Annual Greenhouse Gas Emissions Inventory Update for FY 2014 (11/7/14)

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) 2014. Bowdoin's greenhouse gas emissions (GHG) in FY 2014 were 15,813 metric tons of carbon dioxide equivalent (CO2e). This is 17% 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.

---

[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 and second updates can be reviewed at http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/2011implementationplanupdate.pdf and http://www.bowdoin.edu/sustainability/carbon-neutrality/pdf/implementation_update_070214.pdf, respectively.

Summary of 2014 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 renovations, and weatherization programs for existing buildings increased campus-wide energy efficiencies. However, yearly fluctuations in winter temperatures – colder winters require higher heating fuel usage – as well as one time projects on campus, 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 12% higher in FY 2014 than in FY 2008, an increase of 1,045 metric tons.

Scope 1 emissions have increased mostly as a result of a significant increase in fugitive refrigerants in FY 2014. Fugitive refrigerants were measured at 1,032 metric tons for 2014, after an average of 88 metric tons from 2008-13. This is an increase of 1,573% compared to FY 2008 and is therefore responsible for 93% of the total Scope 1 emission increase. The large increase in fugitive refrigerants resulted from a necessary modification to the chiller at Walker Art Museum and replacement of a failed chiller coil at Druckenmiller Hall. These were both one-time events that are unlikely to reoccur.

The remaining increase in Scope 1 was a result of College vehicle use. Gasoline and diesel fuel use in College vehicles rose 26% (89 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.

On-site fuel combustion showed very little change (down 0.16%) compared to FY 2008. Oil usage increased by 75% (33,700 gallons) compared to FY 2013, as it represented a more cost-effective heating option during several extreme natural gas price spikes this past winter. Also, as expected, the use of natural gas was up 17% (17,170 MMBtu) from FY 2008 as more satellite facilities have been switched from No. 2 oil to natural gas. Some of the increase in both natural gas and oil usage can be attributed to temperatures last winter. As measured by heating degree days, FY 2014 was 8.5% colder than the FY 2008 base year. [2]

Scope 2

Purchased electricity

Scope 2 emissions were 42% lower in FY 2014 than in FY 2008, a 3,051 metric ton reduction.

A large factor in the continued decrease in emissions related to purchased electricity is the use 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. Despite having some operational issues in February 2014, the turbine produced 1,053,000 kWhs during FY 2014.

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. Large scale project sites this past fiscal year included LED lights at the Coffin Street Parking Lot and the David Saul Smith Union. The Smith Union's dome lights in Morrell Lounge, Bookstore, and Café were converted from metal halide to LED.
- Upgrades to the energy systems of Stowe House Inn residence hall, where individual electric water heaters for each room were replaced with a central efficient hot water system that is fueled by natural gas.

[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.

- Residence Hall Energy Competition – estimated 16,585 kWhs reduction in electricity usage due to student participation in energy savings competition.

Bowdoin has chosen to discontinue its purchase of renewable energy credits from Maine renewable electricity generators in the voluntary market to offset 100% of its Scope 2 emissions. These credits have never been factored into the GHG emissions inventory, but it should be noted that the money previously used to purchase renewable energy credits is being put towards expanding efficiency and renewable energy projects going forward.

Scope 3

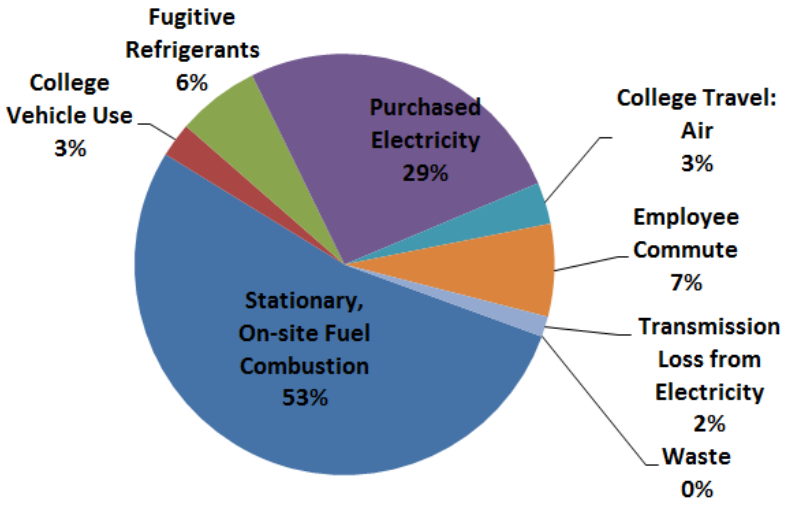
Travel by College faculty and staff, daily employee commuting, transmission line losses from electricity usage, and waste disposal

Scope 3 emissions decreased by 47% in FY 2014 compared to FY 2008, a 1,335 metric ton decrease.

Emissions associated with College travel were down 3%, a decrease of 15 metric tons of CO2e from FY 2008. Emissions related to employee commuting were down by 33%, or 565 metric tons compared to FY 2008. Electricity line loss-related emissions were 45%, or 211 metric tons, lower compared to FY 2008.

Bowdoin's waste-related emissions decreased by 504% in FY 2014 or 544 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 15,813 metric tons of CO2e emissions for FY 2014 is shown by major category in the following chart.



Conclusion

Bowdoin's GHG emissions were 17% lower in FY 2014 compared to the base year of Bowdoin's carbon reduction plan. Although lower than the base year, GHG emissions were 6% higher in FY 2014 than in FY 2013, primarily as a result of a marked increase in fugitive refrigerants and the use of more fuel (particularly No. 2 heating oil) to heat the campus in response to a cold winter.

Achieving carbon neutrality is not an easy task. While we can celebrate progress and evaluate setbacks 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 our satellite facilities from No. 2 heating oil to lower carbon natural gas. Projects to look for in the current fiscal year include:

- In partnership with SolarCity Corp., installation of Solar PV panels at Farley Field House, Greason Pool, Watson Arena, and the former Naval Air Station property that collectively will provide about 8% of the College's electricity each year. ***Combined with the electricity produced by the cogeneration turbine at the heating plant, approximately 16% of the College's electricity is now generated on site from renewable or efficient sources.***

- 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 certified renovation. The LEED silver residence will include a 12 kW solar PV system on the roof.
- Lighting upgrades at 14 different campus locations that will save an expected 600,000 kWh annually. Locations include Hawthorne-Longfellow Library, Thorne Dining Hall, Chamberlain Hall, and Watson Arena.
- Continued progress on switching the remaining satellite facilities from No. 2 heating oil to natural gas.

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