



## Annual Greenhouse Gas Emissions Inventory Update for FY 2012 (11/8/12)

### 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.<sup>1</sup> The plan focused primarily on an ambitious goal of reducing our Scope 1 “own-source” emissions by at least 28% over the 12 years between 2008 and 2020, with the understanding that we would likely need to purchase some carbon offsets in 2020 to help us achieve the ultimate goal of carbon neutrality. The team of Bowdoin students, staff, faculty and trustees who developed the plan knew that becoming carbon neutral by 2020 would be a challenging if not impossible goal to reach in a short 12 years, but by choosing a date further out, the sense of urgency that the committee wished to convey would have been lost.

We are pleased to report that at the end of Fiscal Year (FY) 2012, the College is on track with the plan, as a result of campus-wide conservation efforts, specific initiatives in the Climate Neutrality Implementation Plan, and other factors.

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<sup>1</sup> 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> and the first update can be reviewed at <http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/2011implementationplanupdate.pdf>.

Bowdoin's greenhouse gas emissions (GHG) in FY 2012 were 14,467 metric tons. This is 24% lower than the FY 2008 baseline total of 19,153 metric tons.

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 carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, and uses the global warming potential of each gas to present results in a common unit: carbon dioxide equivalent (CO<sub>2</sub>e).

### **Summary of 2012 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 11% lower in FY 2012 than in FY 2008, a 1,033 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. Oil usage declined 70% (86,000 gallons) compared to FY 2008. As expected, the use of natural gas at the satellite facilities was up 222% (18,000 MMBtu) as oil was displaced. The use of natural gas instead of heating oil reduces GHG emissions by about 30% per Btu consumed. If these conversions had not taken place, the College's FY 2012 Scope 1 emissions would have been about 240 metric tons

higher. Despite the increase in usage at smaller satellite facilities, overall natural gas usage was down 2% (3,000 MMBtu) compared to FY 2008. The central heating plant used 17% (21,000 MMBtu) less natural gas in FY 2012 compared to FY 2008. Most of this decrease was weather related – mild winter temperatures decreased heating demand in FY 2012. As measured by heating degree days<sup>2</sup>, FY 2012 was 9% warmer than the FY 2008 base year. The installation of a new efficient natural gas boiler in 2011, and the completion of a multi-year project to upgrade campus steam line insulation in 2012 also contributed to lower natural gas consumption.

Two smaller portions of Bowdoin's scope one emissions experienced an increase in FY 2012, college vehicle use (3% of total emissions) and fugitive refrigerants (1% of total emissions). Gasoline and diesel fuel use in college vehicles rose 27% (90 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 95% (59 metric tons) compared to FY 2008, primarily due to a one-time event.

## **Scope 2**

### *Purchased electricity*

Scope 2 emissions were 38% lower in FY 2012 than in FY 2008, a 2,730 metric ton reduction.

Despite a 4% increase in campus square footage – and the expectation that, as a rule of thumb, electricity usage would increase approximately 2% per year just as a result of an increase in the use of electronics on campus – electricity purchases decreased in FY 2012 by 4% (760,000 kWhs) compared to FY 2008. A large factor in the decrease was the successful startup of the campus cogeneration system. A 630 kW backpressure turbine was installed at the central heating plant and began making power in February 2012. The turbine produced 311,000 kWhs during FY 2012 and is expected to generate more than 1,700,000 kWhs during FY 2013, its first full year of operation.

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<sup>2</sup> 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.

Also contributing to the decrease in Scope 2 emissions were the ongoing focus on energy-efficiency projects and efforts to raise awareness about conservation measures among students, faculty, and staff. Notable accomplishments included:

- Thorne and Moulton Union Dining Halls – estimated 125,000 kWh reduction due to the addition of variable speed drives to the kitchen exhaust hoods;
- Campus exterior light poles – estimated 30,000 kWh reduction due to the replacement of metal halide bulbs with CFL bulbs; and
- Residence Hall Energy Competition – estimated 24,000 kWh reduction due to student participation in the energy savings competition.

A change in electricity-specific emissions factors published by the Environmental Protection Agency (EPA) and used in Bowdoin's emissions modeling also accounted for a portion of the Scope 2 reduction. The addition of renewables to the Maine power mix resulted in a 6% year-over-year reduction in the EPA emissions factors for Maine power plants.<sup>3</sup>

Bowdoin has continued its longstanding practice 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 33% in FY 2012 compared to FY 2008, a 923 metric ton decrease.<sup>4</sup>

Emissions associated with College travel were down 12%, a reduction of 66 metric tons of CO<sub>2</sub>e from FY 2008. Emissions related to employee commuting were down by 14%, or 233 metric tons compared to FY 2008. Electricity line

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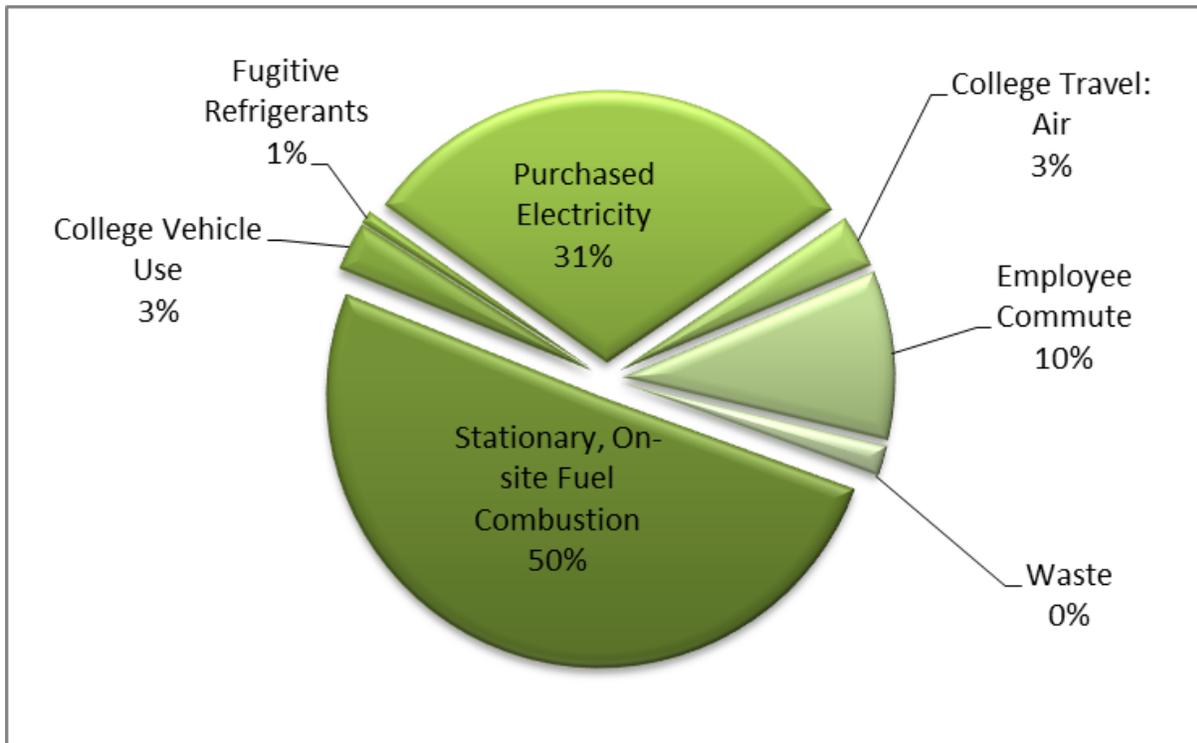
<sup>3</sup> The most recent GHG factors available are from EPA's eGRID2012 Version 1.0 and were released in May 2012. This is the eighth edition of eGRID and provides actual GHG emissions from power plants in Maine from calendar year 2009.

<sup>4</sup> Although lower than the FY 2008 base year, Scope 3 emissions were 10% higher in FY 2012 than in FY 2011.

loss-related emissions were 41%, or 192 metric tons, lower compared to FY 2008.

Bowdoin's waste-related emissions decreased by 401% in FY 2012 or 433 metric tons compared to FY 2008. The College 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 smaller GHG impact. A change in modeling since FY 2008 that correctly assigns waste to its final destination accounts for the majority of this decrease.

A breakdown of the estimated 14,467 metric tons of CO<sub>2</sub>e emissions for FY 2012 is shown by major category in the following chart.



## Conclusion

Bowdoin's GHG emissions were 24% lower in FY 2012 compared to the base year of Bowdoin's carbon reduction plan. Although we received a considerable amount of help from mother-nature in the form of a mild winter,

the trend over the past four years is clear and encouraging. Achieving carbon neutrality, however, will take time and dedication. Reducing campus greenhouse gas emissions will require action by everyone on campus. Our goal is to continue the ongoing effort of making the behavioral goals of the carbon neutrality plan visible, clear, and easy to understand. Looking forward, we are excited about the many ongoing initiatives to reduce GHG emissions at the College.

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

- a new campus lighting audit, which will include the continuous upgrades in both lighting efficiency as well as lighting sensors that either reduce light levels or completely shut lights off when a space is unoccupied (ongoing);
- refrigeration efficiency projects at both Moulton Union and Thorne Dining Halls (2013);
- building weatherization projects (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);
- a new voluntary dorm room energy audit program that gives recognition to students for using energy conservation practices in their rooms (ongoing);
- continued progress on switching the remaining satellite facilities from No. 2 heating oil to lower carbon natural gas (ongoing); and
- continued assessment of onsite renewable energy production from solar photovoltaic (PV) panels (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.

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