

Summary of Miami University's Institutional Assessment of the FY 2015 Carbon Footprint

A formal review was conducted of Miami University's FY 2015 Carbon Footprint on February 18, 2016. The reviewers were Mr. Jeff Johnson, Interim Director of Environmental Health and Safety and Ms. Shawnee Waters, first year Master's student in the Institute for the Environment and Sustainability (IES).

Portions of the footprint had been determined by a team of other first year students in the program as the basis of their year-long Professional Service Project (PSP), which was supervised by Ms. Suzanne Zazycki, Associate Director of the IES. Ms. Yvette Kline, Director of Sustainability and Energy Conservation in Physical Facilities, was the PSP team's client, and she calculated some portions of the carbon footprint herself.

Following is a summary of the components comprising the footprint, as they were approved by the reviewers, except as noted.

On Campus Stationary Sources: 40,846 MTCO_{2e}, as per Version 8 of Clean Air-Cool Planet Campus Carbon Calculator, hereinafter referred to as v8. This section was completed by Y. Kline.

Natural gas: 222,205 MMBTU, provided by Energy Manager.

Coal: 14,347 short tons, provided by Energy Manager.

LPG: 179 gallons, provided by Energy Manager.

#2 Fuel oil: 10,899 gallons, provided by purchase records. (Note, although some of this was used for off-road vehicles, it was all reported in stationary sources.)

Direct Transportation: 1,178 MTCO_{2e}, as per v8. This section was completed by Y. Kline.

Gasoline: 104,011 gallons, provided by purchase records

Diesel: 22,361 gallons, provided by purchase records

The quantity of fuel dispensed from the pumps was compared to the purchase records, and the amounts were reasonably close. The dispensing system, however, had reliability problems during the year, so the purchase record data was used.

Refrigerants: 2140 MTCO_{2e}, as per v8. This section was completed by Y. Kline.

R-404a: 392 pounds, provided by Stores, which dispenses refrigerants by the pound to the maintenance department in association with a work order.

HCFC-22: 1205 pounds, provided by Stores, as per description above. It should be noted, however, that what was actually dispensed was 907 pounds of R-22 and 298 pounds of R-410a. Comparing the global warming potential (GWP) of those refrigerants to the choices available in v8, the total poundage was treated as HCFC-22. In other words, HCFC-22 was used as a proxy for R-22 and R-410a.

HFC-41: 134 pounds, calculated per a model used to estimate annual leakage from the chillers in use at the North and South chiller plants and the Geothermal plant. (These are not being charged through Stores requisitions.) The chillers have a specific charge (pounds/ton) designation as shown:

North chiller plant: 3000 tons at 1.8 pounds/ton of R-123 (HFC-41 was selected as the proxy for R-123, based on similarity of the GWP.) The refrigerant leak rate was modeled while conducting the

institutional assessment of the FY 2012 carbon footprint. Starting with a reference point used in LEED -- 2% annual leakage -- the Director of Utility Systems recommended using 1.25% as the annual leakage rate for all chiller equipment. This was based on his experience and assessment of the level of maintenance achieved.

South chiller plant: 2950 tons at 1.8 pounds/ton of R-123

Calculation:

Estimated annual loss of HFC-41 (R-123) = (3000 + 2950 tons) x (1.8 pound/ton) x 0.0125 = 134 pounds

HFC-134a: 691 pounds, used in both Stores requisitions [as a proxy for R-401a (150 pounds), R-134a (252 pounds) and R-407c (98 pounds)] and for the following chiller plant equipment:

North chiller plant:

2200 tons at 2.44 pounds/ton of R-134a, and 700 tons at 1.44 pound/ton of R-134a

South chiller plant:

3055 ton at 2.44 pounds/ton of R-134a

Geothermal plant:

1000 ton at 1.44 pounds/ton of R-134a

Calculation:

Estimated annual loss of HFC-134a = (150+252+98) + [(2200+3055) x 2.44 x 0.0125] + [(700+1000) x 1.44 x 0.0125] = 691 pounds

The assumptions and methods used are deemed to be reasonable, but they should be reevaluated with each subsequent carbon footprint calculation.

Agriculture: 37 MTCO_{2e}, as per v8. This section was completed by Y. Kline.

The carbon footprint is based on the Equestrian Center's estimate of housing 60 horses.

Fertilizer figures were not available at the time of review, and will be added in per v8 if they are in excess of 600 MTCO_{2e}, the level below which they are considered de minimis based on Miami's overall carbon footprint.

Purchased electricity: 62,525 MTCO_{2e}, as per v8. This section was completed by Y. Kline.

Purchased electricity: 91,023,374 kWh, provided by Energy Manager.

Commuting: 14,077 MTCO_{2e}, comprised of the following:

13,521 MTCO_{2e} calculated by the PSP team using a survey to determine distance, frequency and mode share per semester to determine annual passenger miles per mode:

Faculty & Staff:

16,132,000 passenger miles at the v8 factor of 0.000376 MTCO_{2e}/mile = **6066 MTCO_{2e}**

834,800 carpool passenger miles at the v8 factor of 0.000188 MTCO_{2e}/mile = **157 MTCO_{2e}**

Students:

18,866,000 passenger miles at the v8 factor of 0.000376 MTCO_{2e}/mile = **7094 MTCO_{2e}**

1,091,000 carpool passenger miles at the v8 factor of 0.000188 MTCO_{2e}/mile = **205 MTCO_{2e}**

Bus passenger miles were computed by using the survey method, and this resulted in 1,369 MTCO_{2e} using the v8 factor of 0.000324 MTCO_{2e} / passenger mile.

By way of comparison, Miami's bus company, BCRTA, provided the annual bus miles traveled on the university and regional routes that served the Oxford campus. Using a Federal Highway Administration's statistic for bus fuel economy of 7.2 miles per gallon, and assuming all of the buses run on diesel, the following calculation was deemed preferable to capture the carbon footprint of the commuter buses:

386,640 bus miles x 7.2 miles/gallon x 0.0103478 MTCO_{2e}/gallon of diesel = **556 MTCO_{2e}**

Adding the bolded numbers results in the total for commuting.

Directly financed outsourced travel: 5040 MTCO_{2e}, comprised of the following:

Air travel: **4182 MTCO_{2e}**, calculated by the PSP team by interpreting information provided through expense reports as collected in Banner and provided by Accounts Payable. The team identified or estimated origin and destination airports, and used online flight mile data to calculate passenger miles = 8,668,000 for the year. This was used in v8 to determine the footprint.

Rental car: **519 MTCO_{2e}** calculated by Y. Kline using mileage provided by Enterprise (1,379,000), and the v8 factor of 0.000376 MTCO_{2e}/mile.

Mileage reimbursement: **339 MTCO_{2e}**, calculated by Y. Kline using information provided through expense reports as collected in Banner and provided by Accounts Payable. A total of 901,500 miles was determined by sorting to account for three different mileage rates (ICA = 19,500, Sr. Management = 13,900 and Basic = 868,100 miles).

Adding the bolded numbers results in the total for directly financed outsourced travel.

Study abroad: 9,835 MTCO_{2e} calculated by the PSP team using data provided by the Study Abroad office. (FY2014 data was used because FY2015 was not yet available. The Study Abroad office indicated that the two years would be very similar.)

Solid waste: 929 MTCO_{2e} calculated by Y. Kline (following the institutional assessment), using the solid waste data assembled for STARS (2727 tons, from 2014), and FY2015 annual wastewater (162,696,732 gallons). Per v8, the values are 845 MTCO_{2e} for solid waste (methane recovery and flaring), and 84 MTCO_{2e} for wastewater (anaerobic digestion).

Contribution of upstream adders: 17,332 MTCO_{2e} calculated by Y. Kline using emission factors for coal, natural gas and purchased electricity, inclusive of life cycle carbon footprint contributions determined by NREL for Miami, and subtracting out the values as determined by v8 for the FY2015 quantities of these fuels. The value was calculated as a Scope 3 emission for the 2016 STARS report, but its intended purposes are for use in life cycle costing and as a quick annual check of greenhouse gas emissions due to Miami's major contributors.

Total FY2015 carbon footprint (without upstream adders):

Scopes 1 and 2 = 106,700 MTCO_{2e}

Scope 3 = 29,881 MTCO_{2e}

Total = 136,581 MTCO_{2e}