Report on Greenhouse Gas Emissions during Fiscal Year 2016

Summary: As of FY16, Williams is approximately 53% of the way toward reaching our current greenhouse gas emissions goal of 35% below 1990's level by 2020. Between 1990 and 2005 Williams's emissions had increased from 23,188 to 33,950 metric tons, or about 46%. Since that time, a variety of strategies have been employed to reduce greenhouse gas emissions associated with campus operations.

The increase in emissions from 1991 to 2005 was primarily due to added buildings and increased energy use in existing buildings. Concerted efforts to reduce energy consumption and emissions starting in FY07 lowered annual emissions to 23,893 tons in FY16.

Figure 1 shows how three broad scopes of greenhouse gas emissions have evolved over the past 25 years. Scope 1 includes all direct emissions from the central heating plant and other campus boilers (including cogenerated electricity). Scope 2 includes indirect emissions from purchased electricity. And Scope 3 includes other indirect emissions (mostly from air and car travel by faculty, staff and students). Scope 3 emissions in FY16 were down approximately 7% from the previous year and down 30% from peak emissions in FY05.

Note: Greenhouse gas emissions calculations exclude emissions associated with off-campus properties, such as faculty/staff housing, commercial rentals properties, and properties located outside of Williams, as well as greenhouse gas emissions associated with goods and services purchased by the college, other than electricity and fuels consumed on campus.

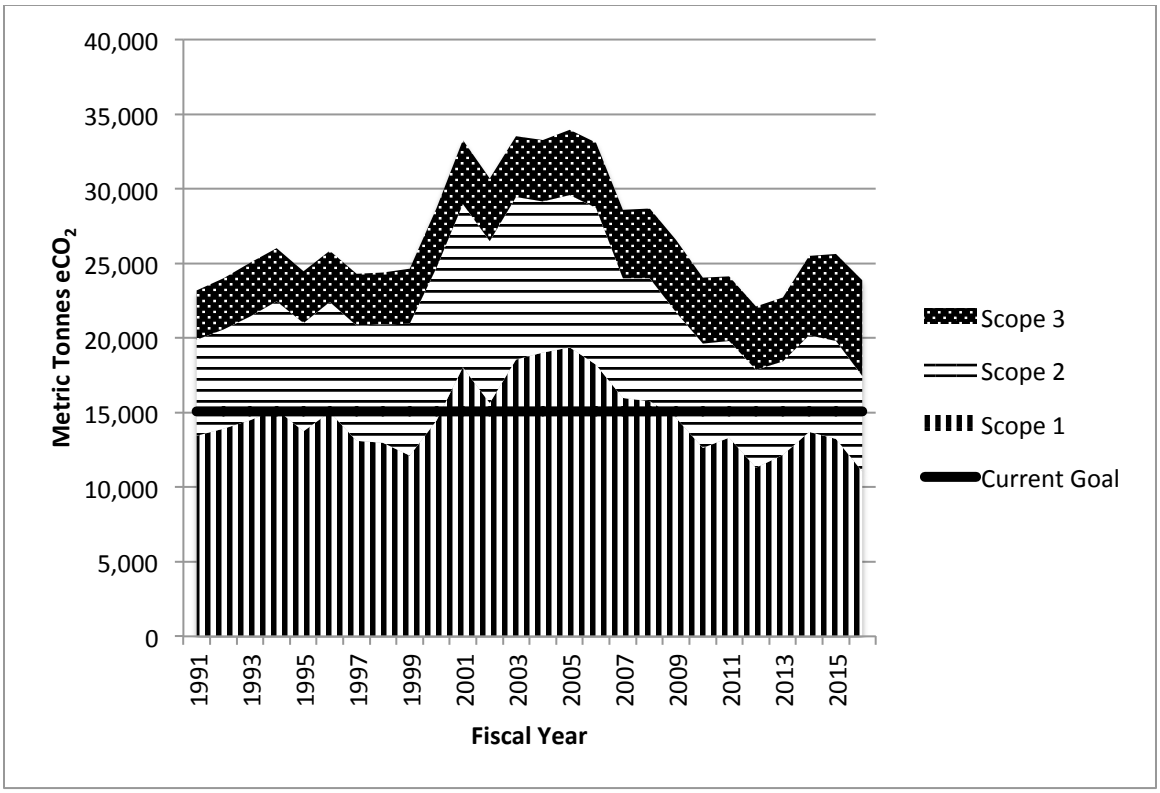

Figure 1: Greenhouse gas emissions by scope 1991-2016

Figure 2 highlights the results of emissions reduction initiatives relative to "business as usual," which is our best estimate of what emissions would have been had we not taken action. Business as usual is shown in the top line of the figure. Each of the areas below then represent the effects of a different category of initiatives. Actual emissions are indicated by the solid black line.

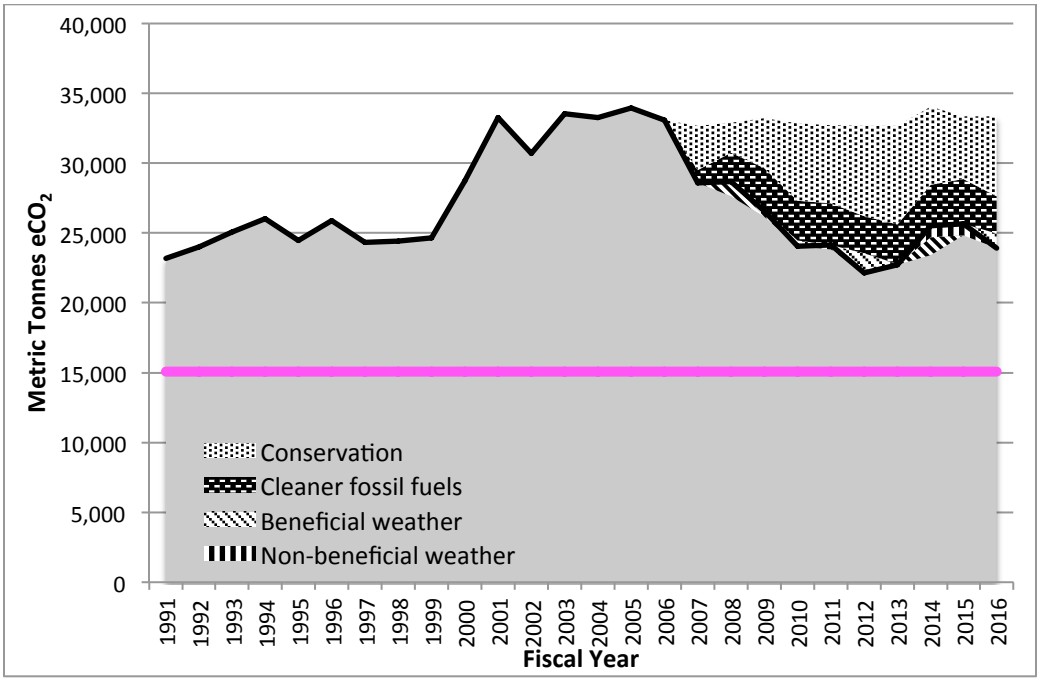

Figure 2: Emissions and impacts of reduction strategies 1991-2016

Why did emissions rise after a low in 2012?
A large portion of the increase was due to the construction of the new library, which was ongoing in 2013 and 2014. While we do not an exact accounting of the construction emissions due to faulty metering, construction emissions were extrapolated from data on previous construction projects. Doing so suggests that construction accounted for about 5% of total emissions for fy14.

There has also been a steady increase in air miles from 2013 through 2015, likely due to the capital campaign. This trend continued in 2016, but increases in emissions through air travel were partially offset by the warmer-than-average weather and continued attention to energy conservation and efficiency.

The overall trend, however, has been a decline in emissions, due to conservation projects and cleaner fossil fuels:
Conservation Projects: In FY16, energy conservation measures accounted for approximately 61% of total emissions reductions. Total campus energy use has decreased 13% from the peak in FY05, even though the campus building footprint has

grown. These savings have come largely from investment in energy conservation projects, such as lighting, insulation, efficient motors, building controls and operational changes.

Cleaner Fossil Fuels:

- **Use of additional natural gas at the heating plant:** Using more natural gas at the central heating plant accounted for approximately 28% of total emissions savings in FY16. The central heating plant can burn natural gas or fuel oil. Natural gas emits about 35% less greenhouse gas per heating unit than fuel oil, but is often more expensive and has other environmental impacts. In FY16, 98% of heating fuel used was natural gas, compared to 43% in FY07. Note that our emissions calculations are not full-life cycle analyses of the impacts of fuel consumption. We follow industry standards in this regard, but fully recognize that impacts of fossil-fuel extraction are not accounted for.
- **Switch to #2 fuel oil instead of #6 fuel oil as a secondary fuel:** Williams does burn a small amount of a secondary fuel in the central heating plant during colder period of the winter. In FY14, that fuel was switched from #6 residual oil to #2 distillate oil. #2 distillate has slightly lower emissions per unit of energy than residual oil, but the switch made a negligible different (less than 20 metric tons eCO_2)
- **Renewable energy accounts 3%.** Williams has seven solar photovoltaic systems, with an additional 7-9 planned by 2020. If all systems are installed as planned, on campus solar production should account for ~15% of total campus electricity use.

What are the plans and risks for reaching our 2020 goal?

1. **Renewable Electricity.** To meet our 2020 goal, Williams will need to generate or procure 100% renewable electricity while retaining the environmental attributes. Williams will need to not sell the renewable energy certifications from any projects that we own, and purchase the renewable energy certificates as part of any long term procurement contract. On campus solar could account for up to 15%, but the rest will need to come from off-campus projects. (See below for a discussion of the current status of our renewable energy project development.)
2. **Impact of construction on emissions.** The increase in emissions during FY13 and FY14 are a cautionary tale about the impact of construction on emissions. The more construction the College undertakes, the more we will need to reduce emissions through on-campus conservation or purchasing or creating carbon offsets in the local economy. Furthermore, the ongoing impact of additional square footage will need to be carefully controlled. Buildings that are currently under design must not increase emissions. This can be accomplished by removing other buildings (as in the case of the science project), designing net zero energy buildings (as in the case of the CDE Annex), or by doing an addition/renovation that decreases overall energy use while satisfying program needs.

3. **Impact of air travel.** Air travel is currently an unavoidable part of the College's business, but the entire campus community should challenge itself to reduce air travel when possible. Business travel on the east coast, for example, can take advantage of train travel, which has lower emissions per mile traveled than air travel.

Carbon Offsets

Williams has committed to purchasing carbon offsets at the end of fiscal year 2020 to reach carbon neutrality. Our current focus, however, is on reducing emissions through conservation, efficiency, and renewable electricity. Nevertheless, in fiscal year 2016, the College received a generous gift of carbon offsets from Tim Tuttle '64. The offsets come from the Isangi REDD + project (see http://www.climate-standards.org/2014/03/21/isangi-redd-project/ for project details), and are sufficient to offset Williams's scope 3 emissions (air travel and car travel). Figure 3 shows the impact of the carbon offsets. We will continue to show the two approaches to emissions reduction separately until 2020.

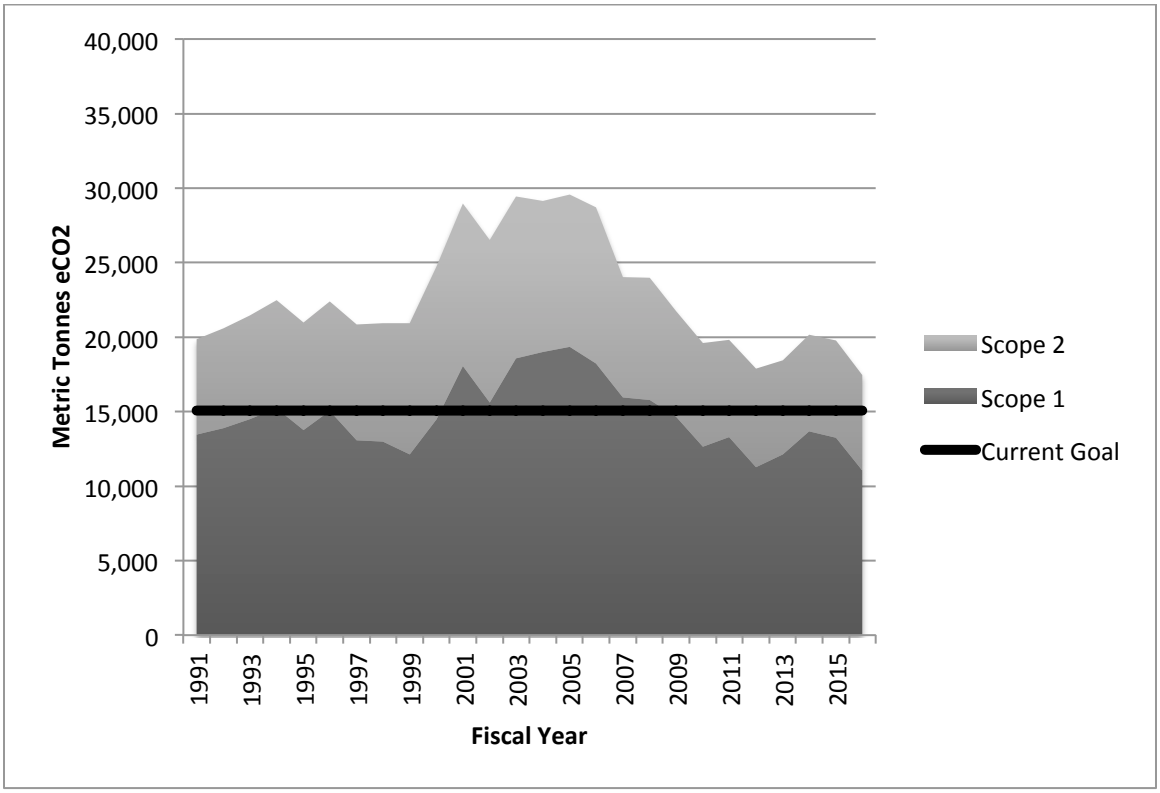

Figure 3: Scope 1 and Scope 2 greenhouse gas emissions 1991-2016. Scope 3 emissions are offset.