Report on Greenhouse Gas Emissions during Fiscal Year 2014

Summary: As of FY14, Williams is approximately 75% of the way toward reaching our greenhouse gas emissions goal of 10% below 1990's level by 2020. Between 1990 and 2005 Williams emissions had increased from 23,188 to 33,950 metric tonnes, 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 due to added buildings and increased energy use in existing buildings. Concerted efforts to reduce energy consumption and emissions starting in FY07 have lowered annual emissions to 24,412 tonnes in FY14.

Emissions in FY14 were up approximately 8% from the previous year and down 28% from peak emissions in FY05. See Figure 1 and Table 1. In Figure 1, 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).

Note: Greenhouse gas emissions calculations do not include energy and emissions associated with off campus properties such as faculty/staff housing and commercial rentals properties or properties located outside of Williams, nor greenhouse gas emissions associated with good and services purchased by the college, other than electricity and fuels consumed on campus.

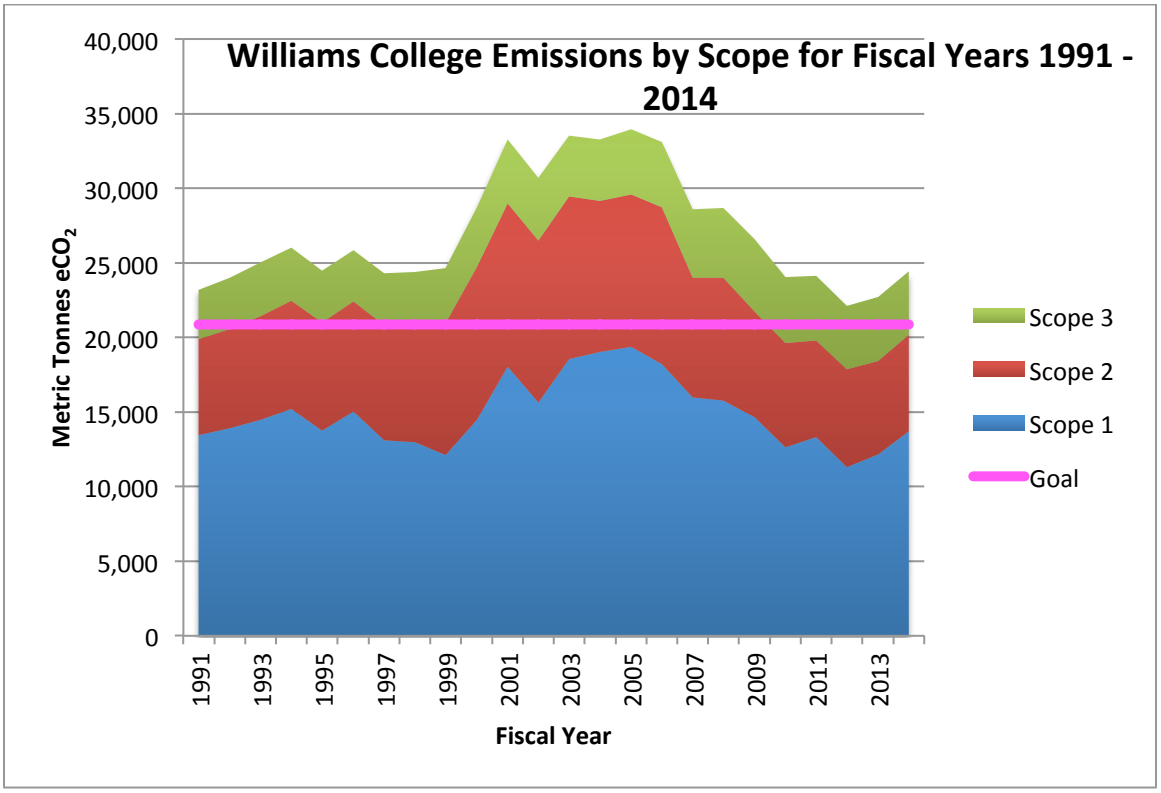

Figure 1: Greenhouse gas emissions by scope from fiscal year 1991 to 2014.

Fiscal Year	Total Emissions (metric tonnes $eC0_2$)	% Change from Previous Year	% Change from Peak in FY05
2005	33,947		
2006	33,088	-3%	-3%
2007	28,584	-14%	-16%
2008	28,686	0%	-16%
2009	26,563	-7%	-22%
2010	24,041	-9%	-29%
2011	24,127	0%	-29%
2012	22,136	-8%	-35%
2013	22,707	3%	-33%
2014	24,412	8%	-28%

Table 1: Total emissions and percentage decreases by fiscal year

Figure 2, Emissions and Effects of Actions on Business as Usual, (below) highlights the results of emissions reduction initiatives. The top of the yellow wedge is our best estimate of what emissions would have been had we not taken action – our "business as usual." Each wedge represents the effects of a different category of initiatives. Actual emissions are indicated by the solid black line.

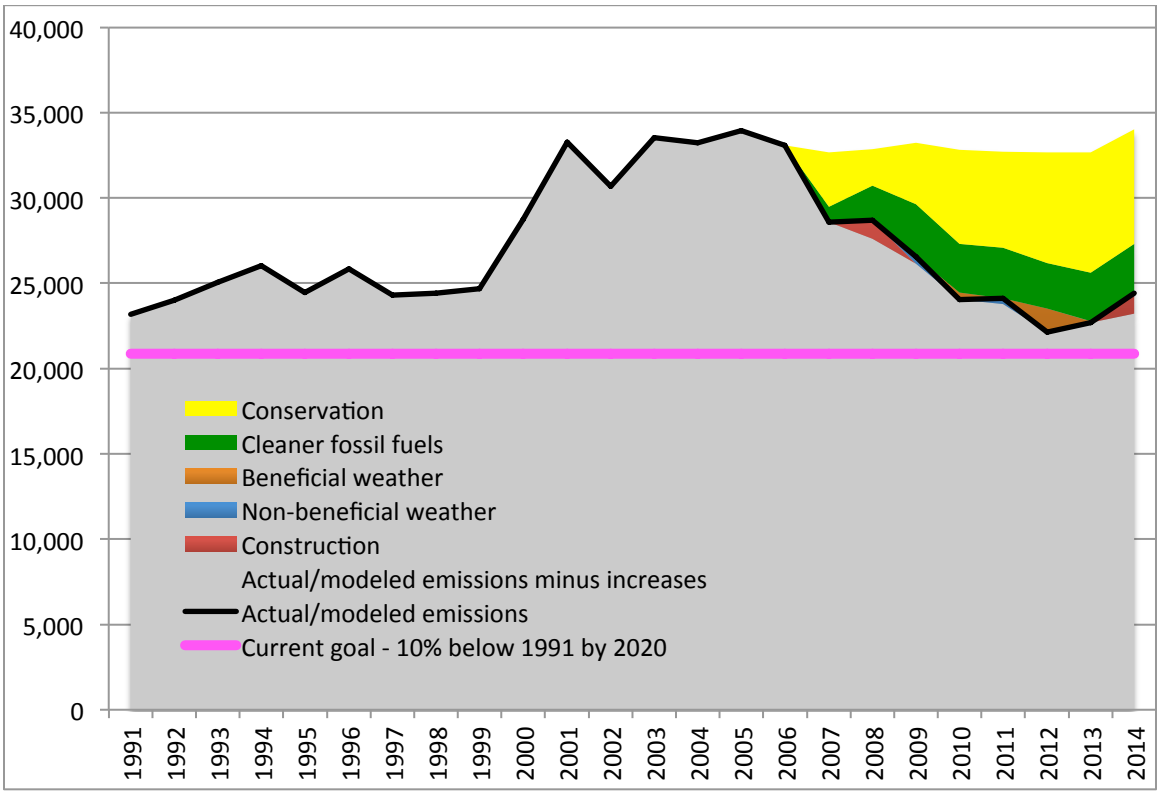

Figure 3: Emissions from Fiscal Year 1991 to 2014, showing effects of reductions measures on business-as-usual.

Fiscal Year	Total Emissions (metric tonnes $eC0_2$)	Business as Usual emissions (metric tonnes $eC0_2$)
2007	28,584	32,657
2008	28,686	32,864
2009	26,563	33,216
2010	24,041	32,820
2011	24,127	32,721
2012	22,136	32,665
2013	22,707	32,658
2014	24,412	34,022

Table 2: Total emissions and Business as Usual Emissions by fiscal year

Why are emissions up in fiscal year 2013 and 2014 from our low in 2012?
Construction of the new library was ongoing during both fiscal year 2013 and 2014. The electricity used during construction was accurately metered, but energy from the central heating plant was unfortunately not metered due to faulty equipment. What is included in Figure 2 is an extrapolation from observed construction energy on previous projects, and may well be an underestimate given the nature of the Library construction. The estimated emissions from construction in fy14 were 1200 metric tonnes eCO_2, or approximately 5% of total emissions for that year.

Williams is embarking on a series of construction projects, and it is likely that our emissions will continue to be impacted. However, none of the currently planned projects are of the same magnitude as the new library so we hope to see lower construction emissions in future fiscal years.

Sources of Reduction:

1. **Conservation Projects (yellow):** In FY14, energy conservation measures accounted for approximately 70% of total emissions reductions. Total campus energy use has decreased 14% from the peak in FY05 even though the campus building footprint has grown. Investment in energy conservation projects such as lighting, insulation, efficient motors, building controls and operational changes have resulted in these savings.

2. **Cleaner Fossil Fuels (green wedge):** Using more natural gas at the central heating plant accounted for approximately 30% of total emissions savings in FY14.
    a. **Use of additional natural gas at the heating plant:** 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 FY14, 91% of heating fuel used was natural gas, compared to 43% in FY07. Note that our emissions calculations are not full-life cycle analysis 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.

b. **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 tonnes eCO_2)
c. **Renewable energy accounts for less than 1%.** Williams has two photovoltaic installation – a 5 kW system at Morley Science Center and a 27 kW system at the Library Shelving Facility. In addition, solar hot water system are located at Susie Hopkins, Lambert House and Fort Hoosac. A 400kw system is currently under construction, but the emissions reduction from that will not impact Williams' emissions until fiscal year 2015 and later.