



## **Climate Action Plan**

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# I. Executive Summary

## A. The ACUPCC

The American College & University Presidents Climate Commitment is a high-visibility effort to address global warming by garnering institutional commitments to neutralize greenhouse gas emissions and to accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth's climate.

Building on the growing momentum for leadership and action on climate change, the Presidents Climate Commitment provides a framework and support for America's colleges and universities to go climate neutral. The Commitment recognizes the unique responsibility that institutions of higher education have as role models for their communities and in training the people who will develop the social, economic and technological solutions to reverse global warming.<sup>1</sup>

Presidents signing the Commitment have pledged to work towards eliminating their campuses' greenhouse gas emissions over time. This involves:

- Creating an institutional structure to guide the development and implementation of the plan.
- Completing a greenhouse gas emissions inventory.
- Setting a target date and interim milestones within two years for becoming climate neutral.
- Establish immediate steps to reduce greenhouse gas emissions:
  - USGBC LEED<sup>2</sup> silver minimum policy for new construction and renovations involving more than 5000 square feet
  - Energy Star Appliance purchasing policy.
- Integrating sustainability into the curriculum and making it part of the educational experience.
- Making the action plan, inventory and progress reports publicly available.

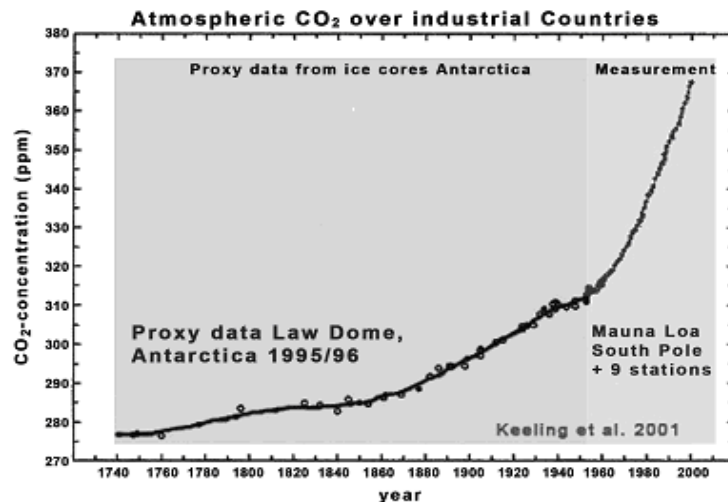


Figure G-1. Atmospheric CO<sub>2</sub> increase over time.<sup>3</sup>

## B. Global Warming

The issue of global warming and its effect on the overall health of the planet is at the heart of the ACUPCC. While there is room for debate as to the severity and timing of the impact, the science is clear: direct analysis of gases trapped in polar ice core samples confirms the current amount of atmospheric carbon dioxide (380 parts per million) is approximately 30% above the pre-industrial revolution level (278 ppm) (figure G-1). Atmospheric carbon dioxide (along with other greenhouse gases and particulate matter) decreases the amount of absorbed solar radiation the Earth is able to release. As a result, the Earth's temperature increases (figure G-2), causing established natural cycles to change in ways that are not always advantageous to the human cause.

According to a June 2008 report by the Harvard University Task Force on Greenhouse Gas Emissions, "the international climate-science community has concluded that climate change resulting from civilization's emission of greenhouse gases [GHG] into the atmosphere poses a clear and present danger to society." (see Appendix A)

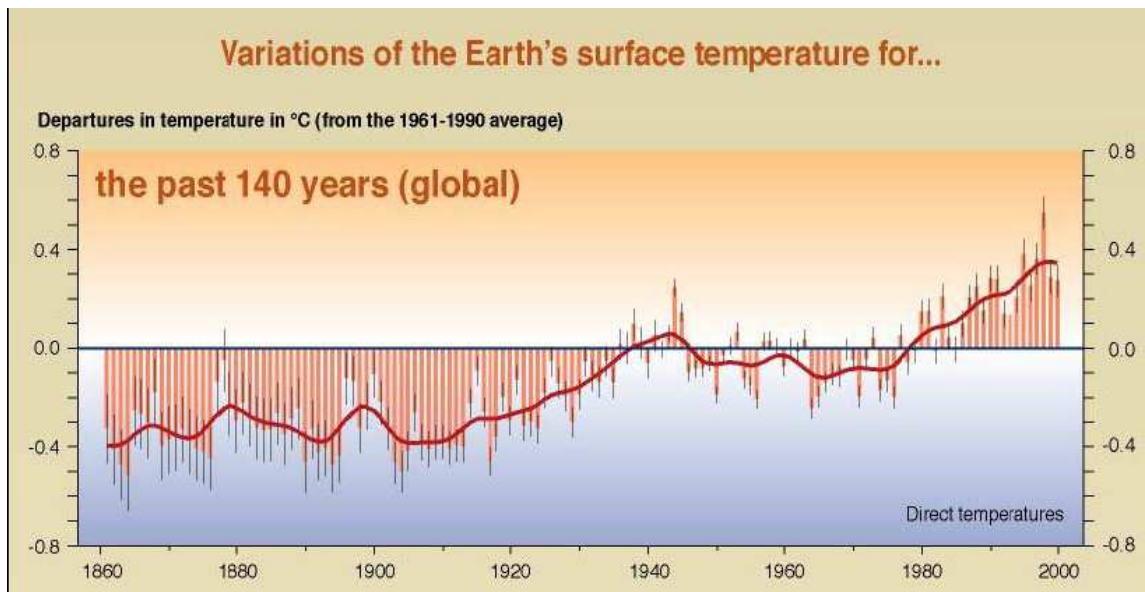


Figure G-2. Global temperature increase over time. (Source: Intergovernmental Panel on Climate Change)

As one of the leading liberal arts colleges in North Carolina, Guilford College welcomes discussion about the science behind global warming and the social, economic and environmental ramifications of climate change. While that discussion serves as a vehicle for awareness and continues across campus in many forums, we will also seek a solution to the cause of the problem. In accordance with our Quaker heritage and our Strategic Long Range Plan (SLRP), Guilford chooses to take an active role as an initiator of, a leader in, and a proving ground for the social changes necessary to effectively combat this "clear and present danger."

## C. The Guilford Plan

One of the goals of the 2004 Guilford College strategic long range plan is “no less than to redefine the role of the liberal arts institution in the 21<sup>st</sup> Century.” Global warming is one of the defining challenges of the 21<sup>st</sup> Century. The status quo will not produce the leadership needed to stem the effects of global warming.

In order to begin drafting a Climate Action Plan (CAP) with carbon neutrality as the goal, the first priority is to know where we stand. In the spring of 2008, Guilford College undertook the first Greenhouse Gas Inventory in the college’s history. As dictated by the availability of data, the starting point for Guilford’s carbon reconciliation is the fiscal year 2006/07. Guilford’s carbon output for that time period was determined to be 14,583 MT

Baseline year 2006/07 eCO <sub>2</sub> .....	14,583 MT <sup>4</sup>
Target date for carbon Neutrality.....	2049
Yearly reduction rate.....	365 MT eCO <sub>2</sub> <sup>5</sup>

The majority of the corrective actions suggested by this plan focus on the areas identified by the FY 2006/07 greenhouse gas inventory as having the most potential for gain toward carbon neutrality: purchased electricity, stationary fuel sources and transportation.

Within the first ten years of implementation of Guilford’s CAP (2009-2019) the following actions are to be taken:

- Wide scale education of the entire Guilford community as to the dangers of global warming and the solutions to it.
- An aggressive public campaign aimed at campus-wide behavioral modification resulting in an overall reduction of energy use.
- Small scale energy efficiency improvement projects that eliminate the “low hanging fruit.”
- Financial and building specific engineering planning for the more capital-intensive projects (post 2019).
- Begin building a financial mechanism to cope with the inevitable cost of offsetting the carbon that can not be eliminated.

The goal of this plan is to achieve carbon neutrality by 2047. This will require a yearly reduction of 2.5% of the baseline year 2006/07 total of 14,583 MT eCO<sub>2</sub>. After the first ten year’s work on implementation, the plan should yield a 25% reduction in carbon emissions. This defines Guilford’s first interim goal of the ACUPCC:

- A 25% reduction in GHG emissions from fiscal year 2006/07 levels by 2019.

Because we can not achieve absolute zero through efficiency and technological advancements alone, the 2.5% per year strategy will not be feasible long term. It is suggested that when Guilford College reaches a position that this rate of reduction is no longer attainable for five consecutive years, that carbon offsets be employed to eliminate the remaining carbon footprint. It is difficult to determine the exact date at which this will occur

due to the ever changing technological advancement in energy efficiency and design and the uncertainty of the future costs of said technologies.

This document marks Guilford's initial foray into the realm of carbon neutrality. Undoubtedly, the "how to" of this plan will change over time as new technologies and practices, as well as our campus, evolve over time. It is anticipated that the action plan presented herein will need to be revisited and when appropriate, rewritten perhaps many times before the goal is achieved. What is expected to remain steadfast through the life of this plan is the spirit in which it is offered. That spirit is expressed in the call to leadership and action that Guilford is answering through what has now become a welcome social obligation through the American College & University Presidents Climate Commitment.  
(nice sentence)

## II. The Climate Action Plan

### A. Introduction

The first steps in Guilford's march toward carbon neutrality after signing the ACUPCC were: a) the creation of a committee to guide the development and implementation the CAP and, b) the initiation of two of seven specified tangible actions to reduce greenhouse gas emissions while the CAP is being developed.

#### **Creation of Institutional Structure** (1.a from ACUPCC document)

During the Fall Semester 2004 Angela Moore and Jon Varnell began meeting to discuss sustainability efforts on the campus of Guilford College. Over time this meeting developed into a committee that has evolved into the current Sustainability Council. The council is comprised of administration, faculty, staff and students that receive support and a budget from President Kent Chabotar to explore projects and initiatives that would support the SLRP. When the ACUPCC was brought to the committee's attention, it was natural to sign on because it encompassed many of the sustainable efforts being pursued. President Chabotar signed the ACUPCC on behalf of Guilford College on May 19, 2007 after garnering approval from the Board of Trustees and the Guilford community at a meeting in February of 2007. During the winter and spring of 2008, the first Greenhouse Gases Inventory was completed by a subcommittee of the Sustainability Council with additional members.

**The Tangible Actions:** To highlight the need for immediate action in the fight to curb global warming, the ACUPCC is equipped with a list of solution-based actions that are intended to be enacted while the long-term plan is being formulated. Signatories agree to select two or more of these "tangible actions" within two months of their implementation start date. From this list, Guilford College chose to implement an Energy Star Purchasing Program and a LEED Building Program. While it is highly likely that the long-term plan will include all of the suggested actions over the life time of the plan, Guilford has, since the winter of 2007, operated according to the following policies:

#### The Energy Star Purchasing Policy (Appendix A)

Requires the College to purchase Energy Star versions of any and all new electronic devices provided that the option is available

#### The LEED Building Policy (Appendix B)

Requires the College to build or renovate at a LEED Silver or higher rating with any structure over 5,000 square feet

## B. Greenhouse Gas Inventory -Baseline FY 2006/07

The initial greenhouse gas inventory for Guilford College was completed during the spring semester of 2008 by a committee of volunteer faculty, staff and students using the Clean Air, Cool Planet Carbon Calculator (CACP). The CACP calculator tracks six broad sources of campus GHG emissions and thereby defines, for the purpose of this document, Guilford's carbon footprint. The sources included are purchased electricity, on campus stationary sources, transportation, agriculture, solid waste and refrigerants and other chemicals. The results of the initial inventory are shown in Table t-1 below.

*Table t-1. Guilford College Base Year 2006/07 Greenhouse Gas Emissions*

<b>Emission Source</b>	<b>eCO<sub>2</sub> Tons</b>	<b>Percent of Total</b>
<b>Purchased Electricity</b>	<b>7245</b>	<b>49.68</b>
<b>On campus Stationary sources</b>	<b>2316</b>	<b>15.88</b>
<b>Transportation</b>	<b>4460</b>	<b>30.58</b>
<b>Agriculture</b>	<b>6</b>	<b>0.04</b>
<b>Solid Waste</b>	<b>349</b>	<b>2.39</b>
<b>Refrigerants and other chemicals</b>	<b>207</b>	<b>1.42</b>
<b>Total</b>	<b>14,583</b>	<b>100</b>

The emissions reported in the CACP calculator are in different units and represent different GHGs. The ACUPCC requires signatories to track the six greenhouse gases<sup>6</sup> covered under the Kyoto Protocol<sup>7</sup>. The CACP normalizes the various emissions by way of equating their individual global warming potential (GWP) to that of carbon dioxide. This simplifies the discussion so that all GHGs are spoken of in equal terms and provides for direct comparisons across source categories.

The first inventory of Guilford's GHG emissions took the cooperation of many different departments and individuals across campus because the data needed was in several different offices and filing systems. The complexity of the data gathering process discovered during the initial inventory underscored the need for a new accounting system for the previously ignored liability of greenhouse gas emissions. The relationships and understanding that are now in place in the various campus offices involved with the aggregation of carbon data as a result of this first GHG inventory mark the beginning of Guilford College's carbon tracking system. As required by the ACUPCC, the inventory will be updated and publicly available every two years.

As the data and information began to take shape during the initial inventory, it became clear that reliable information prior to 2006 was just not available. Several reasons for this lack of data are possible; some are known and can be addressed and some are not. Obstacles such as unwilling third party vendors provide an opportunity to educate others as to the importance

of this work. Regardless of the cause for the shortcomings in the data, this initial inventory process revealed the delicacy of the data; if it is not recorded properly, it is lost.

Nevertheless, for the duration of Guilford College's involvement with the ACUPCC the baseline year of reference upon which all percentages and projections will be based shall be the fiscal year of 2006/07. This puts Guilford in the position of looking inward and forward from a place of limited perspective. Rather than seeing this lack of trend defining data as a negative, it should serve to heighten awareness of the importance of accuracy and thoroughness when dealing with carbon data in this new accounting system.

## 1 The Sources

### **a. Purchased Electricity**

Electricity at Guilford College is provided by Duke Energy through the administration of 98 separate accounts. The data for the purchased electricity section of the CACP Calculator was compiled through the Operations and Facilities Department using a combination of Duke Energy bills and the college's Schooldude<sup>8</sup> account.

### **b. On-campus Stationary Sources**

This category encompasses fuel sources that are burned on campus. For Guilford College there are two fuel sources to track; natural gas and propane. Gas service is provided to Guilford College by Piedmont Natural Gas. The majority of this fuel type is burned in the central steam plant on campus which produces both steam heat and hot water for various campus buildings. Natural gas is also burned in smaller individual building units throughout campus for heating purposes. Guilford currently maintains 39 active accounts with Piedmont Natural Gas. The amount of natural gas consumed by those 39 accounts was acquired from Schooldude by running a G11 report for each year. Propane is used on campus as a fuel source for a forklift and for firing pottery kilns under the Department of Art . Propane is provided by Berico Fuels of Greensboro. Volume data was derived directly from copies of sales bills kept in the Office of Operations and Facilities

### **c. Transportation – Appendix B**

#### **i. University Fleet**

This section includes gasoline and diesel purchased for on-campus transportation. We have divided the gasoline and diesel use into three categories based on the process used in order to determine mileage or gallons. The categories include (i) carbon emissions from gas and diesel purchased for vehicles that the college owns and uses (e.g. tractors, campus cars), (ii) carbon emissions from student clubs, faculty, and staff undertaking trips on behalf of Guilford College, and (iii) gasoline and diesel purchased for the transportation of students via charter buses for athletic or academic activities. The "activities" category includes airline travel for conferences and events. It must be noted that the categories are not necessarily distinct, and some overlap occurs. Whenever possible, we have avoided counting emissions twice.

For the on-campus vehicles, including those used by grounds and public safety, Rex Harrell, Project Sustainability Manger at Guilford College, provided us with information about gas and diesel use. These records were kept by Berico, the company that supplies the fuel for these vehicles.

In order to determine the amount of fuel used for the bus travel category, we requested records from American Charters and Holiday Tours, Guilford's main providers of charter buses. From the companies' mileage records and the approximate fuel-economy of the charter buses, we were able to calculate total emissions from this category. We intended to use a similar methodology for rented vehicles, however Enterprise, the main provider of rental cars to the College, was unable or unwilling to provide us with mileage information. Due to the lack of records from Enterprise, we used Guilford College's record of gas purchases, account number 7128, as the primary estimator for gasoline use for smaller campus related trips. We asked Guilford's Purchasing Department to run a report on account number 7128 (gas). This account includes any purchases requested for requisition or charged to the campus' credit card from clubs, admissions or any other "campus related" gasoline use from any student, staff or faculty member. From the financial record of fuel purchases, we were able to estimate the volume of fuel purchased based on the average cost of gas and diesel for the fiscal year 2006-2007. To compute mileage from college-related air travel, we procured itinerary records from A Way to Go Airline Travel Agency, Guilford's preferred travel agency. The records only include price and itinerary, so we estimated mileage, the unit required for the carbon calculator, based on results from Milecalc.com's trip mileage calculator, [www.milecalc.com](http://www.milecalc.com).

Our data was gathered using a variety of methods with varying precision. Records of the fuel used by on-campus vehicles, for example, are exact because Berico reported the volume of fuel delivered. Fuel volumes that were derived from financial records are considerably less precise, because assumptions were made about the cost of fuel at the time of purchase. We also know that some faculty and staff book airline tickets through companies other than the preferred travel agent and simply request a reimbursement from the college after purchasing the flight. Despite these limitations we feel that we have assessed the emissions from this category with reasonable accuracy.

## ii. Commuters

The transportation sub-committee utilized a two-pronged approach to its task of assessing current commuter GHG emissions: a survey of commuters and zip code data analysis. The transportation sub-committee used both methods in order to 1) have a method to determine the accuracy of the mileage entries from the survey and 2) to have baseline data from which to develop methods that could be utilized in future GHG inventories in the event that surveys are not a feasible method with which to complete a GHG inventory. For example, regarding the accuracy of survey mileage entries, the zip code information provides information for all students and faculty, not just a sample, but it cannot provide insight into the number of trips that students commute to school. The survey, with its questions specifically targeting the number of trips per week that students commute, provides the information that cannot be ascertained by solely using zip code data. Additionally, for future transportation sub-committees, there is already baseline information on both emissions and methods of obtaining emissions so that the transportation sub-committee will not have to start from

scratch each time. Finally, these methods provide a springboard from which other, possibly more detailed methods of determining emissions, can evolve.

#### **d. Agriculture**

Guilford College Grounds Manager David Petree was able to provide the amount of fertilizer that is used on campus along with the percentage of nitrogen contained in said fertilizer.

#### **e. Solid Waste**

At the time of Guilford's first GHG inventory no direct measurement of solid waste was made on the Guilford College Campus. The number of tons for the solid waste section of the CACP Calculator was approximated using averages, estimations and assumptions. The known figures used to generate the numbers for this section of the Inventory are the number and size of dumpsters being used and the frequency by which they are serviced. The weight of the refuse in the dumpster has been calculated, based on information provided by Mr. Mike Greene of the City of Greensboro Field Operations Department. According to his documentation (see Appendix B<sub>1</sub>) the standardized household waste container employed by the city is, by volume, ½ of a cubic yard and, on average, contains 40 pounds of refuse. Based on these given figures, Guilford College will use 80 pounds per cubic yard for all figures generated in this section of the report.

#### **f. Refrigerants and other chemicals**

Refrigerant data was provided by Maintenance staff members Randy Rasmussen and Mark Miller. 410-A refrigerants were not listed as a category, so they were placed in the "other" column. R22 was entered under HCFC-22 and R134-A was entered under HCFC-134a.

Refrigerants are used in all campus-owned air conditioners, freezers and refrigerators. These units are serviced on an as needed basis. The pressure (and thereby the volume) is verified to be within standardized allowable variation from the manufacturers requirements. When the pressure in the system is low (i.e. lost to the atmosphere), an equal amount is added by the service technician to restore the proper operating volume. Theoretically the refrigerant volume of a particular unit does not change over time, so the amount added can be assumed to be the volume that leaked. It is this fugitive emission that is charged to the owner's carbon footprint. By law, each technician who works on a refrigerant system is required to keep record of the amount and type of refrigerant added to a particular system. The logs kept by Guilford College personnel are available from 2006 to current. According to Maintenance Manager Randy Rasmussen, 40% of the repair work is done by contractors. Because these contractors are not required to inform Guilford College of the amount of refrigerant placed in a system during their service call, this information is lost. The number used in the CACP calculator reflects this estimated 40% increase from the known volume based on Guilford's registered technicians' logs. It is proposed that Guilford College request a list of any and all compounds added to Guilford's systems from its contract refrigerant technicians.

## 2 Current Institutional Data

Data pertaining to the number of students on campus was compiled through the offices of Kris Grey, Residential Living Coordinator from Campus Life and Norma Middleton, Registrar. Kris Grey was able to provide the numbers of on-campus students living in each dorm. This data was averaged for the fall and spring semester of each year (total students on campus fall plus the total students on campus spring, divided by two). Norma Middleton was able to provide Summer school numbers for the past three years.

CCE and Early College student information was generated by Thomas Coaxum, Director of Institutional Research and Assessment at Guilford. He was also able to provide traditional student numbers, which then had to be cross-checked with the numbers from Kris Grey in order to determine how many traditional students lived on and off campus. (You might want to define the three student groups we have on campus...CCE, traditional, early college)

Kim Goodman, Assistant to the Vice President for Finance and Administration was able to provide the research dollars and operating budget information.

Jill Piekriel, Administrative Assistant for Associate Vice President of Operations and Facilities was able to provide numbers for the energy budget. Facilities also provided the physical size information.

Fred Devine, Director of Human Resources and Payroll was able to provide the current number of faculty and staff, both full and part-time. The full and part-time faculty and staff numbers for the previous three years were provided by Thomas Coaxum.

### 3. Findings from the Initial GHG Inventory

The data collection process that came from the completion of the first GHG inventory at Guilford College highlighted the need to create a new accounting system for the previously ignored liability of carbon emissions. That system is documented in this report and its biannual upkeep will fall under the responsibility of Guilford's Environmental Sustainability Coordinator.

During the fiscal year of 2006/07, Guilford's baseline year, the college was responsible for generating an estimated 14,583 MT of eCO<sub>2</sub>. When the institutional data is considered, the following figures hold true for Guilford College for the FY 2006/07:

Metric Ton eCO <sub>2</sub> per student FTE.....	6.15
Metric Ton eCO <sub>2</sub> per community.....	4.78
Kilograms eCO <sub>2</sub> per Sq ft building space.....	18.4
Grams eCO <sub>2</sub> per operating dollar.....	268

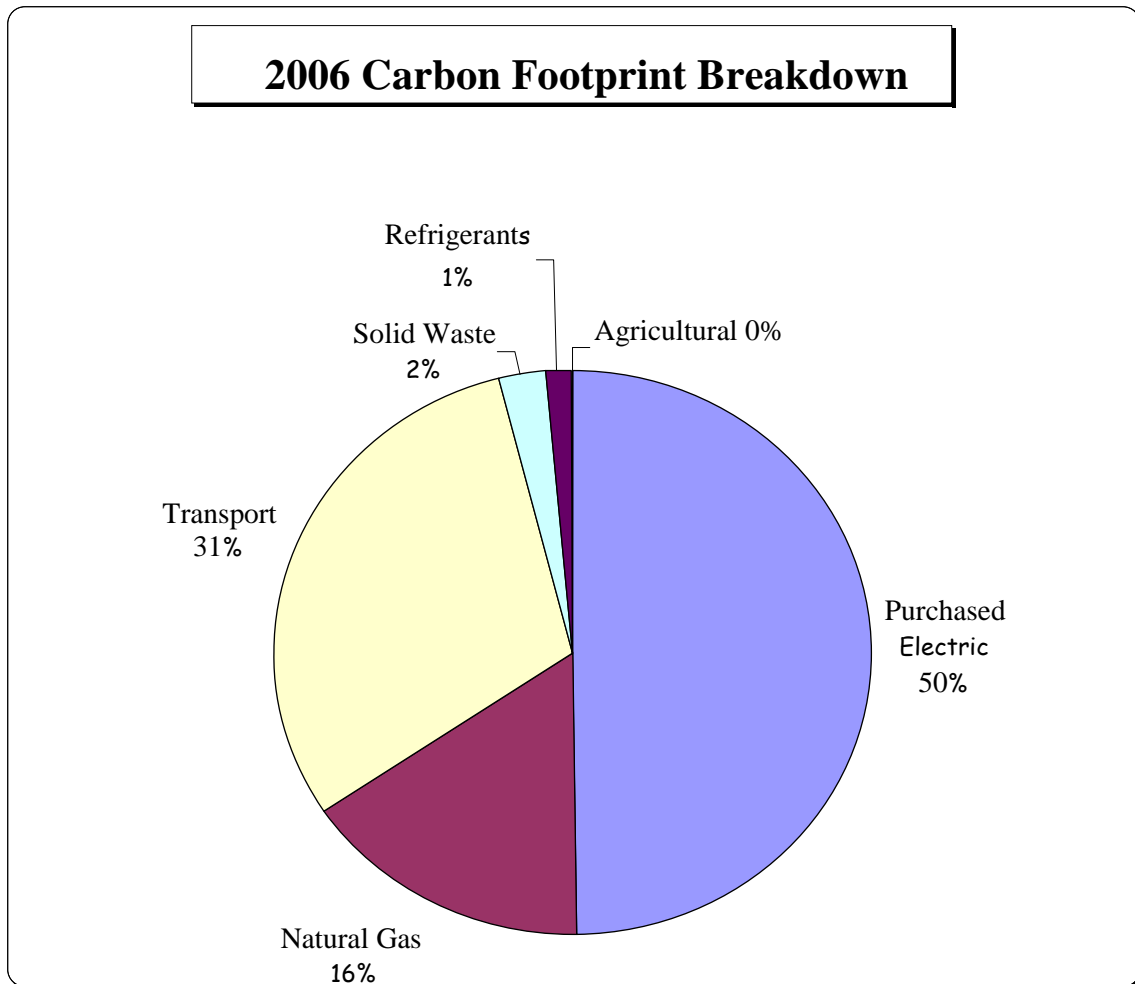
In its Implementation Guide, the ACUPCC defines the term *de minimis* as those small emission sources that collectively comprise less than 5% of the institution's total GHG emissions and make provision for those emission sources to be left out of the inventory process. Of the six GHG emission sources considered in Guilford's inventory (I've noticed that sometimes the word inventory is capitalized and sometimes not...it's a small thing, but for the next folks that might read this and future reports without us to interpret, it seems important to be consistent), the areas of agriculture (<0%), solid waste (2%) and refrigerants (1%) made up collectively less than 4% of the 14,583 MT eCO<sub>2</sub> emitted in 2006/07. Guilford College will continue to monitor the areas of agriculture and refrigerants and adjust as needed but, in the mean time, will consider them to be *de minimis*. The subject of solid waste, while meeting the criteria for inclusion in the *de minimis* category shall very much stay in the forefront of Guilford's environmental efforts due, in part, to the public sentiment surrounding recycling and solid waste handling. A strong recycling and solid waste management program is often one of the most visible indicators of an institution's commitment to the environment.

The remaining 97% of Guilford's emission sources, purchased electricity (50%), stationary sources (16%) and transportation (31%) present the opportunities for ground to be gained on carbon neutrality. The focus of the CAP deals with realizing significant reductions in these areas. Figure t-2 shows the complete breakdown of the total 2006/07 GHG emissions into the six sources considered by the CACP calculator.

Figure t-2. GHG Emissions at Guilford College during Fiscal Year 2006-2007

Emission Source	eCO <sub>2</sub> Tons	Percent of Total
Purchased Electricity	7245	49.68
On-campus Stationary Sources	2316	15.88
Transportation	4460	30.58
Agriculture	6	0.04
Solid Waste	349	2.39
Refrigerants and Other Chemicals	207	1.42
<b>Total</b>	<b>14,583</b>	<b>100</b>

Figure G-3



## C. Mitigation Strategies

The mission of Guilford College is “to provide a transformative, practical, and excellent liberal arts education that produces critical thinkers in an inclusive, diverse environment, guided by Quaker testimonies of community, equality, integrity, peace, and simplicity and emphasizing the creative problem solving skills, experience, enthusiasm, and international perspectives necessary to promote positive change in the world.”<sup>9</sup>

### **Guilford College’s Carbon Neutrality Target Date is 2047**

Guilford College is first and foremost an institution of higher learning, dedicated to the proliferation of knowledge and the acts of learning and teaching. As knowledge is the key to betterment, Guilford must endeavor to educate its faculty, staff, students, alumni and associates to what a Harvard University task force called a “clear and present danger to society” (i.e., the dangers of the current human-induced climate change). It is only from a place of shared understanding about the issue that this institution can expect to move toward a solution. The solution that is sought by this document is not one that can occur without a wholesale consensus of the entire Guilford community. Carbon neutrality is not something that can be done for the population of an institution; it must be done by the population of an institution. As the educational component of this plan, it is suggested that Guilford College pursue the following:

- Require faculty to engage in some form of continuing education/professional development with a focus on solutions to global warming (i.e., sustainability).
- Hold mandatory sustainability workshops for faculty and staff that focus on practical applications.
- Seek out ways to infuse each of its academic departments with at least one course that deals with sustainability in its particular arena.
- Involve The Bryan Series in the pursuit of climate neutrality.
- Hold other informative public speaking events that focus on the effects of climate change.
- Carry itself by way of example and demonstrate that carbon neutrality is an attainable goal.

Guilford College’s Action Plan is primarily aimed at the areas identified by the FY 2006/07 GHG as having the most potential for gain toward carbon neutrality: purchased electricity, stationary fuel sources and transportation. Each will be addressed congruently, using the same conceptual approach of behavioral modification, physical and technological improvements and encouraging social change.

The goal of carbon neutrality by 2047 requires Guilford to maintain a linear incremental decrease of eCO<sub>2</sub> by 2.5 % per year. That is approximately 365 MT eCO<sub>2</sub> per year. When the totality of the plan is considered, each of the three targeted reduction areas (purchased electricity, stationary fuel sources and transportation) need only be reduced by one-third of this amount.

For the sake of planning, these numbers provide a target and a measure by which progress can be tracked. Practically, it is unlikely that reductions will follow such a rigid incremental decline. It is more likely that the eCO<sub>2</sub> number will decrease sporadically as the scope of future projects will be dictated by the availability of funds rather than the exact carbon reduction resulting from their implementation.

Guilford's first interim goal is to achieve a 25% reduction in the first 10 years of implementation of this plan. It is difficult to determine the advancements in energy efficiency possible 10 years from the time this document was prepared, but it is hoped that an additional 30% (or more) can be reduced between the year 2019 and 2047. This would mean that the remaining carbon foot print would be approximately of 45% of the 2006/07 total.

At some point prior to 2047 it will be no longer financially prudent or physically possible to continue to reduce the carbon footprint through improved efficiency and new technology. Even with the greatest of efforts, Guilford College will, conceivably, always be responsible for some amount of carbon emissions. This remaining "un-reducible" carbon will have to be offset. Carbon offsetting is the practice of giving money to an organization that will, in turn, sponsor a carbon reduction project elsewhere that, without funding would not have occurred.

## 1. Scope II Emissions 50%

### Purchased Electricity

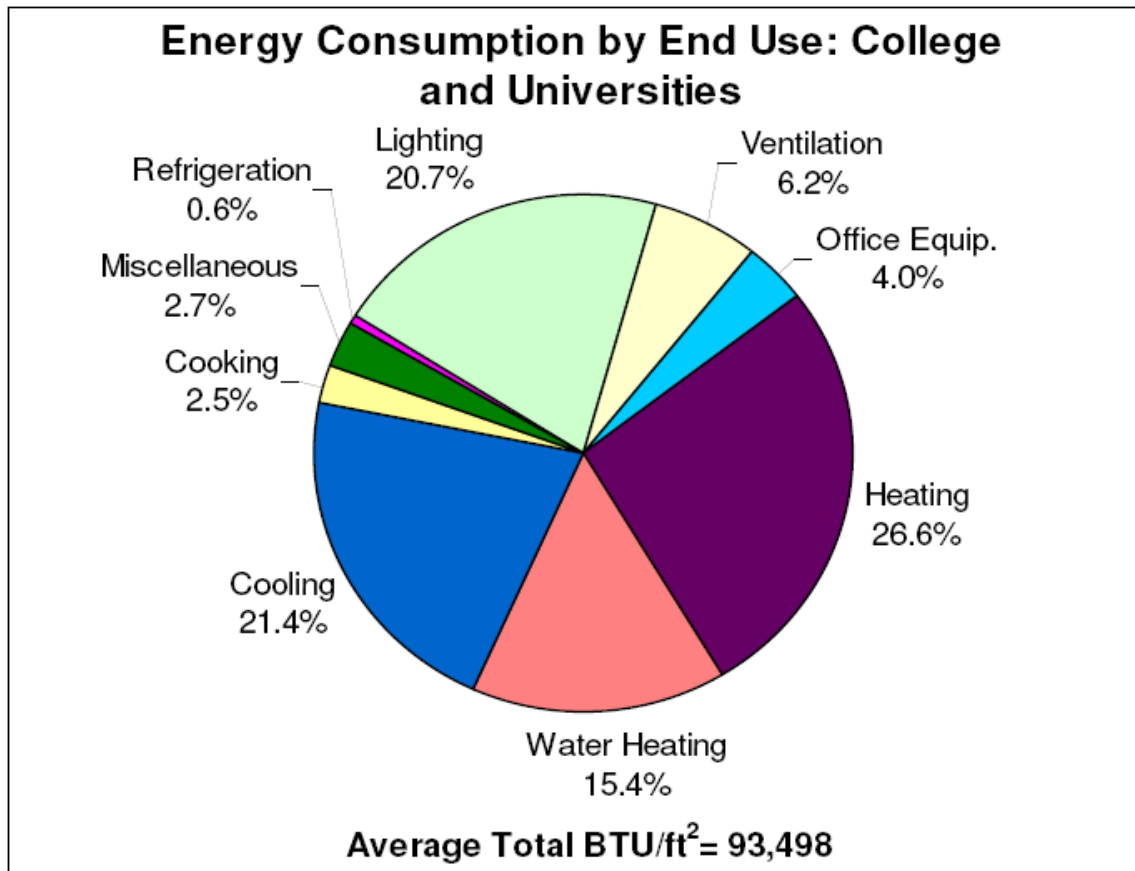
Being the single largest segment of GHG emissions, purchased electricity presents Guilford with its greatest challenge, as well as its finest opportunity. The first step in beginning to reduce this segment of Guilford's carbon footprint is energy efficiency. The most cost-effective way of increasing energy efficiency is behavioral modification. Cost to the college in this area would be minimal, including educational materials, and implementation time in terms of staff and faculty salaries. Initially, \$1,000 per year from the sustainability budget is being sought to cover promotional and educational items concerning behavioral efficiencies.

The behavioral modifications would need to appear on the social landscape of Guilford College as a "grassroots" movement. Various campus departments and student clubs should be encouraged to sponsor a variety of ongoing awareness campaigns that promote responsible treatment of electricity as a resource and a commodity. Changing the way electricity is thought of is the intent of this part of the CAP. The desire is to have people from within the Guilford community lead others in the community to a place where they feel compelled to change from wasteful habits to more thoughtful, informed practices. Some of the suggested activities in this area are:

- raising awareness through public speaking/movies/social events
- light bulb exchanges
- blankets for space heater exchange
- informative light switch plates

The next avenue for improvement in the area of purchased electricity is in the arena of physical and technological efficiencies. This field is wide open to opportunity and ranges from the simple changing of light bulbs to the complex installation of a photovoltaic solar array. Guilford’s CAP suggests that the least expensive options be maximized over the next 10 year period while detailed research is performed at the building by building level to determine which buildings have the most to gain and which technologies best fit those needs. It is difficult, if not impossible, to predict the future financial cost and energy saving that these large scale projects will incur to the college from this perspective in history. Guilford College should begin financial preparation to secure funding for the more costly initiatives during the first 10 years after this document is approved. Also during that time, Guilford should begin to take on smaller projects that have smaller gains and smaller costs. These projects, referred to as “low hanging fruit”, represent the best strategy for Guilford to stay on track with the overall 2.5% yearly carbon reduction.

Figure G-4



This plan suggests that Guilford College should seek grant monies in the sustainability arena such as the Higher Education Sustainability Act (HESA)<sup>10</sup> to help fund the cost of the transition to more sustainable technologies

Currently, both Shore and Mary Hobbs Halls use incandescent light bulbs as their primary lighting source. It is estimated that a complete conversion to compact fluorescent bulbs

would cost in the neighborhood of \$1,200-\$1,500. The conversion could take as little time as a week to complete and could reduce approximately 75 MT of eCO<sub>2</sub>.

It is recommended that Guilford College hire a lighting efficiency consultant to assist in identifying the reduction possibilities in lighting across campus. Based on the percentage provided in figure G-4, 10.3% of Guilford's total carbon footprint can be attributed to lighting.

Occupancy sensors are being touted as being able to save approximately 22% to 65% depending on the room in which they are installed.<sup>11</sup> It is conceivable that widespread use of occupancy sensors in all areas of campus could produce a reduction in the range of 4% of the 2006/07 eCO<sub>2</sub> total. Guilford College should, in the next 10 years, aggressively seek to install as many occupancy sensors as possible.

Joining the Energy Star Challenge would most likely provide an increase in energy efficiency by at least 10%. In terms of electricity, a 10% reduction would equal 956 MT eCO<sub>2</sub> or a 6.5% reduction of the 2006/07 total.

Hot water heater blankets can reduce standby heat loss (heat lost through the wall of the tank) by 25 to 45 percent.<sup>12</sup>

Air conditioning set points should be set (and enforced) between 74 and 76 degrees in the summer months.

After the initial ten low hanging fruit years, Guilford should begin looking at larger projects aimed at entire buildings rather than individual systems. By calculating the electricity usage per building per square foot using Schooldude, "energy hog" buildings can be identified and targeted for upgrades. During the base line year of 2006/07 the top ten electricity consuming campus buildings by square footage were:

	<u>Building</u>	<u>KWH/ft<sup>2</sup></u>
1.	Pump House	103.5
2.	Community Center	50.32
3.	Hege Cox	43.22
4.	Archdale	40.44
5.	Bauman	36.86
6.	Mary Hobbs	36.22
7.	Frank	32.94
8.	Hayward bathrooms	29.47
9.	North Apt Laundry	25.05
10.	Founders Hall	21.85

## 2. Scope III Emissions 31%

### Transportation

Guilford's second largest source of GHG emissions is perhaps its most challenging to control. The difficulty with transportation is the rapid transition from institutional policy to personal scheduling inherent in nature of the discussion. The Guilford community is made up of people, each having a life of commitments outside of the college. To try to coordinate personal schedules for each member of the community, based on carbon efficiency, would be impossible. What Guilford can do is position itself in a way to assist and quicken the change in thinking that must occur in order to realize carbon reduction in this area.

A great part of the Guilford experience is simply being on its historic campus. Personal on-campus interactions, whether programmed or by chance, create Guilford's most valuable asset: the Guilford community. This section of the plan, in no way, is intended to discourage members of the Guilford community from coming together; what it does address is *how* that happens.

When data from the spring 2008 campus-wide transportation survey was extrapolated to include the entire school year, commuting<sup>13</sup> to Guilford College (in its various forms) covered an estimated 7,067,710 miles and used approximately 318,409 gallons of fuel in a single year.

The approach taken by the Climate Action Plan to reduce these two numbers is primarily incentive-based encouragements. For faculty and staff, it is suggested the following measures be given strong consideration:

- develop programs designed to familiarize the Guilford community with Greensboro public transportation options
- provide complimentary passes to faculty and staff who ride the bus
- adopt the Workforce Bicycling Incentive for Guilford College presented in Appendix 10
- provide premium parking spots for hybrid-vehicles, alternative fuel vehicles and vehicles that exceed 40 mpg
- promote and accommodate ridesharing by allowing some flexibility in work schedules. Encourage the use of the "find a ride" link on the Buzz
- investigate the possibility of a 4 day work week. A 20% reduction across the board on commuter days traveled would equal a 45 ton reduction to the total carbon number
- promote and accommodate telecommuting where possible

For its student population Guilford College is asked to consider the following suggestions:

- prohibit first year students from having cars on campus
- require first and second year full time students to live on campus

- investigate the use of car-sharing services that have college partnership programs (e.g. Zipcar)
- encourage carpooling among those who live off campus<sup>14</sup>
- continue its financial commitment to and promote use of the Higher Education Area Transit (HEAT) Program
- develop a college operated bike-rental program

Because it is difficult to project carbon savings with these suggested activities due to the unpredictability of individual involvement, the measurement and verification of changes in Guilford's commuting habits will occur by repeating the transportation survey on a biannual basis. This plan suggests that Guilford College create a transportation internship to conduct the survey and promote a low carbon transportation culture.

## Solid Waste

This area of Guilford's Carbon footprint is relatively small and could be considered *de minimis* by definition; however, because of the high profile given to the area of solid waste in the public eye, Guilford College should continue to aggressively pursue gains in waste reduction.

Beginning in 2009, this plan calls for Guilford College to engage in the national waste reduction competition called Recyclemania. Three of the goals of Recyclemania state what this section of the plan seeks to address:

- increase recycling participation by students and staff
- heighten awareness of schools' waste management and recycling programs
- lower waste generated on-campus by reducing, reusing and recycling

Due to increased pressure from Guilford and other area colleges, the City of Greensboro will, in the fall of 2008, begin a truck weighing program aimed at providing actual recycle weight data. Guilford College should work with the City of Greensboro toward achieving the same capabilities with its trash service to provide real-time measurements of waste removed from campus.

Other suggested courses of action are listed below:

- encourage Meriwether Godsey to operate the dining services in accordance with Guilford's vision of a reduced carbon footprint
- support composting at the dining hall and other campus locations by providing space and staffing for the effort
- develop an on-site electronic waste facility
- continue educational efforts reiterating the importance of reducing, reusing and recycling as they pertain to waste reduction
- investigate implementing printer restrictions and double-sided printing mandates

### 3. Scope I Emissions 19%

#### Propane

Propane is used to operate the college's forklift in the Operations and Facilities Department and to fire two of the three pottery kilns in the Department of Art. On a yearly basis, Guilford burns 860 gallons of propane which emit approximately 5MT of eCO<sub>2</sub>. This number is far below what is considered to be *de minimis*, when compared to the overall carbon output. Because the operation of the forklift occurs partially indoors, its fuel source is predicated on safety. It is not recommended that the fuel source be changed.

#### Natural Gas

Guilford College is fortunate in that its primary heat source is one of the cleanest burning fossil fuels available. According to the Energy Information Administration<sup>15</sup>, of the non-renewable fuel sources, only methane and landfill gas have a lower carbon output per burned unit than natural gas (see Appendix G-11). Because of this, Guilford's carbon management of natural gas, for the short term, should focus on reducing the amount of natural gas used. It is suggested that this be achieved by increased building envelope efficiencies and standardized temperature regulations with wide-scale community behavior modification. These changes should occur with the intent to adhere to the overall goal of a 2.5% or 365 MT eCO<sub>2</sub> reduction per year.

The recommended first step for Guilford to reduce its carbon emissions in this area is by implementing and monitoring a strict set-point policy which would keep each building between 65 and 68 degrees during occupied winter months. This policy may require some members of the Guilford community to sacrifice a measure of their personal preference (modify their behavior) when it comes to the matter of regulating one's personal temperature. This plan does not seek to refuse basic comforts to people, but it does ask us to re-think how that comfort level is achieved. This principal is reflected in the assertion that it is much more beneficial for someone to dress appropriately based on daily weather conditions than it is to manipulate a building's internal environment to gain personal comfort.

The second approach to reducing the natural gas induced portion of Guilford's carbon footprint is to maximize the efficiency of our existing usage. Insulation and efficiency programs that seek to tighten building envelopes by improvements to insulation R-values, weatherizing, window replacements, etc. should be initiated based on the "worst-offender" point of view as ranked below (from a Schooldude BR02 report).

## 2006/07 Natural Gas usage per Square foot of building space

	<u>Building</u>	Therms/ft <sup>2</sup>
1.	Boiler Room	93.16
2.	Pool Boiler	3.90
3.	Upper Annex	1.02
4.	English Hall	0.81
5.	Dana Auditorium	0.75
6.	Worth House I	0.68
7.	Pope House	0.63
8.	Binford Hall	0.44
9.	Bryan Hall	0.41
10.	Milner Guest House	0.35

Guilford College is encouraged to consider the “whole–building”<sup>16</sup> perspective when considering each building’s efficiency. This holistic view of total energy consumption recognizes the relationship between the different systems in a building and their effects on one another. This approach may help identify areas of gain that are not evident by looking at a system in isolation. The goal of looking at our building systems in this light is the transition of CO<sub>2</sub> reduction from being a byproduct of on a job well done, to becoming a discipline and criteria with major influence on the way Guilford designs and maintains its buildings.

It is recommended that any major overhauls or replacements of building-wide heating systems in the future meet or exceed performance standard as outlined by USGBC LEED silver standard.

Currently the use of natural gas affords Guilford the benefit of burning the cleanest of the fossil fuels but, in the end, it is still a fossil fuel; a finite and non-renewable, carbon-based resource. The above suggestions of efficiency improvements and behavioral change are short term steps to lessen the inevitable environmental degradation caused by employing this source of energy. The use of natural gas as the main heat source will not lead to carbon neutrality by any means other than the purchase of carbon offsets. To truly demonstrate the commitment to change asked by the ACUPCC, Guilford College should plan for a future that includes renewable energy options such as geothermal, bio mass or solar energy as the solution to this source of carbon emissions.

### Agricultural

Guilford’s GHG emissions stemming from agriculture is considered *de minimis*. If large scale changes to the campus grounds keeping procedures are made in the future, this designation will need to be reassessed.

## Refrigerants

Refrigerants make up approximately one percent of Guilford's carbon footprint. Due to the relative size of the refrigerant footprint, great gains toward carbon neutrality will not be realized in this area; however, responsible behavior and practice in this area is essential with respect to our overall environmental credibility. Our maintenance staff is required by state law to record the amount of refrigerants added to a system. The log is available through the maintenance department. Guilford College is currently phasing out R-22. We, as an institution, need to stay on the forefront of technological advances in refrigerant materials. Guilford College should be open to, with due diligence, future opportunities involving research of and experimentation with environmentally beneficial refrigerant technologies. Environmental leadership, recognition and financial reward could be realized by offering our campus facilities as a proving ground for new technologies in the future.

## University Fleet

The university fleet was responsible for 1.6% of the carbon footprint during the FY 2006/07. As with the other lesser contributors there is not much room for GHG emission reduction in this area. There is however, considerable value to be gained in the area of public perception should the college choose to operate its diesel fleet using recovered cooking oil. Similar public awareness could be gained should Guilford adopt a vehicle rental policy requiring hybrid vehicles for college related travel.

## D. Offset Options

Carbon emission offsetting can be used to offset the inevitable eCO<sub>2</sub> emissions after all reasonable attempts to operationally eliminate them have been made. The danger of carbon offsetting is to postpone real solutions that work to solve the problem of global warming by diverting funds away from costly energy projects.

If Guilford College can cut its GHG emissions in half by the time it must purchase offsets, at current average market price, the cost to offset one year of carbon emissions would be approximately \$ 117,000.<sup>17</sup>

Starting as soon as possible, Guilford College should begin building a Carbon Offset Fund. This would be a fund designed to pay for offsetting Guilford's unavoidable GHG emissions. This fund should be donation driven and marketed in such a way as to not detract from the regular giving that helps sustain the college's yearly operations. Possible funding streams include Alumni donations, voluntary student "fees", special event appeals, etc. Ideally the money would be invested and grow until it is needed to balance the remaining carbon footprint after all appropriate effort is made to infrastructure and behavior. Potentially this fund could be in investments for 20-25 years before it is needed.

Guilford College should explore creative ways to generate offsets than purchasing them. One suggestion is a solar generator. The College should build a small, mobile solar

generator capable of generating 3500 to 5000 watts of electricity. The generator would be used locally (either rented or operated by Guilford volunteers) to provide off the grid electrical power for musical events, public speaking events, graduations, and any other venues where a temporary outdoor power source is needed. In addition to the promotional value of this project, the generator could also provide a way for Guilford to generate its own carbon offsets by claiming the Kilowatt savings per event toward Guilford's carbon neutrality.

## E Endnotes

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<sup>1</sup> adapted from presidentclimatecommitment.org “about” page

<sup>2</sup> United States Green Building Council Leadership in Energy and Environmental Design

<sup>3</sup> <http://www.friendsofscience.org/>

<sup>4</sup> Metric Ton

<sup>5</sup> MT of Carbon Equivalence

<sup>6</sup> carbon dioxide CO<sub>2</sub>, methane CH<sub>4</sub>, nitrous oxide N<sub>2</sub>O, hydrofluorocarbons , perfluorocarbons and sulphur hexafluoride SF<sub>6</sub>

<sup>7</sup> The Kyoto Protocol to the United Nations Framework Convention on Climate Change is an international agreement ratified by over 170 countries that set targets and timetables for cutting the greenhouse gas emissions of industrialized countries.

<sup>8</sup> Schooldude is a web-based G05 report

<sup>9</sup> The Guilford Mission Statement obtained from

[http://www.guilford.edu/about\\_guilford/services\\_and\\_administration/hr/handbook\\_faculty.html](http://www.guilford.edu/about_guilford/services_and_administration/hr/handbook_faculty.html)

<sup>10</sup> approved by Congress as part of the new **Higher Education Opportunity Act of 2008 (HR 4137)**

<sup>11</sup> from Green seals report.

<sup>12</sup> Source: [http://www.energy.iastate.edu/news/Homeseries3\\_efficiency.html](http://www.energy.iastate.edu/news/Homeseries3_efficiency.html)

<sup>13</sup> The ACUPCC for the purposes of the Commitment defines commuting as travel to and from campus on a day to day basis by student, faculty and staff. It does not include student travel to and from campus at the beginning and end of term or during break periods. see appendix II for complete report

<sup>14</sup> A 30% increase in number of students carpooling = 110 ton reduction (that’s only 0.75% of 14,853)  
20% = 76 ton reduction

<sup>15</sup> <http://www.eia.doe.gov/oiaf/1605/coefficients.html>

<sup>16</sup> <http://www.greencampus.harvard.edu/>

<sup>17</sup> (14,583 eCO<sub>2</sub> x 50%) x \$16. \$16 is the average cost to offset one ton of eCO<sub>2</sub>