaking sections of steam line was completed during the summer of 2011, with the remaining work to be completed during the summer of 2012.
 - *Status Update 2014: The remainder of the steam line replacement project was completed during the summer of 2012. The new lines are expected to reduce fuel usage at the central plant by 3,250 MMBtu each year.*
 - **Cost and Funding Source:** The College spent approximately \$1.5 million on the project which was funded out of the major maintenance and capital renewal budget.
 - **Complete the boiler replacement project for the campus central heating plant and install cogeneration system that generates electricity from back pressure steam turbine.**
 - **Status Update 2011:** Bowdoin completed the replacement of its two oldest boilers with a single more efficient boiler.⁷ The new boiler has been in operation since fall of 2010 and is expected to reduce fuel usage by about 5% or 6,000 MMBtu per year.
 - *Status Update 2014: The installation of a cogeneration system in the summer of 2011 has produced roughly 1,050,000 kWh of “free” electricity in both FY 2012 and FY 2013 or about 6% of Bowdoin’s annual electrical requirements.*
 - **Cost and Funding Sources:** The back pressure steam turbine was a Capital Project, costing approximately \$3.5 million, \$400,000 of which was provided by a grant from the Efficiency Maine Trust.
 - **Continue the conversion of College facilities from higher carbon distillate oil and propane to natural gas. Continue to collect and use fry oil produced by dining services.**
 - **Status Update 2011:** Of the 38 satellite locations identified in the 2009 Carbon Neutrality Implementation Plan, 36 were targeted for natural gas conversion by 2020.

⁷ RMF Engineering, Inc. Baltimore, Maryland. Cogeneration Feasibility Study: Bowdoin College. September 2008. Hard copy located in Bowdoin College Facilities Management.

By the end of FY 2012 Bowdoin had completed 19 conversions. The College no longer burns waste fry oil at the central heating plant. Since September 2011 a recycling company began buying Bowdoin's waste oil and selling it offsite as heating oil.

- *Status Update 2014: By the end of FY 2013 Bowdoin had completed an additional 8 conversions, bringing the total to 27, or nearly 75% of the total. This puts Bowdoin well ahead of its anticipated conversion schedule. The full conversion of satellite facilities from #2 oil and propane to natural gas is now expected to be substantially completed by 2015.*
 - Cost and Funding Source: Bowdoin spent approximately \$461,000 between FY 2009 and FY 2013 on these conversions and has planned about \$27,000 in #2 oil and propane to natural gas conversions for FY 2015. Paid for by the annual operating budget.
- Evaluate solar thermal for the two largest users of hot water on campus, Greason Pool and Thorne Hall.
 - Status Update 2011: The Thorne Hall installation was completed in two phases. In March 2010, Bowdoin announced it had been awarded a \$50,000 grant from the Efficiency Maine Trust toward the Thorne project. A 960-square-foot solar thermal array was installed atop Thorne Hall in June 2010. The array was then doubled in size in January 2011 when Bowdoin received another \$50,000 grant, again from the Efficiency Maine Trust, but funded through the federal American Recovery and Reinvestment Act (ARRA). The total system consists of 48 flat plate solar thermal collectors with a 1,920 square foot surface area. Bowdoin students and members of the Brunswick community can monitor the output of the Thorne solar thermal system on site via an LED monitor in the lobby of the Smith Union or by visiting Thorne Hall's building dashboard at: <http://www.buildingdashboard.net/bowdoin/>. This site allows visitors to see key statistics for the system.
 - *Status Update 2014: Bowdoin will continue to evaluate opportunities to install solar thermal systems on campus, but with the solar PV project that will be installed during the summer of 2014 on the roof of Farley Field House, a solar hot water system at Greason Pool is now unlikely.*
 - Cost and Funding Sources: \$221,000 for both phases of Thorne Solar Hot Water system. Paid for by annual operating budget supplemented with grants from the Efficiency Maine Trust.
 - Implement all conservation measures that have attractive economic returns immediately. These include setting inactive public computers to sleep mode, various lighting upgrades, and building weatherization projects.

Conservation measures - lighting:

- Status Update 2011: By 2011 Bowdoin had substantially completed the 2007 recommendations contained in a detailed lighting audit of its facilities. The College had replaced incandescent light bulbs on campus with compact fluorescent bulbs and had upgraded the majority of T12 fluorescent tube lights throughout the campus to T8 and "super T8" fluorescents. Over the summer of 2011, 170 campus pole lights were retrofitted with compact fluorescent bulbs, saving approximately 43,000 kWh

annually. In 2011 it became College policy to no longer stock incandescent lights in the lighting inventory. Remaining lighting audit recommendations are being undertaken as time and funding permit.

- *Status Update 2014: Between 2011 and 2014 Bowdoin implemented numerous lighting efficiency projects, including considerable deployment of LED lighting and occupancy and daylight sensors. Projects included upgrades in Greason Pool, Sargent Gym, Hawthorne-Longfellow Library stacks, the David Saul Smith Union, Coffin Parking lot, Massachusetts Hall, the Visual Arts Center and upgrading all campus pole lights with 19 watt LED bulbs. In spring 2014, Bowdoin received a grant from the Efficiency Maine Trust to retrofit enough lights to save a collective 500,000+ kWh on campus. This work will take place over the summer of 2014.*
- **Cost and Funding Sources:** Between 2009 and 2013 Bowdoin has invested \$441,000 in various lighting projects across campus. Funding was provided by the annual operating budget, supplemented by rebates funding from the Efficiency Maine Trust.

Conservation Measures - Thermal Performance:

- **Status update 2011:** Bowdoin has substantially implemented the recommendations of two energy audits received in 2009 for many of its satellite buildings. The first audit was commissioned based on the seven biggest fuel users on a per square foot basis;⁸ the second was done on the 13 faculty rental houses on campus.⁹ Measures included improving the building envelopes, converting from oil to natural gas, and controlling the interior temperature of each building more precisely.
 - *Status Update 2014: In fiscal years 2012 and 2013 Bowdoin spent a combined \$322,000 on energy conservation projects that were not lighting related. The majority of these projects improved building thermal performance, including weatherization of faculty rental houses, programmable thermostats, window replacement, air recirculation fans, retrocommissioning of Druckenmiller Hall, and upgrading both Moulton Union and Thorne Dining hall kitchen ventilation systems with variable frequency drives and controls.*
 - **Cost and Funding Sources:** Between FY 2009 and FY 2013 the College invested more than \$588,000 in energy efficiency projects that were non-lighting related. Funding was provided by the annual operating budget and supplemented by rebates from the Efficiency Maine Trust's Home Energy Savings program.
- Evaluate the performance of LED bulb lighting for current and future pilot projects. Monitor improvements in the technology and the experience of other institutions with LED lights. Plan for widespread adoption of diode lighting as a replacement for compact fluorescent lighting.
 - **Status Update 2011:** By 2011 Bowdoin had begun testing LED lighting in several pilot projects. These projects included Lancaster Lounge, the Visual Art Center's Kresge Auditorium and Beam Classroom, the Peary-MacMillan Arctic Museum, and the locker rooms and laundry rooms in Farley Field House.

⁸ Richard Grondin, Integrated Energy Systems, PLLC, Falmouth, Maine. Energy Audit: Bowdoin College. 26 March, 2009. Hard copy located in Bowdoin College Facilities Management.

⁹ Justin Pizzolato, Maine Green Energy Audit, Harpswell, Maine. Hard copy of audits located in Bowdoin College Treasurer's Office.

- *Status Update 2014: As mentioned above, since 2011 Bowdoin has made considerable use of LED lighting as technology has rapidly advanced in recent years. Over a dozen buildings now utilize LED lights including Greason Pool, the David Saul Smith Union and all campus pole lights. In the summer of 2014, Bowdoin will retrofit portions of lighting in Hubbard, Sills, Osher, West, Druckenmiller, Chamberlain, Howard, Stowe, Farley, Watson, Hawthorne-Longfellow, and Thorne – all of which will utilize LED lights in some areas of the buildings.*
- **Cost and Funding Sources:** Bowdoin has invested \$441,000 in various lighting projects across campus since 2009, several of which have been LED projects. Lighting projects are typically funded through the annual operating budget, with supplementation from the Efficiency Maine Trust’s rebate and grant programs. The 500,000+ kWh efficiency projects planned for the summer of 2014, which include a considerable amount of LED lighting, will cost more than \$361,000, with nearly \$162,000 being provided by a grant from the Efficiency Maine Trust.
- The College will investigate sending all of its non-recyclable waste to a waste-to-energy facility when its next waste contract is negotiated. Currently some of Bowdoin’s non-recyclable waste continues to go to a landfill without energy or GHG recovery.
 - **Status update 2011:** As of 2011, there are logistical issues that are making this option too cost prohibitive.
 - *Status Update 2014: Unchanged*
 - **Cost and Funding Source:** N/A
- Update the GHG emissions inventory each year and this action plan every second year.
 - **Status update 2011:** The College’s energy consultant, Competitive Energy Services, LLC in Portland, Maine, continues to assist Bowdoin in modeling and tracking GHG emissions each year. Each year the College releases an update to the Bowdoin community (see: <http://www.bowdoin.edu/sustainability/carbon-neutrality/index.shtml> for the most recent annual emissions update). With ongoing advice from Competitive Energy Services, the College continues to track electricity and fuel consumption as well as waste recycling and disposal.
 - *Status Update 2014: Unchanged*
 - **Cost and Funding Source:** N/A
- Establish new efficiency standards/targets for renovations and construction.
 - **Status Update 2011:** Bowdoin’s Climate Action Plan set a goal to make near term construction and renovation projects at least 20% more efficient than the average of its 2008 building stock, increasing to 45% more efficient by 2020. In 2011 the College adhered to a comprehensive set of sustainable design standards¹⁰ for all major renovations and sought the United States Green Building Council’s (USGBC) LEED certification for all new construction. Bowdoin’s design standards for renovations relied heavily on Stanford University’s “Guidelines for Sustainable Development,” which were based on USGBC’s LEED¹¹ rating system. Bowdoin continues to

¹⁰ www.bowdoin.edu/sustainability/sustainable-planning/designstandards.shtml

¹¹ Leadership in Energy and Design. See www.usgbc.org.

- improve its ability to measure progress towards these goals by continuing its current practice of installing electricity, water and steam sub-meters on newly constructed and renovated buildings.
- *Status Update 2014: In the summer of 2013 Sustainable Bowdoin performed research on green building best practices, investigating options that could help achieve the goal of increasing building efficiency 45% by 2020. Suggestions included pursuing LEED Silver (or greater) for all new construction as well as major renovations. The former Steven's Home at 52 Harpswell Road will be Bowdoin's first renovation project to pursue LEED certification. Project completion is scheduled for August 2014. One of the goals in utilizing LEED for all major building and renovation projects is to pay special attention to "LEED EA Credit 1: Optimize Energy Performance". Potential best practices that could improve Bowdoin's score on EA Credit 1 include a focus on integrated design, energy modeling, and using "total cost of ownership" or "lifecycle costing" as a means of assessing long-term utility costs associated with any mechanical equipment, lighting systems and building envelop choices under consideration.*
 - Cost and Funding Source: Incremental costs associated with achieving LEED certifications are part of approved capital project budgets.
 - Status Update 2011: The College has decided that building retro-commissioning should be considered for buildings with complex HVAC systems. A pilot retro-commissioning study, which was partially funded by the Efficiency Maine Trust, was completed for Druckenmiller Hall. Corrective measures such as air rebalancing, optimizing air handler and heat pump operations, and repairs to other building equipment were completed, thereby reducing energy consumption.
 - *Status Update 2014: Unchanged.*
 - Cost and Funding Source: The initial study cost \$23,000 and implementation of corrective measures and repairs cost \$42,000. All measures taken anticipate a short term payback. Funding was provided by the annual operating budget and supplemented by a grant from the Efficiency Maine Trust.
 - Replace single pane windows in Coles Tower and Hawthorne-Longfellow Library.
 - Status Update 2011: Project has not been started but is under investigation.
 - *Status update 2014: Project has been investigated.. In lieu of replacement, the windows in Coles Tower will be repaired and better sealed in the summer of 2014.*
 - Cost and Funding Source: Estimates to repair, lubricate and replace hardware as needed totals \$117,000. The project is part of a larger capital project which includes masonry repairs; replacement of aging heating; plumbing and electrical systems; conversion to digital temperature controls; upgrade of the fire alarm system; a new secondary means of egress from the first-floor lobby; elevator improvements; and energy-efficient lighting.
 - Make efficiency a key criterion when the Coles Tower elevators need to be replaced at the end of their useful life.
 - Status Update 2011: Project has not begun. The College has engaged an elevator consultant to perform a maintenance and modernization evaluation of certain campus

- elevators. The suggested modernization timeframe for the Coles Tower elevators is 5 – 7 years from 2011. When the College modernizes the Coles Tower elevators, it will specify high efficiency drives to reduce energy consumption.
- *Status Update 2014: Based on a survey from Otis Elevator Company, the modernization of the Coles Tower elevators has been delayed due to the current condition of the elevators. Bowdoin is doing minor updates during the summer of 2014 to improve operation and ride quality. Full modernization of the elevator is likely a decade away. When the College modernizes the Coles Tower elevators, it will specify high efficiency drives to reduce energy consumption.*
 - Cost and Funding Source: N/A
- Consider geothermal HVAC systems or new heat pump technologies for renovations and new building projects. Implement mechanisms to better evaluate payback and performance metrics compared to an equivalent facility without geothermal systems.
 - Status Update 2011: By 2011 Bowdoin had several buildings utilizing ground source geothermal heating and cooling: Osher and West Halls and Studzinski Recital Hall. Unfortunately, a geothermal system at the Walker Art Building did not perform as expected and was replaced with a conventional heating/cooling system. Bowdoin will proceed cautiously with geothermal solutions.
 - *Status Update 2014: For future building projects Bowdoin will consider closed-loop geothermal systems rather than standing column wells. Bowdoin is installing a Variable Refrigerant Flow (VRF) heat pump system for heating and cooling in a new administrative building at 216 Maine Street which is scheduled to open in December of 2014.*
 - Cost and Funding Source: Incremental costs associated with geothermal systems and VRF heat pump systems are part of the approved capital project budget.
 - Use only Energy Star rated or better equipment when replacing any non-lighting equipment on campus.
 - Status Update 2011: The Energy Star policy has been established and is in place. Compliance is ongoing as equipment is retired and replaced at the end of its useful life.
 - *Status Update 2014: Unchanged.*
 - Cost: N/A; equipment is only replaced at the end of its useful life.
 - Prioritize the purchase of hybrid vehicles within the College-owned fleet when current vehicles are up for replacement with the goal to be 100% hybrid by 2020.
 - Status Update 2011: In 2011 the College operated roughly 60 cars, vans, and trucks, 6 of which were hybrids and 1 of which was an all-electric utility vehicle used on campus by Bowdoin's IT department. The number of hybrids was up from 5 hybrids in operation when the 2009 plan was published. In 2011 Bowdoin was exploring a subsidized installation of a vehicle charging station on campus for pure electric vehicles or plug-in-electric hybrids.
 - *Status Update 2014: The size of Bowdoin's fleet remains relatively unchanged since 2011, with the exception of an additional electric vehicle, a highway-capable Chevy*

Volt. In January 2014 Bowdoin installed a dedicated level 2 charging station for the Chevy Volt.

- Cost and Funding Source: Vehicles are purchased according to Bowdoin's vehicle replacement cycle and are funded out of an annual vehicle replacement reserve. Central Maine Power provided \$15,000 toward the purchase of the Chevy Volt in return for data collection regarding its use. The vehicle charging station was donated by Clipper Creek.
- Consider planning for a potential 2,000 kW solar PV installation on land that will be acquired at the Brunswick Naval Air Station.
 - Status Update 2011: In 2011 Bowdoin had plans to acquire land at the former Naval Air Station by early 2012. The College continued to monitor this opportunity.
 - *Status Update 2014: In Fall 2013, Bowdoin announced a power purchase agreement (PPA) with SolarCity of San Mateo, California, to install, own and operate a 1,300 kW solar array on the roofs of Farley Field House, Greason Pool, Watson Arena, and 52 Harpswell as well as on three acres of land formerly owned by the naval base. The 4,500 panels are expected to provide roughly 8% of the College's electricity usage. Construction is expected to be complete by fall 2014.*
 - Cost and Funding Source: Bowdoin signed a PPA with SolarCity Corporation to purchase all of the electricity from the company's solar installations at a fixed rate for 20 years. As a PPA, SolarCity will finance, build and maintain the multi-million dollar project. Bowdoin will invest an initial \$200,000 from annual operating funds to pay for the electrical distribution line which will connect the panels at the former base to the Farley Field House complex.

Beyond 2020 Projects

- By 2050 achieve a 36% reduction in purchased renewable energy credits or carbon offsets required to maintain neutrality.
 - Status: Unchanged
- Continue to use only Energy Star rated or better equipment when replacing any non-lighting equipment on campus.
 - Status: Ongoing.
- Expand the existing educational efforts of campus faculty, staff and students in order to affect behavioral changes that lead to sustained reductions in energy usage and associated carbon emissions.
 - Status: See section 3, below.
- Complete the conversion of College satellite facilities from higher carbon distillate oil to natural gas.
 - Status: Of the 38 satellite locations identified in the 2009 Carbon Neutrality Implementation Plan, 36 were targeted for natural gas conversion by 2020. By the end of FY 2013 Bowdoin will have completed 27 conversions, or 75% of the total. This puts Bowdoin well ahead of its anticipated conversion schedule. The full

conversion of satellite facilities from #2 oil and propane to natural gas is now expected to be substantially completed by 2015.

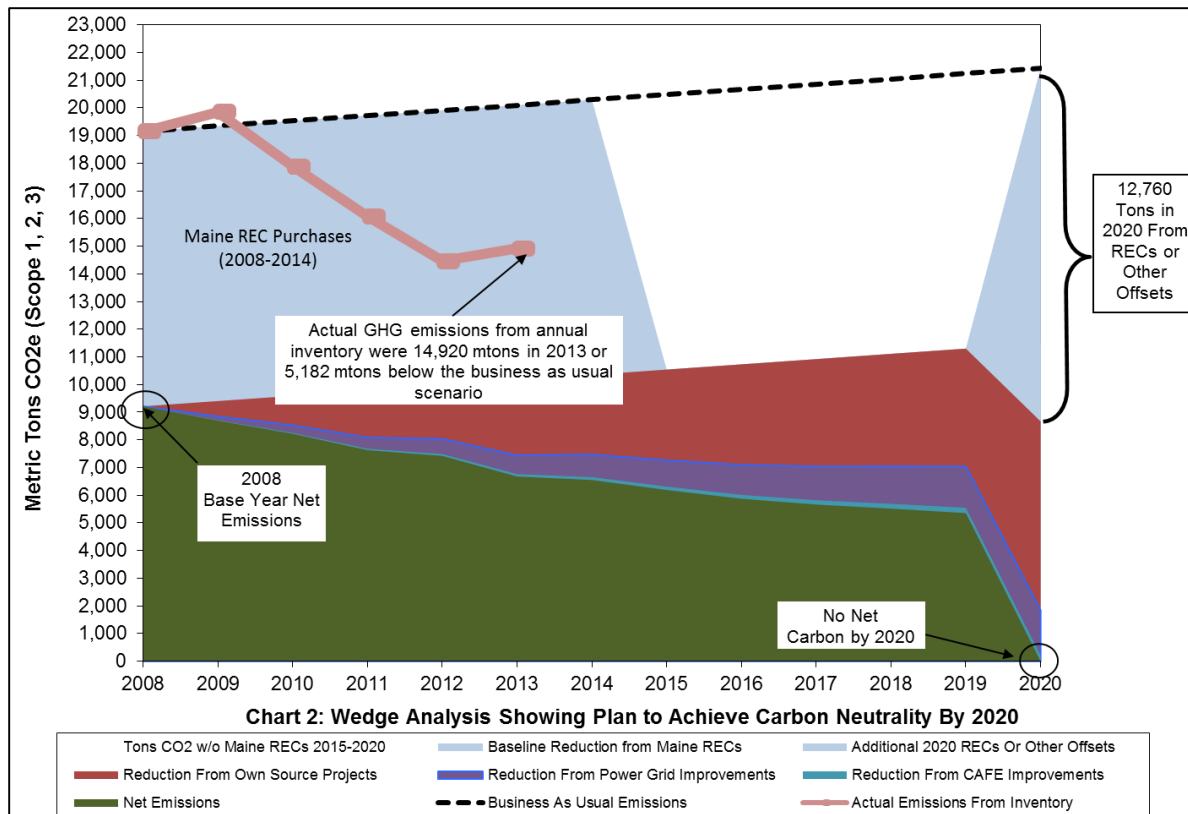
- Pursue building envelope and HVAC system improvements for each renovation and new building project. Attempt to achieve a 70% improvement by 2030 and an 80% improvement by 2050 compared to current building stock.
 - Status: No change.
- Monitor the improvement of full electric vehicles and begin to phase in their use as soon as the technology becomes commercially viable.
 - Status: Of the 60 vehicles maintained by the College currently, two are electric vehicles, only one of which is highway-capable, the 2013 Chevy Volt. At this time there are no trucks or mini-vans that meet the full electric capability.
- Continue to support high quality renewable energy projects and carbon reduction projects with a sustained commitment to renewable energy credits and/or offsets. Prioritize local projects that have an impact on the local economy and air-shed.
 - Status: Bowdoin has been purchasing Maine based RECs between FY 2008 and 2014 in order to offset all electricity usage that did not meet the Maine Renewable Portfolio Standard. These RECs have primarily been Low Impact Hydro Institute (LIHI) certified RECs from the Worumbo hydroelectric project in Lisbon Falls, Maine and the Rumford Falls project in Rumford, Maine owned by Brookfield Energy Marketing. Starting in FY 2015, Bowdoin will temporarily halt the purchase of RECs. The decision to halt the purchase of RECs involved input from several student groups and the members of the Sustainability Implementation Committee. Money saved from REC purchases will instead be invested in campus efficiency projects.
 - Cost: In aggregate, Bowdoin has spent about \$35,000 per year on Maine renewable energy credits, which has been funded from the annual operating budget.

2.0.2 Greenhouse Gas Mitigation Target

A key target of Bowdoin's fall 2009 Carbon Neutrality Implementation Plan was to reduce greenhouse gas emissions from business as usual by approximately 2,500 tons of CO_{2e} by 2015.

Bowdoin has reduced emissions from business as usual by 4,233 metric tons through a combination of discrete projects and other sources.

The Fall 2009 Plan contained a "wedge analysis" that showed graphically how Bowdoin planned to achieve carbon neutrality by 2020 through a combination of own source onsite renewable energy and efficiency projects, renewable energy credits or other offsets, and regional grid improvements. This chart is recreated below with a new line showing actual GHG emissions for FYs 2009-2013 from Bowdoin's annual GHG inventory.



3.0- Education, Research, and Community Outreach

Faculty and students across campus actively engage in courses, off-campus study, summer fellowships, civic engagement, and primary research examining climate change and the environment. The Climate Action Plan identified 16 strategies or initiatives that the College could undertake to promote sustainability and climate action as part of the curriculum as well as part of the everyday life at Bowdoin. During the 2009-2010 and 2010-2011 academic years, Bowdoin created the Working Group on Sustainability (WGS), comprised of faculty, staff and students, tasked with identifying strategies that everyone who works and lives at Bowdoin can contribute to energy/emissions reductions as part of a broader goal of infusing sustainability into campus culture. WGS discussed ways to implement the following proposals, which have now been incorporated into the activities of the Sustainable Bowdoin office as well as the Sustainability Implementation Committee:

- make the behavioral goals of the carbon neutrality plan visible, clear, and easy to understand;
- generate bottom-up support and engagement through the development of specific action items that help attain energy conservation and emissions reductions;
- develop ways to build a campus culture that includes sustainability as a core principle; and
- assess the effectiveness/meaningfulness of carbon neutrality/sustainability as an overall part of the Bowdoin experience.

Additional detail is provided below on the status of each of the education, research and community outreach initiatives that were identified in the 2009 Carbon Neutrality Implementation Plan. Each initiative is either underway currently, ongoing, or expected to be underway by 2020. While many of these activities are funded within the College's annual operating budget, several initiatives are supported by external grants.

- Strive to be a national leader in the role of liberal arts education in preparing students for a world that will experience wide-ranging impacts of a warming world.
 - Status Update 2011: The College is achieving this goal with the involvement of faculty offering courses, independent research opportunities, and primary research focused on the topics of climate change and sustainability.
 - *Status Update 2014: Unchanged.*

- Work closely with academic departments to infuse the topics of climate change and sustainability throughout the curriculum. Place based learning will continue to provide opportunities to engage students and faculty with the local community and provide students the experience to address the topic of climate change.
 - Status: The Environmental Studies (ES) Program actively engages other departments and programs not traditionally affiliated with the environment to examine sustainability within a broader context that includes human health and social justice.
Status Update 2014: The program currently cross-lists ES courses with 19 other departments.

- Continue to offer co-curricular programming in order to inform Bowdoin faculty, staff and students about climate change and provide opportunities for members of the Brunswick community to continue to learn more about this topic.
 - Status: Over the past two years, the ES Program has collaborated with a number of other departments and programs and supported student initiated events to sponsor events to raise awareness about climate change and sustainability.
 - *Status Update 2014: In the 2013-2014 academic year, the program cosponsored an environmental justice symposium, and panels on climate adaptation and transportation alternatives.*

- Connect with Bowdoin College alumni working in the field of climate change and sustainability in order to keep abreast of evolving technologies and initiatives and to connect students with future internship or employment opportunities in this field.
 - Status Update 2011 : The College is beginning to develop such connections through its Career Planning Center.
 - *Status Update 2014: During the 2013-2014 academic year, the ES program sponsored a Green Career series focusing on topics of LEED design, corporate sustainability, and resilience planning.*

- Build upon the success of the first Climate Days. This could include an annual lecture by a prominent speaker from the environmental community focused on climate action, an annual themed meal similar to the “locavore” dinner, and/or other events designed to engage students and employees in the College’s commitment.
 - Status Update 2011 : In the fall of 2011, the College initiated the “Bowdoin Carbon Neutral by 2020” campaign to raise awareness among students, faculty, and staff and to help the Bowdoin community develop simple ways to achieve the goal of cutting 500 pounds of CO₂e per person per year. Events included video presentations in collaboration with Residential Life, action item lists that demonstrate ways to reduce emissions, dorm energy wars, and academic building energy competitions using the College’s Web-based Building Dashboard®.
 - *Status Update 2014: During the 2013-2014 academic year, the ES program cosponsored a series with the Government Department that examined topics such as green labeling of businesses and security dimensions of climate change. These lectures are tied to specific courses, providing meaningful opportunities for faculty and students to discuss themes raised in the lectures, while also enabling members of the local community to attend. Bowdoin College continues to sponsor an annual Locavore Dinner each spring tied to a larger theme of “Meet What You Eat” that examines the role of local agriculture. Bowdoin also continues to promote the “Bowdoin Carbon Neutral by 2020” campaign to raise awareness among students, faculty, and staff and to help the Bowdoin community develop simple ways to achieve the goal of cutting 500 pounds of CO₂e per person per year. Events include presentations in collaboration with First-year Orientation, Residential Life programming, action item lists that demonstrate ways to reduce emissions, dorm energy competitions, and using the College’s Web-based Building Dashboard®.*

- Support student leadership on climate topics.
 - Status Update 2011: A group of Bowdoin students attended Power Shift 2011 in Washington, DC. Inspired by their experience, they returned to Bowdoin to start a new student group on campus named the Green Bowdoin Alliance, an umbrella group connecting different efforts to support environmental sustainability.
 - *Status Update 2014: Green Bowdoin Alliance, established in 2011, continues to provide a venue for student leadership opportunities. Green Bowdoin Athletes, established as a subgroup of Green Bowdoin Alliance, and then chartered as their own club in the spring of 2014, promotes ways in which sustainability can be incorporated into athletic events and programming on campus. For the 2014-2015 academic year, Green Athletics and the Athletic Department will be teaming up to implement an efficiency program and award for all sports teams known as the “Efficiency Initiative.” Each team will be given a list of sustainable tasks to complete together, and the teams that complete their tasks for each sports season will win recognition from their peers. Bowdoin Athletic Council representatives will help keep track of each team’s completion of these tasks.*

- Develop a sustainability and climate-focused Orientation trip that will introduce first-year students to climate action and the College’s commitment to carbon neutrality.

- Status Update 2011: These projects are in development. The College has added alternative spring break opportunities that focus on sustainability.
- *Status Update 2014: All first year students now participate in an orientation experience. The McKeen Center has developed two sustainability themed orientation programs for incoming first year students as part of the overall orientation programming.*
- Organize an educational outreach program to promote energy conservation across campus.
 - Status Update 2011: Many of these initiatives are underway as described elsewhere in this document.
 - *Status Update 2014: The two primary ways the Sustainability Office promotes energy conservation on campus are through the annual energy conservation dorm competition and the Green Dorm Room Certification program. The student and office EcoRep programs also promote energy conservation throughout the year, as peer-to-peer educational outreach programs.*
- Develop an “eco-award” to promote energy conservation and environmentally friendly behaviors among faculty and staff as part of the annual employee recognition program.
 - Status Update 2011: As part of the College’s annual employee recognition program, the Polar Star Award for Innovation recognizes an individual who generates and/or facilitates ideas or suggestions to make Bowdoin a better or more sustainable place.
 - *Status Update 2014: Unchanged.*
- Develop a wider array of first year courses that can provide more academic opportunities for environmental literacy among Bowdoin students.
 - Status Update 2011: Several first-year seminars and sub-100-level courses have been added across the curriculum that focus on environmental science, climate change, and sustainability.
 - *Status Update 2014: Unchanged.*
- Continue to support faculty and student scholarship on topics related to climate change.
 - Status Update 2011: Several faculty have externally funded research projects focused on climate change and/or sustainability.
 - *Status Update 2014: Faculty and staff participate in a state level Climate Change Adaptation Providers Network.*
- Explore the potential for acquiring carbon offsets through the development of community based energy efficiency programs that could involve faculty, staff and students similar to the programs at Brown University and Oberlin College. The capstone course offered by the Environmental Studies Program in which students will craft community climate action plans could provide a framework for moving this type of program forward.
 - Status Update 2011: This project has not yet been initiated.
 - *Status Update 2014: This has not occurred yet, but as we get closer to 2020 and the need to purchase either Renewable Energy Credits (RECs) or carbon offsets to achieve carbon neutrality, members of the Bowdoin faculty have agreed that*

this could be an excellent research project for Bowdoin students, likely in 2018 and 2019.

- Expand the student Eco-Rep program to include one Eco-Rep for each of the 22 dorms on campus. Possibilities also exist for the creation of a renewable energy technology club, led and organized by students.
 - Status Update 2011: For the 2011-2012 academic year, Bowdoin doubled the size of its student peer-to-peer Eco-Rep program, increasing from 8 to 16 students. With a new Sustainability Outreach Coordinator to oversee the EcoRep program, the feasibility of being able to supervise 22 EcoReps is now feasible. The Sustainability Office also manages an Office Eco-Rep program, with one or more representatives from roughly 20 departments across campus. The Office EcoReps act as a sustainability resource, educating their colleagues about pro-environmental behaviors they can incorporate into their work day.
 - Status Update 2014: *New in the 2012-2013 academic year, Sustainable Bowdoin has developed a Green Dorm Room Certification program as another means to spread sustainability in the residence halls, a program heavily promoted by the EcoReps.*

- Increase the use of videoconferencing to reduce travel to meetings and conferences and expand faculty/staff alternative transportation options to reduce employee commute miles.
 - Status Update 2011: Bowdoin has taken a variety of steps to make videoconferencing readily available, including: obtaining an enterprise license for Webex; supporting, through Audio Visual Services, webinars for a wide variety of departments; installing Skype on all lab and classroom computers; supplying laptops with Skype and iChat for events; and installing videoconferencing equipment in several locations on campus. Bowdoin faculty and students regularly use these technologies for meetings with colleagues at off-campus institutions.
 - Status Update 2014: *Unchanged*
 - Status Update 2011: The College maintains an alternative transportation Web site at: <http://www.bowdoin.edu/sustainability/campus-initiatives/alternative-transportation/index.shtml>. The site contains a list of resources that can be used by employees who would like to connect with other interested carpoolers or learn more new local transportation options such as the Amtrak Downeaster which runs to Portland and Boston; and the Brunswick Explorer, which provides public transit service throughout Brunswick. Buses run hourly, Monday through Friday from 6:00 am to 9:00 pm.
 - Status Update 2014: *As of the spring of 2014 Bowdoin now has a rideshare app, developed by a Bowdoin Computer Science major. It can be downloaded for free from iTunes <https://itunes.apple.com/us/app/bowdoin-college-rideshare/id805275665?mt=8>*

- Secure funding for faculty and student scholarship.
 - Status Update 2011: As described above, several faculty have externally funded research projects focused on climate change and/or sustainability.

- *Status Update 2014: Environmental Studies fellowships have been expanded to include a designated Sustainability fellowship and Environmental Justice fellowship. Examples of recently funded fellowships have provided students with the opportunity to examine the potential of redeveloped brownfield sites for alternative energy development, and assist in the design of energy efficient residential housing.*
- Provide opportunities for faculty, staff and students to be active participants in the identification of solutions at the local, state and federal levels.
 - Status Update 2011: Several courses and independent studies in the ES Program have worked towards achieving this goal. One example was a project to develop a simplified methodology for assessing sea level rise impacts in coastal Maine communities, using Brunswick and Harpswell as case studies.
 - *Status Update 2014: ES courses continue to provide opportunities for students to engage in examinations of climate change impacts on local communities.*

4.0 – Financing Options

The following table shows Bowdoin’s progress on the specific measures outlined in the 2009 Climate Neutrality Implementation Plan to reduce GHG emissions directly associated with campus operations (“own-source” emissions). The table includes the amount spent on each measure through FY 2013 as well as grant funding that helped support a number of the projects. Capital projects are typically funded outside the operating budget so have not been included in the table below.

FY	Sum of Actual Project Cost	Sum of Grants
9	\$132,252	7,504
Energy Conservation Lighting	\$7,534	
Energy Conservation Other	\$48,548	7,504
RECs	\$34,560	
Fuel Switching (#2 oil to natural gas)	\$34,110	
New Construction & Renovation (Major Maintenance)	\$7,500	
10	\$344,782	4,810
Energy Conservation Lighting	\$157,836	4,810
Energy Conservation Other	\$10,460	
Other	\$54,040	
RECs	\$34,560	
Fuel Switching (#2 oil to natural gas)	\$8,196	
New Construction & Renovation (Major Maintenance)	\$79,690	
11	\$958,819	145,480
Energy Conservation Lighting	\$91,641	10,295
Energy Conservation Other	\$207,267	13,185
Onsite Renewables	\$221,181	100,000
Other	\$94,537	
Physical Plant	\$145,000	
RECs	\$37,560	
Fuel Switching (#2 oil to natural gas)	\$86,019	
New Construction & Renovation (Major Maintenance)	\$75,614	22,000
12	\$571,074	25,916
Energy Conservation Lighting	\$63,794	15,916
Energy Conservation Other	\$172,383	10,000
Other	\$91,989	
RECs	\$30,869	
Fuel Switching (#2 oil to natural gas)	\$202,184	
New Construction & Renovation (Major Maintenance)	\$9,855	
13	\$413,681	21,453
Energy Conservation Lighting	\$116,600	20,353
Energy Conservation Other	\$149,822	1,100
RECs	\$30,000	
Fuel Switching (#2 oil to natural gas)	\$117,259	
Total	\$2,420,608	205,163

4.0.1 – Overview of Financing Options

The College has successfully used a number of the financing options outlined below to implement many of the energy-savings and emissions-reducing initiatives outlined in the 2009 Climate Neutrality Implementation Plan. To achieve complete climate neutrality, the College will need to identify additional funding sources in the future. Based on a review of strategies employed at other colleges and universities as well as the creative ideas of students, faculty and staff, the College plans to explore some specific funding strategies to evaluate their possible use in the future.

4.1.1 – Financing Options Successfully Used to Date:

Annual Operating Budget

Several initiatives outlined in sections 2 and 3 of this report continue to be funded in the College's annual operating budget. Examples include: summer fellowships that place students in 10 week stipend fellowships often focusing on some dimension of climate change, Environmental Studies faculty and staff, McKeen Center initiatives and Sustainable Bowdoin activities. Through the Student Activities Fee, several student organizations have been funded such as the Green Bowdoin Alliance, Green Athletics, and the Yellow Bike Club.

Use of Projected Annual Operating Budget Savings

Many energy conservation or carbon reducing initiatives with a payback of 0 – 3 years have been funded within the existing annual operating budget. The conversion of satellite boilers from #2 distillate oil to natural gas, lighting upgrades, weatherization projects and investing in onsite renewable energy generation have dominated this category of projects. From FY 2009 through FY 2013, the College's annual operating budget has contributed over \$2 million in funding. When the implementation of carbon reducing initiatives will result in significant and short term budget savings, the College will continue to consider funding these projects within the annual operating budget.

Capital Projects

Major capital projects, such as new construction and significant renovation projects, are typically funded outside the operating budget through gifts, grants and long-term debt. Forthcoming capital project carbon reduction achievements include the new office building at 216 Maine Street and the renovated former Stevens Home at 52 Harpswell Road, which are both anticipated to receive LEED Silver certification by the USGBC. The student dormitory at 52 Harpswell will be Bowdoin's first LEED certified renovation.

Fundraising

Alumni now have the option of designating their annual alumni gifts towards sustainability initiatives at Bowdoin by making a gift at: <http://www.bowdoin.edu/support-bowdoin/alumni/environmental-stewardship.shtml>

Grants

A number of external grants have been used to fund carbon reducing initiatives. With funding from the Efficiency Maine Trust's programs that provide cash incentives to businesses to save energy and money and improve the environment, the College has completed the solar thermal installations on Thorne Hall, weatherized two multi-unit rental properties, and upgraded lighting and heating/cooling equipment in a variety of locations. Since 2009, the College has received more than \$150,000 from the Efficiency Maine Trust rebate programs. In addition, Bowdoin received a \$400,000 grant from the Efficiency Maine Trust to help fund the central heating plant's new cogeneration system, and \$100,000 to help fund the 48 panel solar hot water system at Thorne Dining Hall. In FY 2014 the college anticipates receiving an additional \$161,570 grant to help offset the cost of 14 campus lighting projects. Grant funded educational initiatives include three Mellon Global Scholars and Mellon Global Symposia as well as climate research supported by the NSF, NASA and others. Starting in FY 2014 Bowdoin's Sustainability Outreach Coordinator will expand their work focus to include grant writing for campus sustainability initiatives.

Use Major Maintenance and Capital Renewal Budget Savings

Starting in 2010, the College began using savings from approved budgeted major maintenance projects to fund certain unbudgeted energy conservation projects. The major maintenance and capital renewal budget has funded energy conservation projects totaling more than \$600,000 through FY 2013.

Solar Power Purchase Agreement

In December of 2013 Bowdoin entered into a 20-year solar power purchase agreement with SolarCity Corp. which will allow SolarCity to install, own, operate, and maintain a 1,300 kilowatt system partially on former Brunswick Naval Air Station land acquired by the College and supplemented by the installation of solar panels on the roofs of Bowdoin's largest athletic facilities and one residence hall.

4.1.2 – Additional Financing Options Identified:

Pilot Projects

By partnering with manufacturers of new energy saving products to test these products at Bowdoin, the College could evaluate new technology at no cost or at reduced cost.

Internal Revolving Fund

The College is using certain Efficiency Maine Trust rebates – primarily those received for completed lighting projects – to help finance the costs of other efficiency improvements or carbon reducing initiatives.

4.1.3 – Financing Options for Further Exploration:

Energy Service Companies (ESCOs)

The College may consider contracting with an ESCo which would implement energy-savings initiatives on a performance-contracting basis. An ESCo could provide third-party financing as well as guarantee savings in energy costs. To date, the College has not chosen to contract with an ESCo due to its high credit rating and ability to access debt markets at a lower cost of capital than most ESCos.