Bowdoin Achieves a 16% Reduction in Greenhouse Gas Emissions and Issues the First Update to its Climate Neutrality Plan (10/13/11)

Background and Overview

In fall 2009, Bowdoin College made a commitment to become carbon-neutral by the year 2020 and released a detailed implementation plan to achieve that goal.[1] The first update to the 2009 Climate Neutrality Implementation Plan has been completed and can be reviewed at: http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/final-climate-neutrality-implementation-plan-update.pdf.

We are pleased to report that at the end of Fiscal Year (FY) 2011, the College is 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.

Bowdoin's greenhouse gas emissions (GHG) in FY 2011 were 16,085 metric tons. This is 16% lower than the FY 2008 baseline total of 19,153 metric tons.

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[1] This initiative was formally launched in 2007, when President Barry Mills signed the American College and University Presidents' Climate Commitment. To achieve this goal, the College developed a Climate Neutrality Implementation Plan in 2009. As part of that plan, the College tracks and reports annually on its greenhouse gas (GHG) emissions relative to the Fiscal Year (FY) 2008 baseline year. The plan is 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. The 2009 plan can be reviewed at: http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/implementationplan.pdf.

This Annual Greenhouse Gas Emissions Inventory Update summarizes key changes that contributed to Bowdoin's reduction in emissions. The College's GHG inventory accounts for the six greenhouse gases specified by the Kyoto Protocol and uses the global warming potential of each gas to present results in a common unit: carbon dioxide equivalent (CO2e).

Summary of 2011 Bowdoin College Greenhouse Gas Emissions

Bowdoin categorizes emissions into three scopes. Scope 1 includes onsite combustion of fuels, College vehicle use, and fugitive refrigerants. Scope 2 encompasses purchased electricity. Scope 3 includes travel by College faculty and staff, daily employee commuting, transmission line losses from electricity usage, and waste disposal.

The College has the most control over Scope 1 emissions and has made significant progress in this area as fuel-switching, green building standards for new construction, and weatherization programs for existing buildings increased campus-wide energy efficiencies. However, yearly fluctuations in winter temperatures – colder winters require higher heating fuel usage – may offset the positive impact of these emissions-reducing initiatives in a given year.

Scope 1

Onsite fuel combustion, College vehicle use, and fugitive refrigerants

Scope 1 emissions were nearly 4% higher in FY 2011 than in FY 2008, a 328 metric ton increase.

Higher fuel usage at the central heating plant was the largest factor in the Scope 1 increase. The central heating plant used 13% (16,000 MMBtu) more natural gas in FY 2011 compared to FY 2008. Most of this increase was weather related – colder winter temperatures increased demand in FY 2011. As measured by heating degree days[2], FY 2011 was 7% colder than the FY 2008 base year. During this time, many of the College's satellite facilities were converted from No. 2 heating oil to natural gas, a conversion that typically reduces GHG emissions by about 30% per Btu consumed. If these conversions

[2] 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.

had not taken place, the College's FY 2011 Scope 1 emissions would be 136 metric tons higher. College vehicle use, which rose nearly 31% (104 metric tons) compared to FY 2008, also contributed to the increase in Scope 1 emissions.

These increases were slightly offset by a decrease in GHG emissions due to fugitive refrigerants which fell 87% (54 metric tons) compared to FY 2008.

Scope 2
Purchased electricity

Scope 2 emissions were almost 32% lower in FY 2011 than in FY 2008, a 2,296 metric ton reduction.

A change in electricity-specific emissions factors published by the Environmental Protection Agency (EPA) and used in Bowdoin's emissions modeling accounted for the majority of the Scope 2 reduction. While electric emissions factors are updated periodically by the EPA, and a gradual improvement is expected each year for Maine as a higher percentage of renewable energy is integrated into the State's portfolio of power plants, the improvement in the most recent factors from the EPA were more significant than anticipated.[3]

With no appreciable change in gross building square footage on campus compared to FY 2008, the College would expect, as a rule of thumb, that its electricity usage would increase approximately 2% per year just as a result of an increase in the use of electronics and new technology on campus. Based on

[3] The most recent GHG factors available are from EPA's eGRID2010 Version 1.1 and were released in May 2011. This is the seventh edition of eGRID and provides actual GHG emissions from power plants in Maine from calendar year 2007. The improvement in eGRID2010 is related to a number of factors including the following: 1) A significant reduction in the output of Wyman Station. Wyman Station is an old and inefficient 846 MW oil fired power plant in Yarmouth, Maine, that is increasingly used only for grid reliability purposes. Compared to the eGRID 2006 Version 2.1 factors used for the FY 2008 base year emissions calculations, Wyman production declined 46%. 2) A 5% increase in the share of total Maine electrical generation that came from hydroelectric facilities. 3) A 5% increase in the share of total Maine production that came from biomass facilities. Hydro and biomass production are both carbon neutral in EPA's eGRID models and the increase in production corresponded to a proportional decrease in production from natural gas fired electric generation and a reduction in GHG emissions. [See eGRID2010 Version 1.1 State File (Year 2007 Data) and eGRID2006 Version 2.1 State File (Year 2004 Data)].

this trend, College electricity usage for FY 2011 would have been 21,500 megawatt hours (MWh) or about 6% higher than the College's actual 2011 electricity usage of 20,236 MWh. College electricity usage in 2011 decreased slightly (114 MWh or 0.6%) compared to FY 2008. Holding electricity usage flat over four years reflects many completed energy-efficiency projects, particularly lighting upgrades, and a higher level of awareness about conservation measures among students, faculty, and staff. One of the most visible of these initiatives was the ninth annual, month-long dorm energy-savings contest, which is estimated to have reduced electricity consumption by 16,893 kilowatt-hours in the fall of 2010.

Also contributing to increased energy conservation awareness on campus in FY 2012, will be the efforts of the Working Group on Sustainability (WGS), a two-year initiative by faculty, staff, and students with the purpose of helping the College identify ways 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. Specifically, the WGS is focused on the behavioral dimensions specifically outlined in the climate action plan, in which the campus community will collaborate to help the College reduce its emissions by 590 metric tons of CO2e per year. Having focused on specific proposal development in 2011, the WGS's focus will shift to implementation oversight in 2012.

It is worth noting that Bowdoin has continued its practice of the past several years of purchasing renewable energy credits from Maine renewable electricity generators in the voluntary market to offset 100% of its Scope 2 emissions. Bowdoin does not consider renewable energy credits or other carbon offsets for purposes of calculating its base GHG inventory each year.

Scope 3

Travel by College faculty and staff, daily employee commuting, transmission line losses from electricity usage, and waste disposal

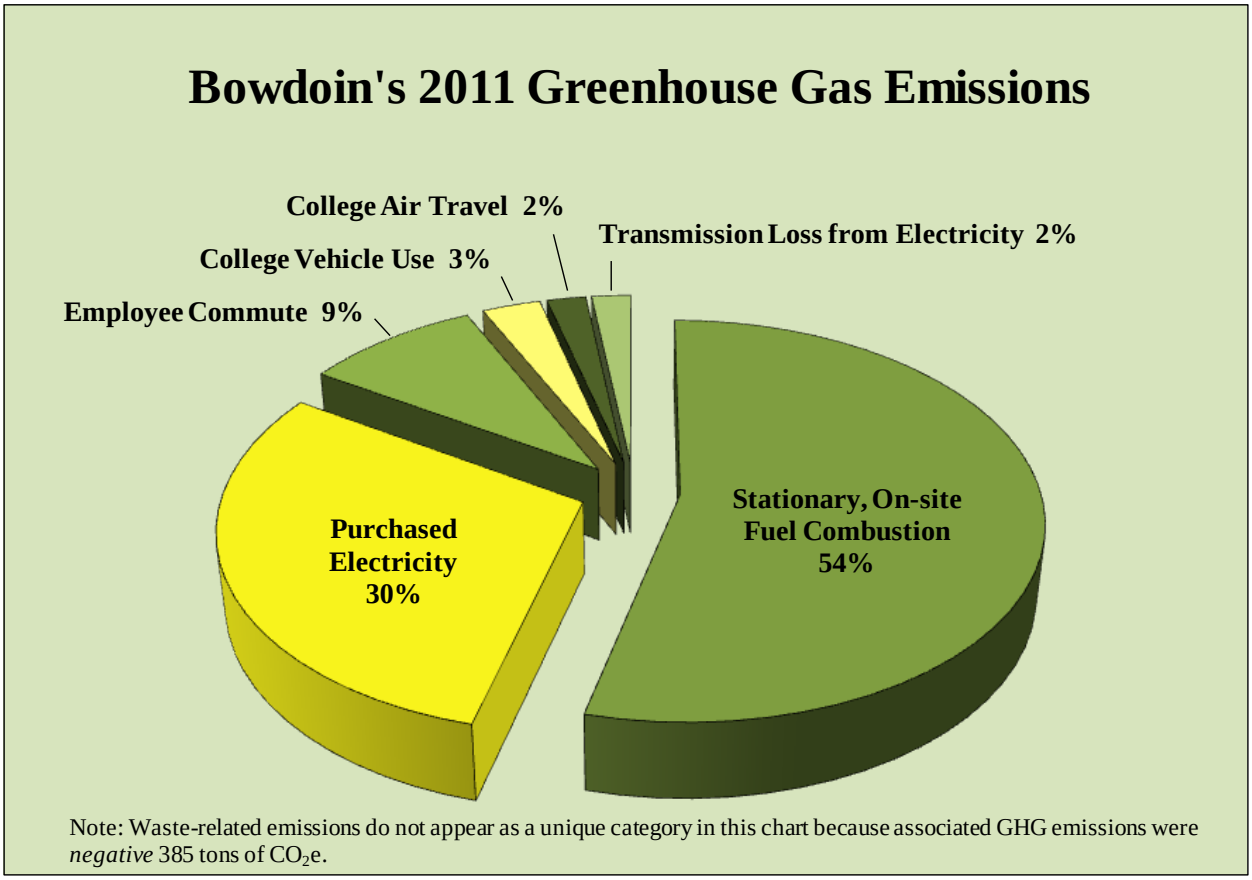
Scope 3 emissions decreased by 39% in FY 2011 compared to FY 2008, a 1,100 metric ton decrease.

Emissions associated with College travel were down 35%, a reduction of 185 metric tons of CO2e from FY 2008. Emissions related to employee commuting were down by 15%, or 256 metric tons compared to FY 2008. Certain

emission factor changes discussed in Scope 2 also reduced electricity line loss-related emissions by about 36%, or 166 metric tons compared to FY 2008.

Bowdoin's waste-related emissions decreased by 457% in FY 2011 or 493 metric tons compared to FY 2008. This major reduction was entirely due to more accurate modeling of the climate impact associated with the College's waste. Bowdoin sends a significant portion of its non-recycled waste to a facility that uses waste to generate electrical power. Compared to landfills with no energy recovery, waste-to-energy facilities have a much better GHG impact. Correctly assigning waste to its final destination more than offset a 2% increase in overall waste produced at the College. Initiatives such as Bowdoin's decision to limit free student printing in public printing locations in fall 2010 helped reduce the growth in waste. Compared to spring 2010, when students had unlimited free printing, the number of sheets of paper used by students in spring 2011 decreased by 23% (nearly 260,000 sheets of paper).

A breakdown of the estimated 16,085 metric tons of CO2e emissions for FY 2011 is shown by major category in the following chart.



Note: Waste-related emissions do not appear as a unique category in this chart because associated GHG emissions were *negative* 385 tons of CO_2e.

Conclusion

We are greatly encouraged by the 16% reduction in GHG emissions made during the three years since Bowdoin's carbon reduction plan was adopted. Achieving carbon neutrality, however, will take time and dedication. Looking forward, we are excited about the many ongoing efforts to reduce GHG emissions at the College.

In the next 2 years, specific projects to look for include:

- cogeneration in the central heating plant (winter 2011) that is estimated to reduce the College's annual electricity usage by as much as 10%;
- WGS's implementation of the following proposals (2012):
    - making the behavioral goals of the carbon neutrality plan visible, clear, and easy to understand;
    - generating bottom-up support and engagement through the development of specific action items that help attain energy conservation and emissions reductions;
    - developing ways to build a campus culture that includes sustainability as a core principle ; and
    - assessing the effectiveness/meaningfulness of carbon neutrality/sustainability as an overall part of the Bowdoin experience.
- lighting upgrades in Hubbard Hall, Sargent Gymnasium, and other locations (ongoing);
- expansion of the College's Web-based Building Dashboard®, which makes Bowdoin's energy use visible, engaging, and easily understood by students, faculty, staff, and guests (ongoing); and
- continued progress in switching the remaining satellite facilities from No. 2 heating oil to lower carbon natural gas (ongoing).

As we have seen in our early years of implementation, the collective efforts of Bowdoin's students, faculty, and staff will be critically important to achieving carbon neutrality by 2020.