St. Cloud State University

Greenhouse Gas Emissions Inventory

Final Report

FY 2004-2009

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Index

Executive Summary

This Report

The purpose of this report is to create an inventory of Greenhouse Gas (GHG) Emissions by St. Cloud State University to meet the requirements of the American College and University President's Climate Commitment, signed by President Potter in 2008. It will create a baseline from which future emissions can be compared to track SCSU's emissions reductions as they implement their Climate Neutral Plan, to be filed in September 2011.

Methodology

Under the direction of John Frischmann, Acting Director of Building and Grounds, GLTArchitects created this inventory, interviewing campus sources and vendors to collect data on six separate categories:

- **Institutional Data**
- **On-Campus Stationary Fuel Use**
- **Purchased Electricity**
- **Agriculture (Fertilizer Use)**
- **Refrigeration**
- **Transportation**

Emissions were only tracked for on-campus emissions. The temporal boundary for the inventory was set at FY 2004–FY 2009.

The data gathered was entered into the *Campus Calculator* (software developed by Clean Air-Cool Planet and the primary calculator used by the institutions in the signatory). The Calculator converted the information into greenhouse gases, and reported it as CO_2 equivalents (eCO_2) to estimate the carbon footprint of the University. The eCO2 is reported in metric tons.

Results

Totals: SCSU emitted the equivalent of 60,302 metric tons of CO_2 in FY 2009. Total emissions have increased by 7% since FY 2004, the earliest relatively reliable data available. On-campus stationary sources and purchased electricity account for approximately 70% of the carbon emissions by SCSU.

SCSU emits approximately 4.1 metric tons per student. Signatory institutions in St. Cloud State University's peer group (per IPEDS) emit a range of 1.9 to 11.6 metric tons of eCO_2 per student. Signatory public universities in Minnesota emit a range of 2.1 to 12.6 metric tons eCO_2 per student.

On-campus stationary sources of GHG emissions account for 14,400 metric tons of eCO_2. As a percentage of total carbon emissions, on-campus stationary sources has been trending downward as St. Cloud State University has switched from use of #6 oil to natural gas.

Emissions per square foot of building area in FY 2009 was 18.5 metric tons of eCO_2/SF. This number has been trending downward as SCSU has added building space and remodeled buildings pointing to increased efficiency in energy usage in new and remodeled construction. It is also a result of significantly decreased use of #6 oil and increased use of natural gas in on-campus stationary plants. SCSU's peer signatory institutions (per IPEDS) have emissions per square foot ranging from of 6.7 to 28.6 metric tons of eCO_2/SF. Minnesota signatory institutions have emissions per square foot ranging from 12.0 to 38.2 metric tons of eCO_2/SF.

The most significant source of eCO_2 emissions for SCSU is electricity purchased from Xcel Energy. This source, coupled with transmission and delivery (T & D) losses, accounts for 42% of SCSU's total GHG emissions.

Transportation fueled by gasoline, diesel and jet fuel accounts for 32.6% of total eCO_2 emissions for SCSU. However, the data related to commuting is less reliable than other data collected.

Conclusion

The greatest impact on its carbon emissions St. Cloud State University could make would be to reduce or eliminate its reliance on purchased electricity and by continuing to find alternatives to fossil fuel combustion in its on-stationary campus plants.

Acknowledgements

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Summary and Overview

As a signatory to the American College and University President's Climate Commitment (ACUPCC), St. Cloud State University (SCSU) has committed to eliminate their greenhouse gas (GHG) emissions in a reasonable period of time. SCSU has agreed to complete an inventory of current and past GHG emissions and to update this inventory every other year to measure their progress. Additionally, SCSU has agreed to create and implement a Climate Neutral Plan with a target date and interim milestones for achieving campus climate neutrality. They have agreed to integrate sustainability into the curriculum and make it part of the educational experience. SCSU has also agreed to make the action plan, inventory, and periodic progress reports publically available.

This report summarizes the Greenhouse Gas Emissions Inventory for St. Cloud State University, and provides some analysis of the results. The inventory was prepared in accordance with the guidelines established by the ACUPCC. The basic purpose of the inventory is to serve as a baseline from which future emissions can be compared to track SCSU's emissions reductions, and to measure how SCSU is doing with respect to their Climate Action Plan, to be filed in September 2011. The inventory will also provide a basis to identify in which areas the University can show the most improvement and as a basis to prepare projection models showing the probable impact of various practices and procedures on the University's carbon footprint.

The inventory summarizes the data collected for fiscal years 2004 - 2009, as these were the only years for which relatively reliable data was available for most of the required criteria. As described later in this report, some of the data was interpolated from one or two years to a span of years to complete the record.

Inventory Process

It was determined early in the process to use the Clean Air –Cool Planet Campus Carbon Calculator to document the GHG Inventory as it is recommended by the ACUPCC. It is comprehensive, relatively easy to use, and easily accessible. Improvements have been made to the calculator to align it specifically with the requirements of the ACUPCC GHG Inventory.

Methodology

The group on campus primarily charged with providing data for the inventory was Buildings and Grounds Management, under the direction of Acting Director of Buildings and Grounds, John Frischmann. GLTArchitects was hired to facilitate the process, indentify the information needed, track the information, create a history and journal of the collection effort, calculate the GHG Emissions, and publically post the information to the ACUPCC website and prepare this report.

The University decided to gather data related to the main campus and to the Minnesota Highway Safety Research Center. SCSU agreed to collect data from the operational boundaries recommended by the ACUPCC, namely all Scope 1 and Scope 2 emissions, and part of Scope 3 emissions. Scope 1 refers to the GHG emissions occurring from sources that are owned or controlled by the institution, including on-campus stationary combustion of fossil fuels, mobile combustion of fossil fuels by university owned/controlled vehicles, and "fugitive" emissions. Fugitive emissions result from releases of GHGs from refrigeration and fertilizer use. Scope 2 emissions refer to indirect emissions generated in the production of electricity consumed by the institution and includes transmission and delivery losses. Scope 3 emissions refer to all other indirect emissions – those that are a consequence of the activities of the University, but occur from sources not owned or controlled by the institution. Scope 3 emissions required to be tracked by the ACUPCC include all air travel, and staff, faculty, and student commuting to and from campus.

Data was gathered from both on-campus sources as well as University vendors. Where possible, data from vendors was cross-checked with data from University sources to verify accuracy. Initially, the University agreed to collect data from FY 2000 to FY2010. It became apparent during the course of the inventory that collecting data for this time period would not be possible for all of the categories as much of the data was irretrievable. Therefore, the temporal boundary for the GHG Inventory was reset at fiscal years 2004 - 2009. Note that later in the analysis, where we have accurate data for additional years outside of this boundary in any one particular category and we feel that additional data does point to a particular trend worth noting, we have included that data in the analysis.

In the stationary on-campus combustion and fuel for campus owned vehicles, accurate on-campus records had to be supplemented by vendor records. The data for the years included in the temporal boundary is believed to be complete and accurate.

Retrieving accurate fugitive emission data from chemical and fertilizer use was problematic, especially for earlier years and may not be reliable. We were able to accurately identify the type of fertilizer used, but the rate of use each year is a constant based on FY 2009 quantities.

Obtaining Scope 3 commuting data area was challenging, as monitoring miles traveled by air, rental vehicle, personal vehicle, bus travel, or light rail is not done systematically. Information regarding where off-campus students live while attending school was difficult to obtain. We were able to find surveys conducted in 2002 and in 2004 that had some of the information needed for determining the commuting habits of the faculty, staff and students, and extrapolated this information to complete FY 2004-2009. It should be noted that many of the signatories to the ACUPCC identified compiling accurate commuting data was particularly challenging.

Inventory Results

Institutional Data

In the 6 years included in this summary, SCSU's operating budget has increased by 38%. The portion of the budget used to pay for energy has increased in this same period by nearly 65%.

Total student enrollment has increased 8.1%, from 16,130 in 2004 to 17,429 in 2009. Full time student enrollment has increased 2.5% during this time period, while part-time student enrollment has increased 26.3%.

Faculty full-time equivalents (FTE) have increased 11.5%, and staff FTE have increased by 27.1%.

Building area has increased by 10.6%, from 2,821,175 square feet in 2004 to 3,118,827 square feet in 2009.

Carbon Dioxide Emissions (eCO_2)

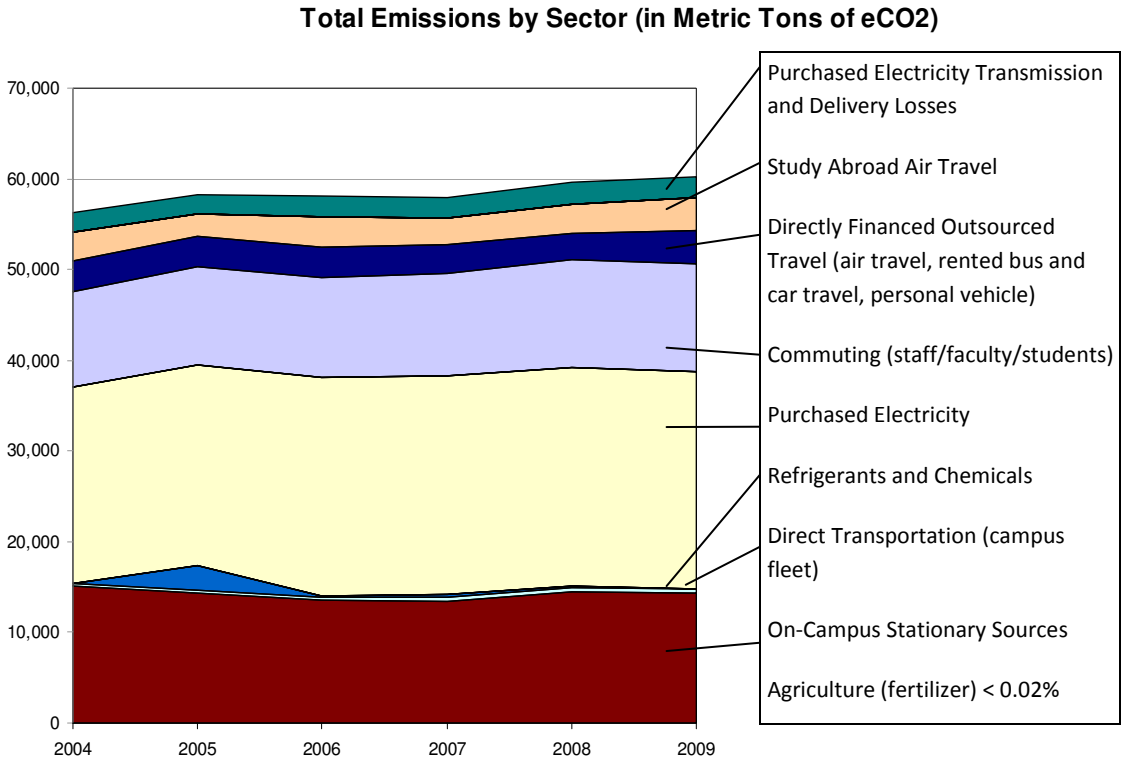

Figure 1: ***Total Emissions by Sector***

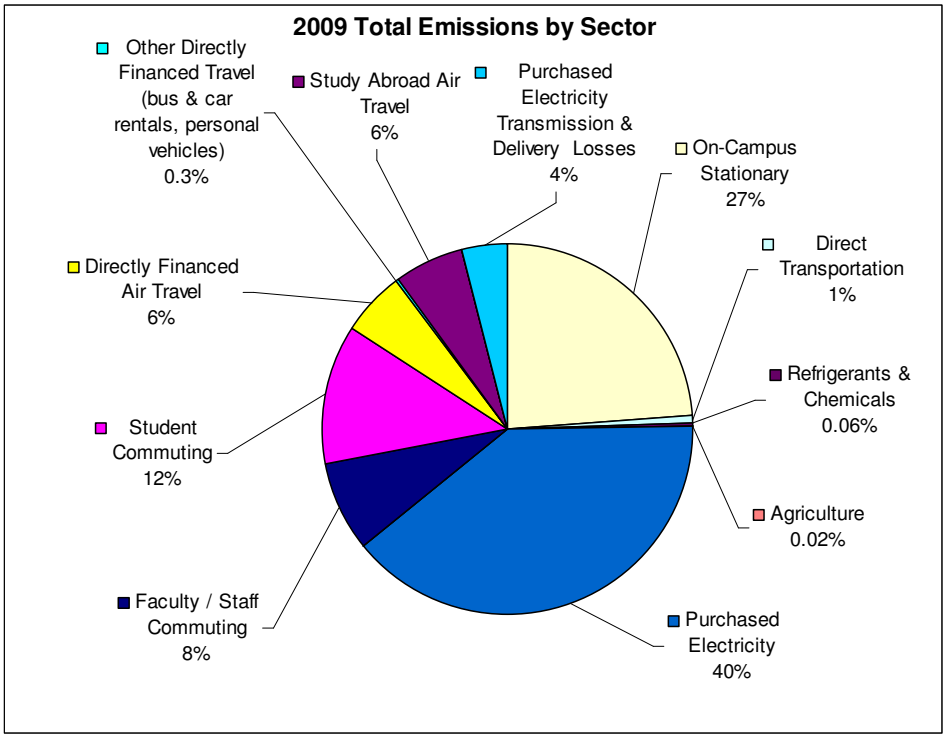

Figure 2: ***2009 Total Emissions by Sector***

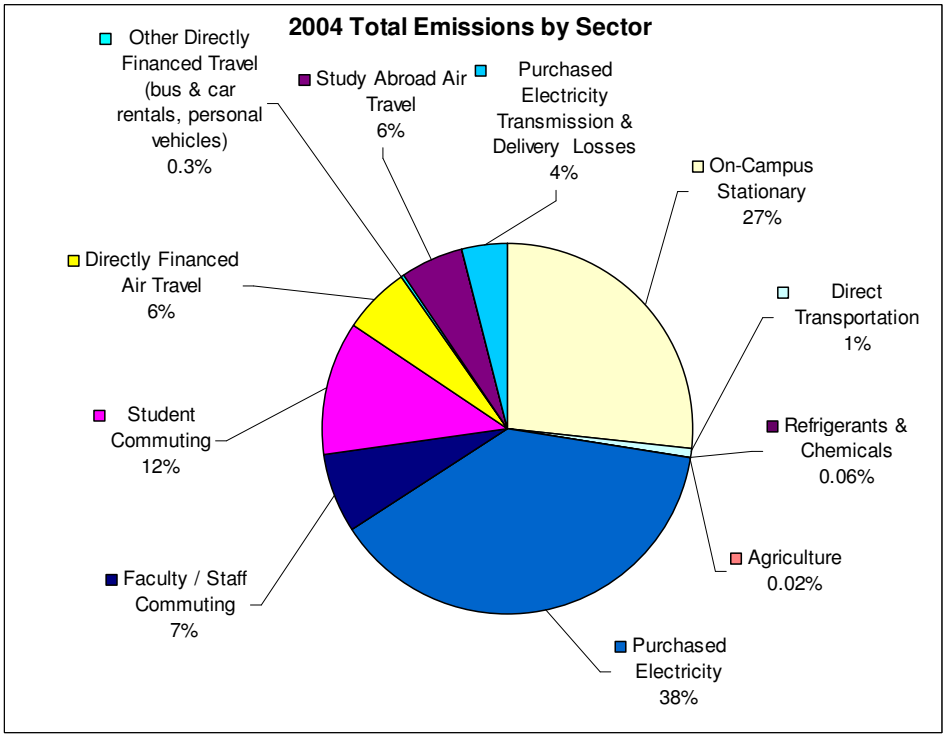

Figure 2a: ***2004 Total Emissions by Sector***

The primary purpose of the GHG inventory was to create a baseline for comparison in future years and to create a basis for analysis of St. Cloud State's Greenhouse Gas (GHG) emissions (eCO_2). St. Cloud State University's eCO_2 emissions have increased by 7% since 2004, as evidenced by Figure 1. How the different sources of GHG emissions impact the total emissions is demonstrated in Figures 2 & 2a. The primary source of Greenhouse Gas (GHG) Emissions has been Purchased Electricity, which has been fairly constant at 38.4% - 41.6% of all emissions, with the peak in FY 2006. In FY 2009, On-Campus Stationary Combustion, (fuel burned for heating and cooling), is second at 24%, and all other sources each represent 12% or less of the total emissions. As demonstrated by the Figure 1 graph, the contribution of each of the various sources of GHG emissions have been fairly constant as the total has risen, with 3 exceptions.

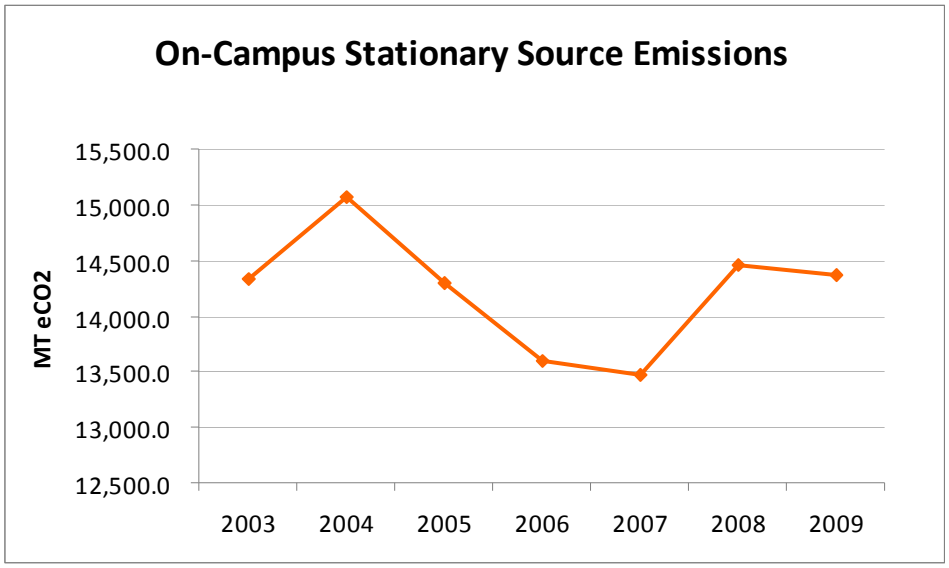

Figure 2b: ***On-Campus Stationary Source Emissions***

Exception 1. Starting in 2006, the University began to use dramatically less #6 fuel oil (down 27%), more diesel oil (up 100%), and more natural gas (up 40%). This shift became even more dramatic in 2007, when #6 fuel oil use dropped another 75%, diesel oil use increased 330%, and natural gas use increased 75%. While less dramatic, in the years since #6 oil use has continued to drop, and diesel oil and natural gas use has continued to rise through FY 2009. The original reason for this change was the loss of a boiler, for several years, which burned #6 oil, requiring a shift to diesel oil and natural gas. Since burning #6 oil produces 50% more eCO_2 emissions than burning natural gas, this change reduced the amount of eCO_2 emissions produced by stationary sources. This has allowed eCO_2 emissions from stationary sources to remain nearly flat since 2004, reducing its contribution to the overall emissions by over 3% even as building area has increased by almost 11% (Figure 2b).

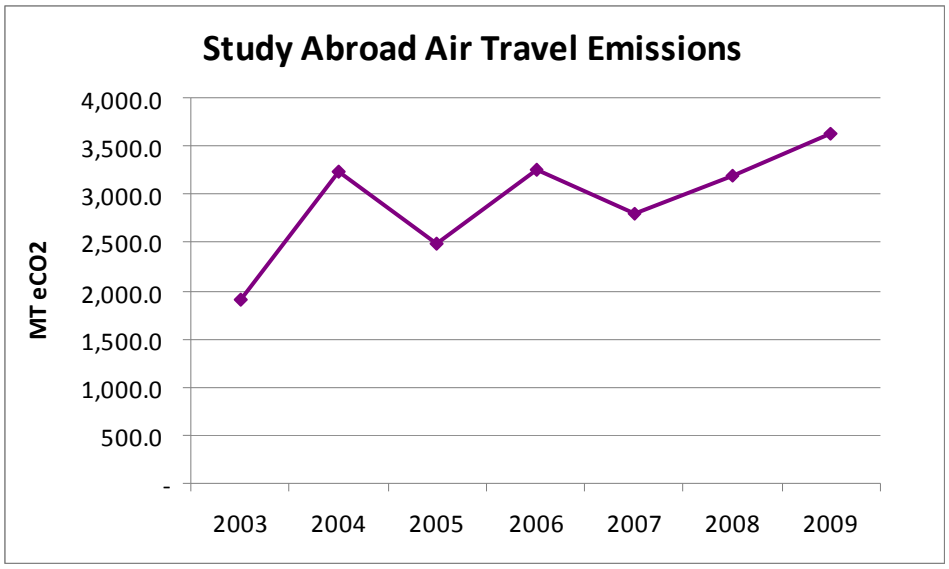

Figure 2c: ***Study Abroad Travel Emissions***

Exception 2: As shown in Figure 2c, Study Abroad air miles have increased 90% since 2003. This increase in miles has increased the percentage that study abroad travel contributes to the overall campus eCO_2 emissions from 3.5% (2003) to just over 6% (2009). However, it should be noted that total travel abroad miles are somewhat erratic from year to year, and so may not necessarily be seen as a constant trend upward.

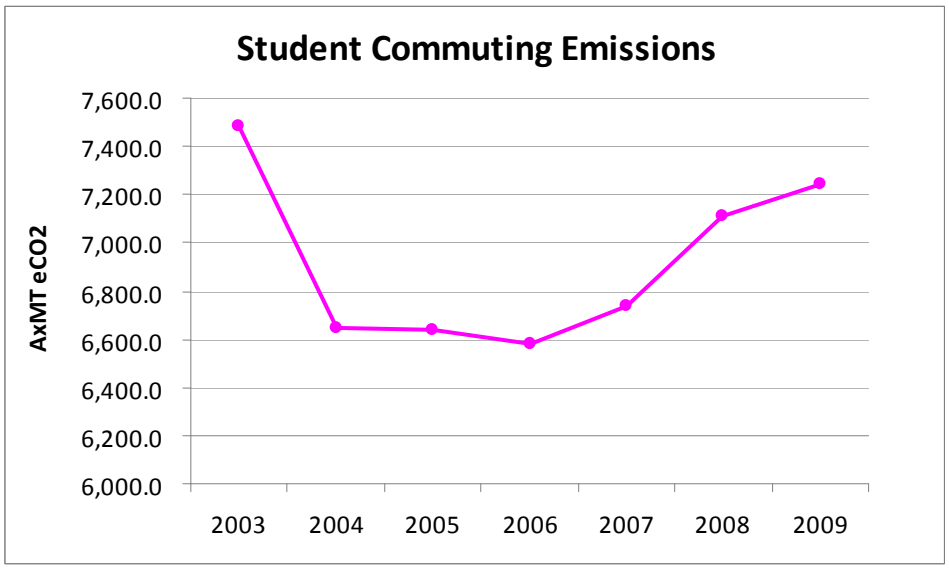

Figure 2d: ***Student Commuting Emissions***

Exception 3: While not terribly significant in terms of its overall contribution to eCO_2 for the campus, there has been a shift in the emissions due to student commuting (Figure 2d). While admittedly this data may be somewhat inaccurate, it does show a dramatic decrease in student commuting emissions in

2004, which is when the University and Metro Bus made travel by bus free and more convenient for students and employees of the University. As student enrollment has risen, total emissions for student commuting has climbed back to nearly the level they were before the drop. However, Student Commuting as a percentage of all campus emissions has dropped by 1 ½ % since 2003.

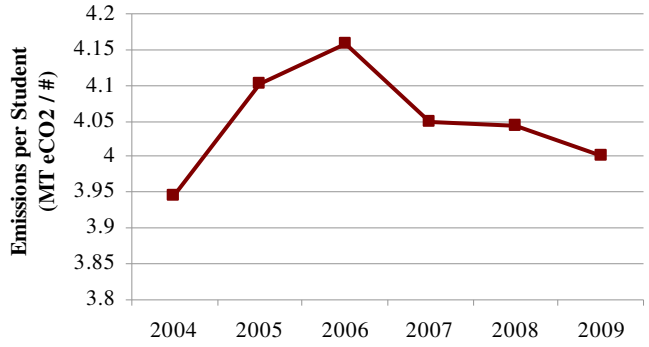

Figure 3: ***Emissions per Student normalizes the total emissions estimates by the size of the student body.***

Figure 3 illustrates the metric tons of eCO_2 per student. While the graph looks fairly dramatic, it is important to note that the total range represented on the graph is a low of 3.95 metric tons per student in 2004 and a high of 4.15 metric tons per student in 2006. Accounting for changes in degree days, this is nearly a constant variable. It is highest in 2006, when total student enrollment took a slight drop (see Figure 6).

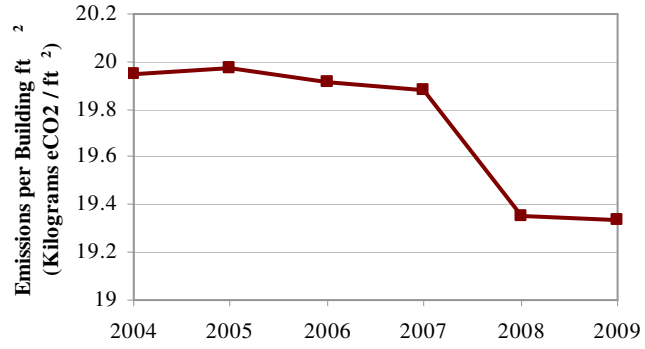

Figure 4: ***Emissions per Square Foot of Building Space is another estimate of the overall emissions efficiency of the institution.***

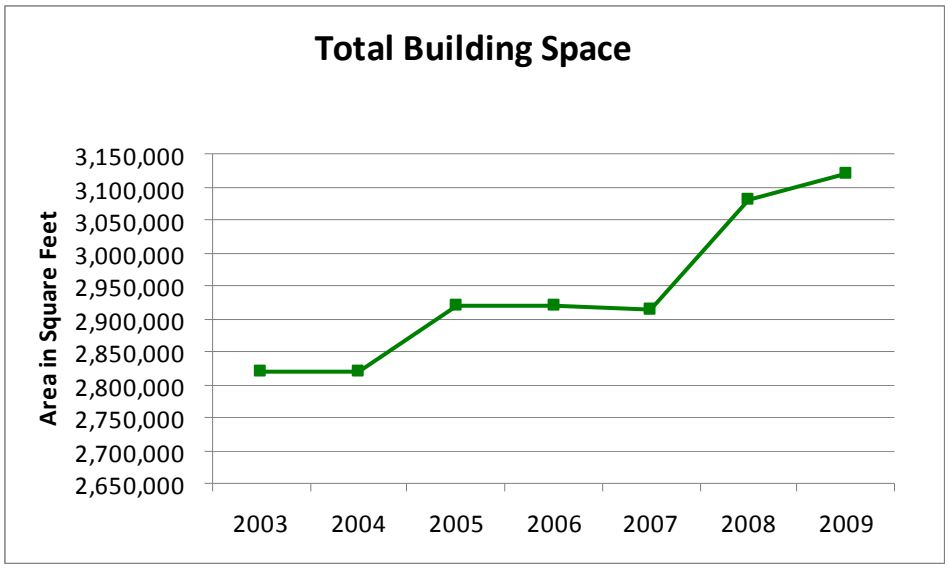

Figure 5: ***Total Building Space***

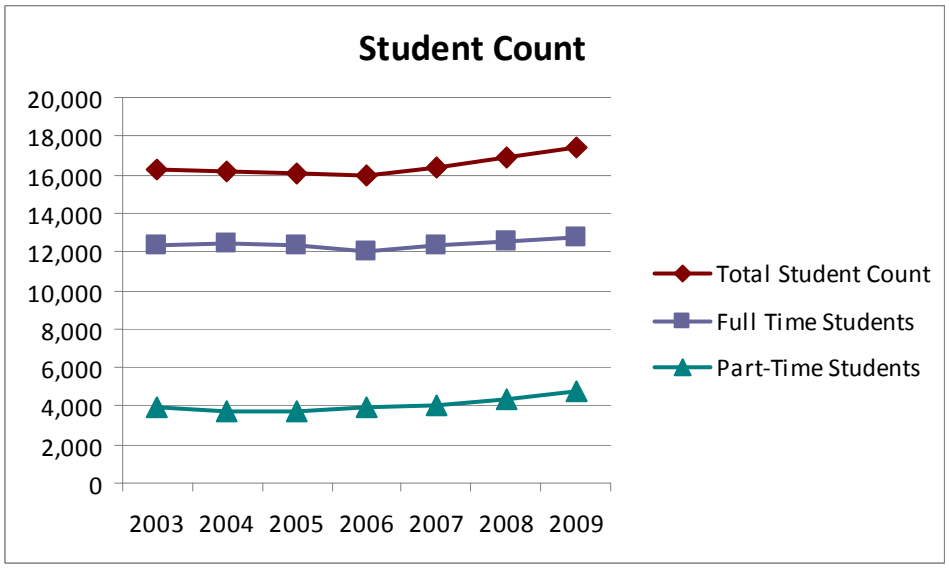

Figure 6: ***Student Count***

Since electrical usage including transmission and delivery (T&D) losses and stationary campus combustion combined make up around 70% of total emission for the campus, it is useful to look at trends in these areas. Figure 5 illustrates that even as the University has added over 10% new space, and student count (full-time students plus ½ of part-time students) has increased by over 8% (Figure 6), the University has experienced a decrease of about 3.5% in the emissions per square foot of building area since 2004 (Figure 4). This certainly reflects the decision to change the fuel source to natural gas for the central boilers and perhaps points to increased energy efficiency as more efficient buildings are added to the campus and steps are taken to increase energy efficiency in existing buildings as they are remodeled. In fact, the emissions per square foot data is almost an inverse graph to the increase in

student count and increase in building area. The sharpest drop in emissions/SF building area is between FY 2007 and FY 2008, when a significant amount of building area was added to the campus at the same time the switch was made to burn natural gas in lieu of #6 heating oil.

Transportation Emissions

Transportation fueled by gasoline, diesel and jet fuel contribute to over 32.6% of the total emissions of St. Cloud State University (up from 31% in 2004). Student commuting is 12% of total emissions, and faculty/staff commuting is just under 8% of total emissions. Commuting emission is defined as emissions generated by students, faculty and staff traveling by car or bus to and from campus each day. It does not include student transportation to and from their homes during breaks.

Directly financed outsourced travel, which includes all bus, van and car rentals, as well as business air travel and personal vehicle travel reimbursement, accounts for roughly 12% of total emissions. Of that total, air travel by the Study Abroad programs accounts for just over 6% of total emissions. Emissions by direct transportation (defined as the campus fleet vehicles) accounts for less that 1% of total emissions.

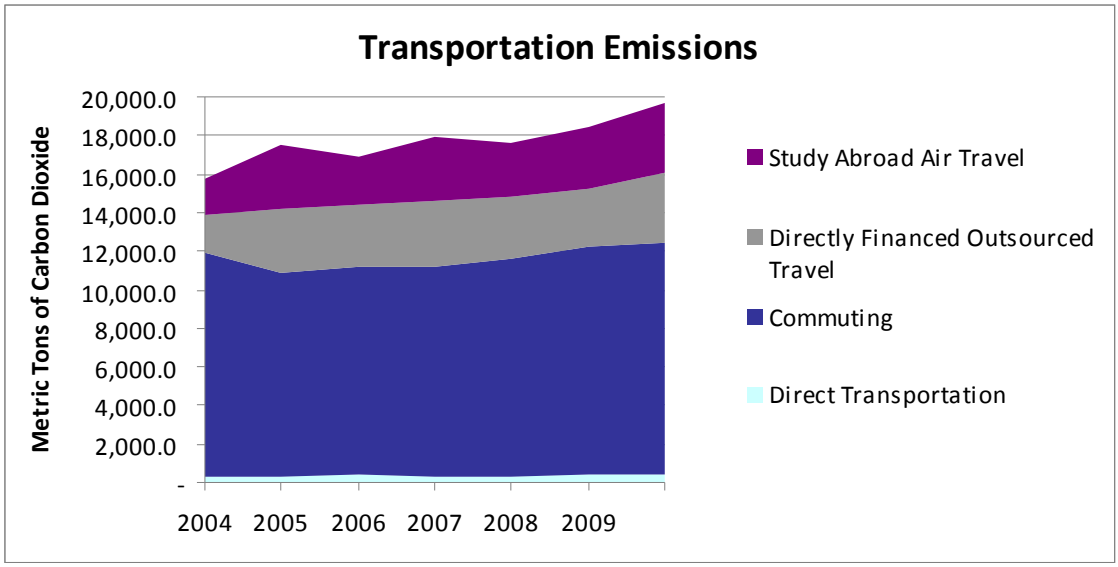

Figure 7: ***Transportation Emissions***

Figure 7 shows the contribution by each type of transportation to the total emissions by transportation sources. Emissions by transportation sources has grown by over 12.5% since 2004, even though total emissions have only grown by 7%, so this data would suggest that emissions from this segment has grown faster than emissions as a whole. It should be noted that the largest segments of transportation – commuting and directly outsourced travel – are the least accurate of all the information gathered for this GHG Inventory, for reasons outlined earlier in this report. Therefore, these results will need to be revisited in the next inventory with more accurate data to determine if this trend is accurate.

Comparisons to Peer Institutions

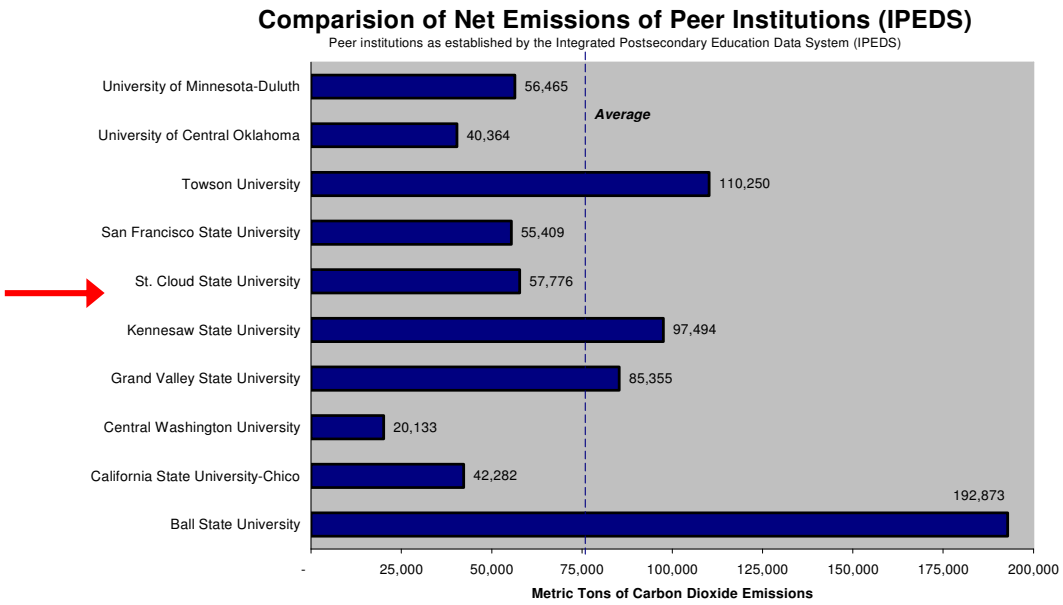

Figure 8a: ***Comparison of Net Emissions of Peer Institutions***

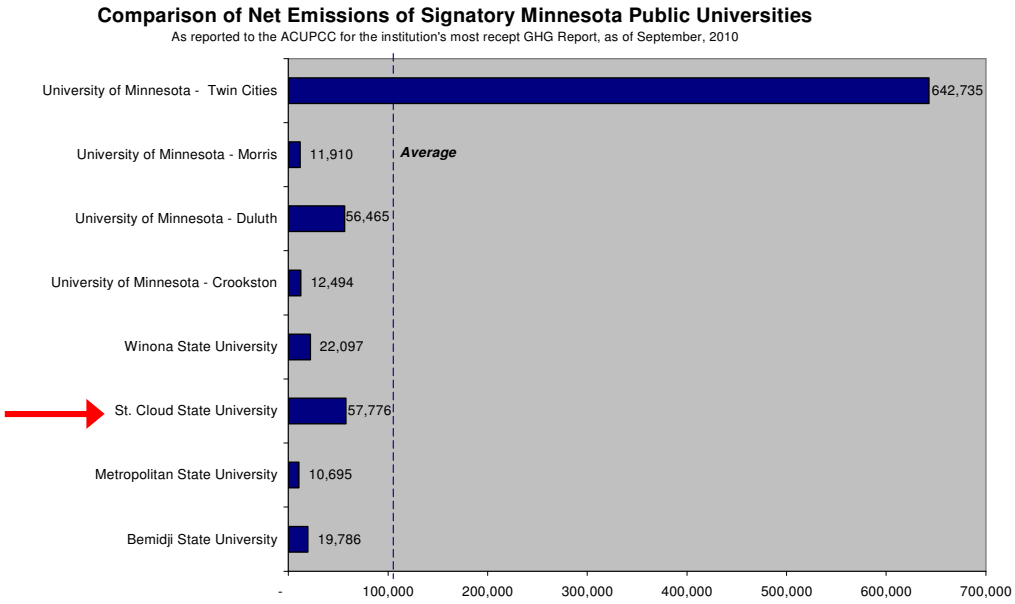

Figure 8b: ***Comparison of Net Emissions of Minnesota Public Universities***

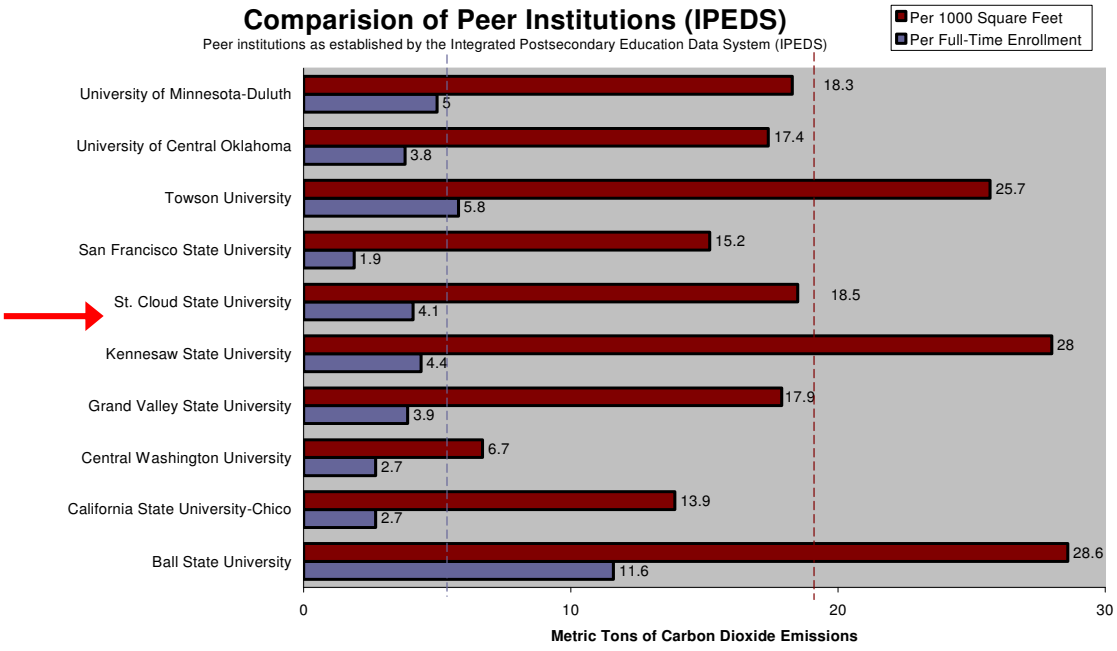

Figure 9a: ***Comparison of Peer Institutions by Student Count and Building Area***

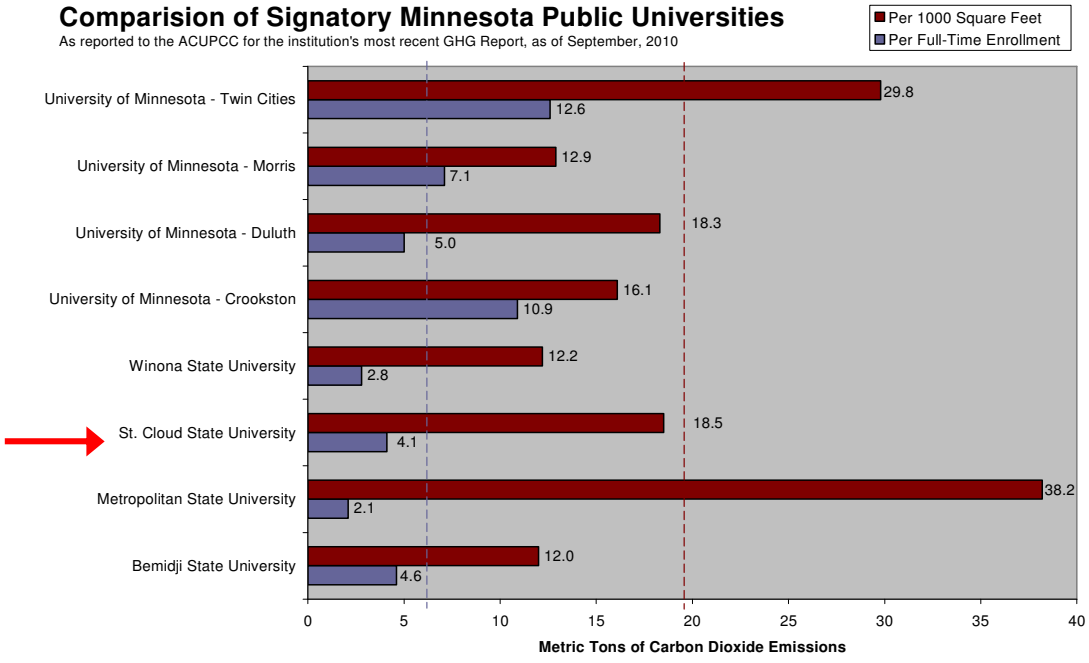

Figure 9b: ***Comparison of Minnesota Public Universities by Student Count and Building Area***

Figure 8a compares the net emissions of St. Cloud State University to peer institutions (as identified in IPEDS) that are also signatories to the ACUPCC. St. Cloud State University's total net emissions of 57,776 metric tons of eCO_2 compare with a range of 20,133 metric tons to 192,870 metric tons at these peer institutions. Signatory public Minnesota universities, figure 8b, have a range from 11,910 metric tons to 57,776 metric tons, excluding the University of Minnesota, which emits 642,735 metric tons.

Figure 9a compares St. Cloud State University to the same group of peer institutions, this time with the total emissions divided by the student count. Here, the range for the IPEDs peer institutions is 1.9 to 11.6 metric tons per student, compared to St. Cloud State University's 4.1 metric tons per student. Signatory public Minnesota universities, figure 9b, have a range from 2.1 to 12.6 metric tons of eCO_2 per student.

Figures 9a and 9b also compare St. Cloud State University's emissions of 18.5 metric tons of eCO_2 per square foot of building space to that of the peer groups. For the IPEDs peer group, the range is 6.7 to 28.6 metric tons per square foot of building area. For the signatory public Minnesota universities, the range is 12.0 to 38.2 metric tons of eCO_2 per square foot of building area.

Conclusion

St. Cloud University's best opportunity to improve its carbon footprint will be to reduce its dependence on purchased electricity, continue to reduce the carbon produced by on-campus stationary sources, and reduce the amount of fuel consumed in those sources by providing alternative methods of energy. Carbon offsets will likely not prove cost effective for SCSU to offset its carbon usage, as carbon offsets are generally expensive relative to the offset created.

The University is currently pursuing 3 programs to reduce its carbon footprint:

1. We are engaged in a program call PBEEP (Public Buildings Energy Efficiency Program) with the Minnesota Department of Administration and the Center for Energy and Environment. Through this program, the campus will be screened to identify potential energy saving project with less than a 3-year payback.
2. SCSU and Xcel Energy have partnered in a pilot project call Annex 49. The overriding premise of this program is to look at energy use holistically ("exergy") and to capture as much heat from conditioned air or water and re-use it before returning water back to a chiller or exhausting conditioned air.
3. St. Cloud State University is constantly upgrading controls (converting pneumatic – controlled systems to DDC controlled) or improving efficiencies (replacing old windows) in various buildings on campus.

This report is the first step in creating a baseline as the foundation of a plan to reduce St. Cloud State University's carbon footprint. The University is committed to reducing its greenhouse gas emissions and will continue to aggressively pursue options to do so.