Annual Greenhouse Gas Emissions Inventory Update for FY 2013 (1/23/14)

Background and Overview

Bowdoin College committed to become "carbon-neutral" by the year 2020 and released a detailed implementation plan to achieve that goal in fall 2009.[1] The plan focused primarily on an ambitious goal of reducing "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 achieve the ultimate goal of carbon neutrality.

This serves as the Annual Greenhouse Gas Emissions Inventory Update for Fiscal Year (FY) 2013. Bowdoin's greenhouse gas emissions (GHG) in FY 2013 were 14,920 metric tons of carbon dioxide equivalent (CO2e). This is 22% lower than the FY 2008 baseline total of 19,153 metric tons. The balance of this update provides a more detailed explanation of the College's inventory.

Summary of 2013 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

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

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 1.25% lower in FY 2013 than in FY 2008, a 113 metric ton decrease. [2]

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 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 days[3], FY 2013 was 1% colder than the FY 2008 base year.

Two smaller portions of Bowdoin's scope one 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

[2] Although lower than the FY 2008 base year, Scope 1 emissions were 11% higher in FY 2013 than in FY 2012. FY 2013 was 11% colder than FY 2012.

[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.

to use a College-owned vehicle. Fugitive refrigerants increased 140% (86 metric tons) compared to FY 2008.

Scope 2
Purchased electricity

Scope 2 emissions were 39% lower in FY 2013 than in FY 2008, a 2,853 metric ton reduction.

Despite a small 6,000 square footage increase in the size of the campus – 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 2013 by 6% (1,293,000 kWhs) compared to FY 2008. A large factor in the decrease 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 kWhs during FY 2013.

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:

- A gradual progression toward LED light conversions on campus. Switching from higher wattage metal halide, high pressure sodium, and halogen light fixtures to LED fixtures has provided considerable electrical savings. Major projects this past fiscal year included exterior lights in several campus locations including the walkway between South Street and Longfellow Avenue, as well as the Coles Tower plaza and the Pine Street Apartments parking lot.
- An updated campus lighting audit, which identified and implemented several lighting projects. Results of that work included lighting upgrades in the Smith Union (estimated savings of 55,476 kWhs per year) and Rhodes Hall (estimated savings of 18,000 kWhs per year), as well as the installation of motion sensors in the first year brick dorm stairwells (estimated savings of 24,000 kWhs per year).
- Residence Hall Energy Competition – estimated 16,252 kWhs reduction due to student participation in energy savings competition.

Bowdoin continued to purchase 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

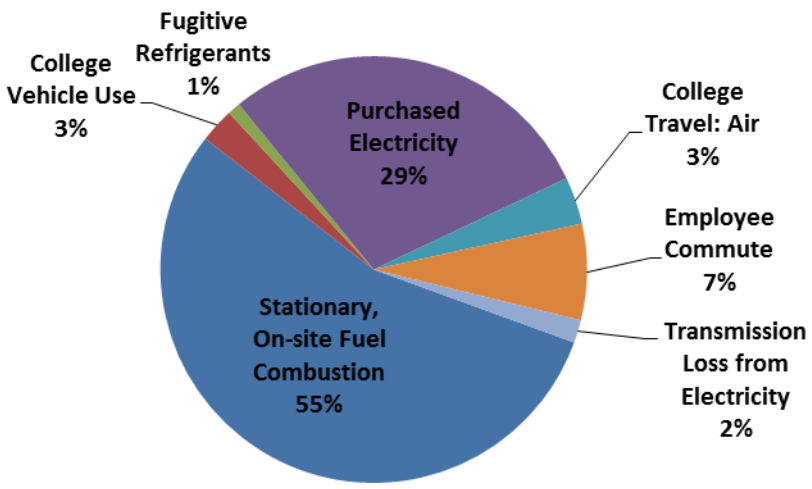
Travel by College faculty and staff, daily employee commuting, transmission line losses from electricity usage, and waste disposal

Scope 3 emissions decreased by 45% in FY 2013 compared to FY 2008, a 1,267 metric ton decrease.

Emissions associated with College travel were up 2%, an increase of 12 metric tons of CO2e from FY 2008. Emissions related to employee commuting were down by 35%, or 608 metric tons compared to FY 2008. Electricity line loss-related emissions were 43%, or 199 metric tons, lower compared to FY 2008.

Bowdoin's waste-related emissions decreased by 438% in FY 2013 or 473 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 14,920 metric tons of CO2e emissions for FY 2013 is shown by major category in the following chart.



Conclusion

Bowdoin's GHG emissions were 22% lower in FY 2013 compared to the base year of Bowdoin's carbon reduction plan. Although lower than the base year, GHG emissions were 3% higher in FY 2013 than in FY 2012, as more fuel was used to heat the campus in response to a much colder winter.

Achieving carbon neutrality is not an easy task. While we can celebrate progress each year, reducing campus greenhouse gas emissions will require ongoing action by everyone on campus.

This past year we completed several previously mentioned major lighting projects and furthered our efforts to switch from No. 2 heating oil to lower carbon natural gas. Projects to look for in the coming year include:

- Onsite renewable energy production from solar photovoltaic (PV) panels ground mounted on 3 acres of College land at the former Base and roof mounted on Farley Field House and Watson Arena (2014).
- Renovation of the former Stevens Home located at 52 Harpswell Road into an energy-efficient building for student housing. This will be the College's first LEED renovation (2014).
- An upgrade to the dome lights in Smith Union's Morrell Lounge, Bookstore and Café from metal halide to LED (2014).

- Expansion of the 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 natural gas (ongoing).

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

Prepared by the Staff of the Sustainability Implementation Committee
Catherine Longley, chair, Sr. VP for Finance and Administration & Treasurer
Don Borkowski, Director of Capital Projects
Keisha Payson, Coordinator for a Sustainable Bowdoin
Andrew Price, Senior Vice President, Competitive Energy Services
Theodore Stam, Director of Facilities Operations and Maintenance
Delwin Wilson, Director of Finance and Campus Services