



Climate Action Plan
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Prepared by the Office of Sustainability for the
Environmental Advisory Council

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Executive Summary

Elon University believes that one of the most pressing issues facing students, indeed all citizens, today is global environmental change. It is imperative that we teach our students about environmental change, human interactions with the earth and how they can be good stewards of this earth so that our mission of producing “global citizens and informed leaders motivated by the common good” is accomplished. This belief and vital mission is what led President Lambert to create an Environmental Advisory Council in 2004 with faculty, staff and student representation. After researching environmental sustainability, including Elon’s current practices and additional opportunities, the Council created Elon’s Sustainability Master Plan. The overarching goal of Elon University’s Sustainability Master Plan (2006-2007) is “to minimize our impact on the global environment by establishing a carbon neutral university.” The target for doing so was identified as within the next 30 years, so by 2037.

As an important step toward reaching carbon neutrality, Elon’s first greenhouse gas (GHG) emissions inventory was conducted for fiscal year (FY) 2008 and serves as the baseline from which to measure reductions in emissions. The net GHG emissions for FY 2008 were 40,951 metric tons of carbon dioxide equivalents (MTCDE). The largest contributor to emissions was energy consumption at 56.2% of emissions followed by transportation with 40.9% of emissions. In FY 2009, net GHG emissions decreased by 3.72% to 39,428.5 MTCDE. Energy consumption remained the largest contributor to emissions at 55.8% of emissions with transportation next at 40.9% of emissions. The decrease in emissions was mainly due to a decrease in energy consumption.

In the past 10 years, Elon University’s campus has grown by about 1 million square feet; the student and faculty and staff populations have increased, as well. The campus will continue to grow, which will inherently affect the university’s GHG emissions and make reductions in emissions more challenging. Taking into consideration an estimated growth rate of 3%, emissions in 2037 are projected to be 93,034 MTCDE. This is the business as usual (BAU) case without implementation of reduction strategies. It clearly indicates the need to quickly begin emission reduction projects and continue them to work toward the goal of carbon neutrality. The BAU case also highlights the importance of planning for carbon neutrality with future campus expansions.

Emission reduction strategies and goals have been identified in four categories: energy, transportation, solid waste and other sources (fertilizer application, refrigeration and wastewater). Future technologies will also contribute to Elon’s long-term emission reductions. Energy and transportation are the primary focus given they are the main contributors to Elon’s emissions. Energy strategies include energy efficiency and conservation in existing buildings, energy conservation through behavior modification, green building, standards and policies, green information technology, renewable energy and the Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in North Carolina.

Transportation strategies address the following sources of transportation emissions: commuting, the university fleet, faculty/staff and athletic team travel and study abroad. Strategies for commuting include increasing the use of alternative transportation and increasing the fuel efficiency of commuter vehicles. Improving the fuel efficiency of the university fleet is the primary strategy for the university

fleet. Strategies for faculty/staff and athletic team travel include virtual meetings, alternative transportation and scheduling. Study abroad is one category of emissions that will not be actively reduced. However, there are steps that can be taken to educate students about the impact of study abroad, to develop creative ways to offset study abroad travel emissions and to identify logistical opportunities for efficiency.

Offsets are a necessary component of reaching carbon neutrality. However, Elon intends to utilize offsets *only* after reducing emissions on campus as much as possible through the strategies outlined in this plan. Offset strategies will be investigated to identify the best options taking into consideration the desire for high-quality offsets that are as local as possible.

The goals identified for each emission category are summarized in Table 1. The reduction goals are per emission category from 2037 emissions.

<u>Emission Category</u>	<u>Reduction Goal</u>
Energy Reductions	
Energy Efficiency and Conservation (includes T&D)	20%
Energy Conservation through Behavior Modification	10%
Green Building	4%
Renewable Energy	30%
Renewable Energy & Energy Efficiency Portfolio Standard	25%
Future Technologies (based on 2037 projected total)	12%
Transportation	
Commuting – Alternative Transportation	20%
Commuting – Fuel Efficiency of Commuter Vehicles	40%
University Fleet	40%
Faculty/Staff and Athletic Team Travel	14%
Study Abroad	0%
Solid Waste	80%
Other Sources (fertilizer, refrigeration, wastewater)	60%

Table 1: Summary of Reduction Goals

If the strategies outlined are implemented and the goals above met, Elon’s gross emissions are estimated to be about 32.2% *lower* in 2037 than in FY 2008. Projected 2037 emissions will be reduced by approximately 65,238 MTCDE or 70%. During this time, the campus is estimated to grow over 2 million square feet.

The remaining amount (27,668 MTCDE) will need to be offset to achieve carbon neutrality. Of the remaining amount, 19,156.9 MTCDE is projected to be emissions from study abroad travel. Using a rough estimate of \$15/ton in 2008 with a 5% yearly increase, it would cost Elon approximately \$1.71 million to purchase offsets for the remaining emissions in 2037 to reach carbon neutrality. A yearly offset purchase will be necessary to maintain carbon neutrality.

Near-term interim emission reduction targets for net emissions will guide Elon’s progress toward the goal of carbon neutrality in 2037. These targets calculated from a FY 2008 baseline are as follows:

2015 – 5%

2020 – 18%

It is important to note that there are many factors that could affect Elon's carbon emissions and the ability to meet the goals and interim targets set forth in this plan. Most notably, campus growth estimates and economic conditions. Additionally, many of the goals identified are dependent upon factors outside of the university's direct control. Periodic reviews and updates will be necessary to take evolving external factors and emerging technologies into consideration.

Further incorporating sustainability and climate change into education, research and community outreach will contribute toward creating a culture of sustainability, which will foster emission reduction efforts. To that end, several recommendations have been made, such as investigating the development of a peer education program on sustainability for faculty and staff, investigating the feasibility of a new major in sustainability or sustainability science or studies, creating an award for outstanding research in sustainability-related research and strengthening and further developing community service opportunities related to climate change and sustainability through the Kernodle Center for Service Learning and Office of Civic Engagement.

This plan will be funded through several mechanisms, such as annual capital project requests for efficiency improvements, third party partnerships for large projects and rebate and grant programs (when applicable). It is also recommended that creating a Green or Sustainability Fund dedicated to emission reduction and sustainability projects be investigated. The progress of this plan will be tracked through Elon's annual GHG emissions inventory. As previously noted, Elon will continue to develop strategies and stay abreast of new technology developments as well as other external factors, which could further emission reduction goals, and revise this initial Climate Action Plan accordingly.

Background

Elon University's mission statement says, in part, that "We integrate learning across the disciplines and put knowledge into practice, thus preparing students to be global citizens and informed leaders motivated by concern for the common good." Elon believes that one of the most pressing issues facing students, indeed all citizens, today is global environmental change. In order to be true to our mission statement, it is imperative that we teach our students about environmental change, human interactions with the earth and how they can be good stewards of this earth so that our mission of producing "global citizens and informed leaders motivated by the common good" is accomplished.

This belief and vital mission is what led President Lambert to create an Environmental Advisory Council in 2004 with faculty, staff and student representation. The Council was tasked with researching environmental sustainability, assessing Elon's current practices and identifying additional opportunities to expand the university's sustainability efforts. Their efforts culminated in the creation of Elon's Sustainability Master Plan. The Master Plan includes a series of recommendations in numerous categories ranging from Green Building and Purchasing to Communication and Curriculum, which are designed to further Elon's sustainability program. The overarching goal of Elon University's Sustainability Master Plan (2006-2007) is "to minimize our impact on the global environment by establishing a carbon neutral university." The target for doing so was identified as within the next 30 years, so by 2037. Since then, this goal has been guiding the university's sustainability efforts.

In 2007, Sustainable Environment was added as an institutional priority and the emphasis on sustainability has continued. In 2008, a full-time sustainability coordinator was hired to guide the university's efforts, and a Sustainability Policy was created and adopted to formalize and strengthen Elon's commitment to sustainability. The Policy identifies focus areas and goals within them to further minimize Elon's impact on the environment and create a more sustainable campus. As stated in that policy, 'Elon University is committed to sustainability and to serving as a positive example through sustainable operations and education. The University will pursue its mission to become more sustainable by focusing on three areas: reducing greenhouse gas emissions, conserving resources and educating the community.'

As an important step toward reaching carbon neutrality, Elon's first greenhouse gas (GHG) emissions inventory was conducted for fiscal year (FY) 2008 and serves as the baseline from which to measure reductions in emissions. That initial inventory and the subsequent inventory for FY 2009 have guided the development of this Climate Action Plan. This plan outlines emission reduction strategies; identifies interim emission reduction targets; recommends strategies to incorporate climate change and sustainability into education, research and community outreach; summarizes financing options and identifies how progress will be tracked. It is important to note that this Climate Action Plan is a living, flexible document that will undergo periodic reviews to take new technologies, incentives and developments into consideration.

Greenhouse Gas Emissions

Calculating the university's GHG emissions or carbon footprint is one of the essential steps in establishing a carbon neutral university. Elon's first GHG inventory was conducted for FY 2008 and serves as Elon's baseline from which to measure reductions in emissions as it is the year with the most complete set of data. A yearly GHG inventory will be conducted to monitor progress toward Elon's emission reduction goals.

Elon's yearly GHG inventory includes four main components: three different emission sources classified as Scope 1, Scope 2 and Scope 3 and offsets.

- Scope 1 is direct emissions including natural gas and propane usage, fuel usage for university vehicles, refrigeration and fertilizer usage.
- Scope 2 emissions come from imported sources of energy, i.e., purchased electricity.
- Scope 3 is all other indirect sources of emissions including business travel, commuter travel, study abroad travel, athletic team travel, solid waste generation and wastewater generation. [Transmission and distribution (T&D) losses of purchased electricity are included under Scope 3, as well.]
- An offset is a reduction of carbon dioxide or removal of carbon dioxide equivalent (eCO₂) GHG emissions that is used to counterbalance or compensate for ("offset") emissions from other activities.

To provide consistency and compatibility, the boundaries for Elon's GHG inventory are all directly financed emissions and directly encouraged emissions such as study abroad. Scope 3 upstream emissions are not included at this time.

The Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator is used to calculate the GHG emissions, and the yearly GHG inventories are conducted by the Office of Sustainability, including student interns.

Greenhouse Gas Emissions Inventory for FY 2008

Elon's total GHG emissions for FY 2008 (using Version 6.4 of the Calculator Tool) were 40,985.6 metric tons of carbon dioxide equivalents (MTCDE) (Figure 1). The net GHG emissions for FY 2008 were 40,951 MTCDE due to an offset of 34.6 MTCDE for yard waste composting. Elon's net GHG emissions per full-time equivalent (FTE) student were 7.7 MTCDE/student and per thousand square feet of building space were 21.7 MTCDE/1,000 ft².

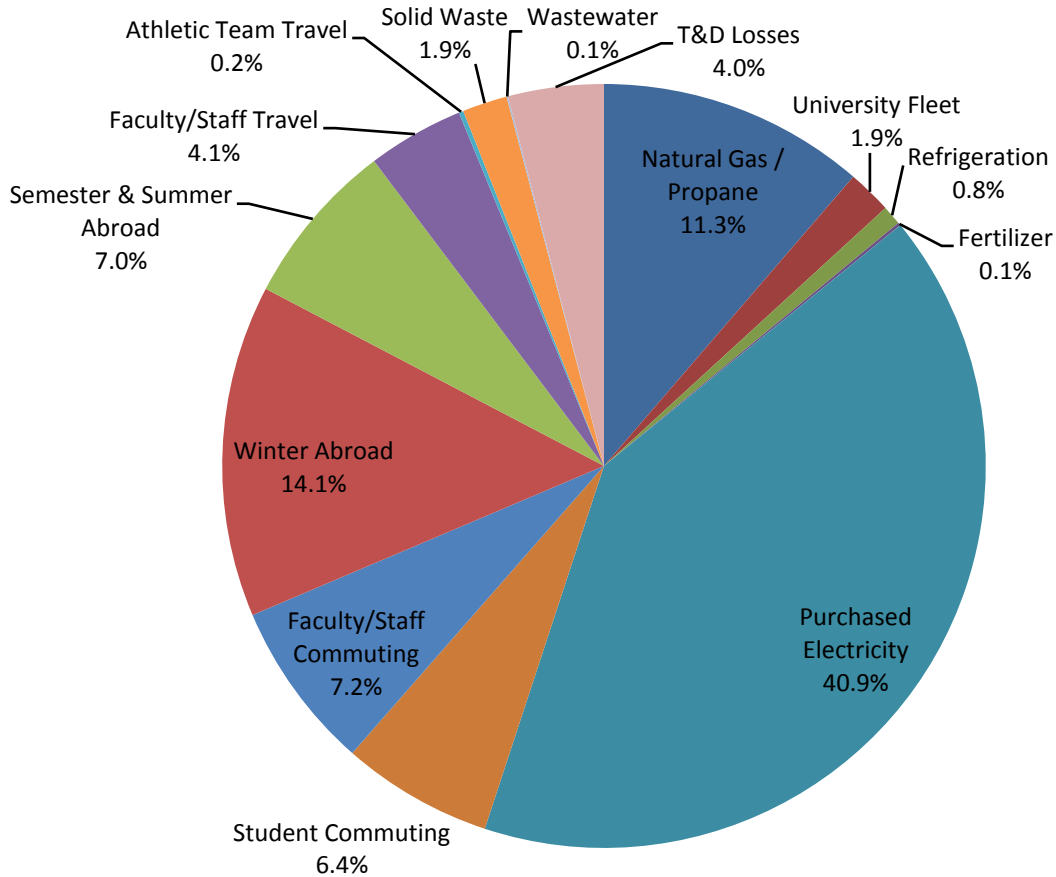


Figure 1: FY 2008 Emissions Percentage by Category

Energy consumption is the largest source of emissions accounting for 56.2% of the total emissions. Transportation is next with 40.9% of the total emissions. The transportation category includes the university fleet, athletic team travel, faculty and staff travel, study abroad travel and commuting. These two categories will be the main focus for this Climate Action Plan.

Greenhouse Gas Emissions Inventory for FY 2009

Elon's total GHG emissions for FY 2009 (using Version 6.4 of the Calculator Tool) were 39,505.5 MTCDE (Figure 2). The net GHG emissions for FY 2009 were 39,428.5 MTCDE due to an offset of 77 MTCDE for yard waste composting. Elon's net GHG emissions per full-time equivalent (FTE) student were 7.2 MTCDE/student and per thousand square feet of building space were 20.6 MTCDE/1,000 ft².

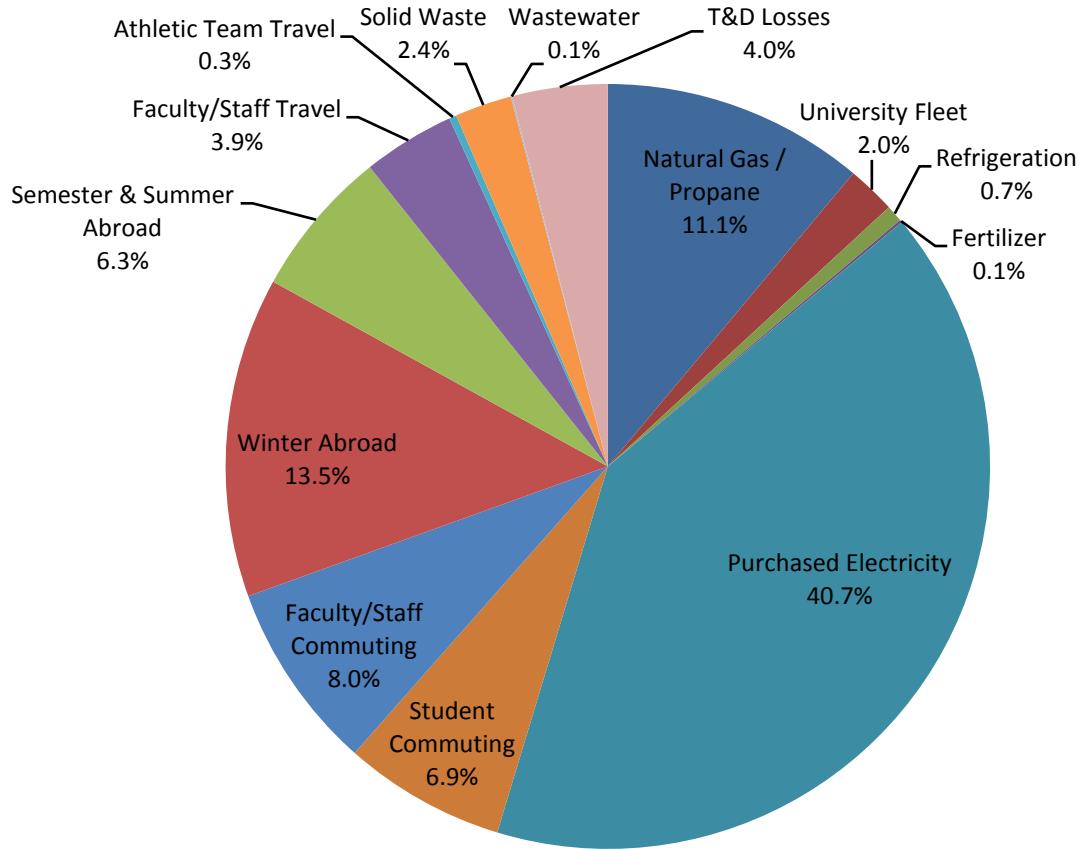


Figure 2: FY 2009 Emissions Percentage by Category

Comparing FY 2008 with FY 2009, the distribution of emissions is very similar. Energy consumption remains the largest source of emissions accounting for 55.8% of the total emissions. Transportation is next with 40.9% of the total emissions. Elon's net GHG emissions decreased 3.72% from FY 2008 to FY 2009. See Figure 3 for a comparison of FY 2008 and FY 2009.

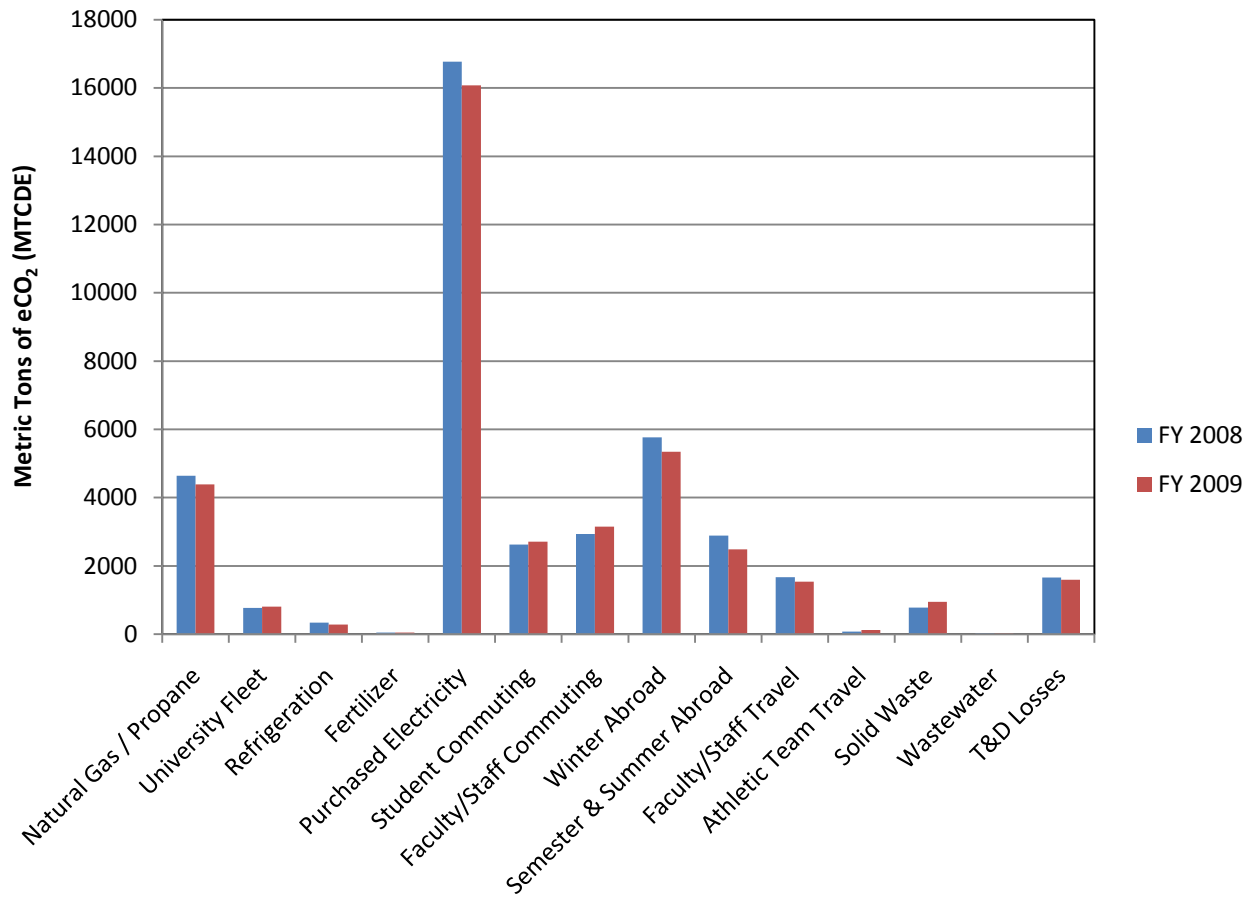


Figure 3: Emissions by Category for FY 2008 and 2009

The decrease in emissions was mainly due to a decrease in energy consumption as well as fewer students studying abroad through Elon Programs. As illustrated in Figure 3, emissions from purchased electricity and natural gas/propane decreased in FY 2009. Emissions from winter abroad and semester & summer abroad also went down in FY 2009. Yard waste composting offsets went up because Elon is now operating its own yard waste composting facility, which allows more materials to be collected and composted. Commuting emissions went up in FY 2009 due to an increase in population numbers. Solid waste emissions increased in FY 2009 mainly because more information was available. In FY 2008, complete records for solid waste disposal were not available. For example, tonnage amounts from dumpsters brought in for special events and/or circumstances were not available. This information was available and included for FY 2009.

Projected Emissions

In the past 10 years, Elon University's campus has grown by about 1 million square feet; the student and faculty and staff populations have increased, as well. The campus will continue to grow, which will inherently affect the university's GHG emissions and make reductions in emissions more challenging. It

will be essential to consider the university’s goal of carbon neutrality when planning for the institution’s continued growth.

Figure 4 illustrates an estimated growth rate of 3% in campus building square footage and population numbers with energy and other parameters normalized according to building square footage or student population as appropriate. It is the business as usual (BAU) case without implementation of reduction strategies. Projected emissions in 2037 are 93,034 MTCDE, which is more than two times the emissions in FY 2008, Elon’s baseline year.

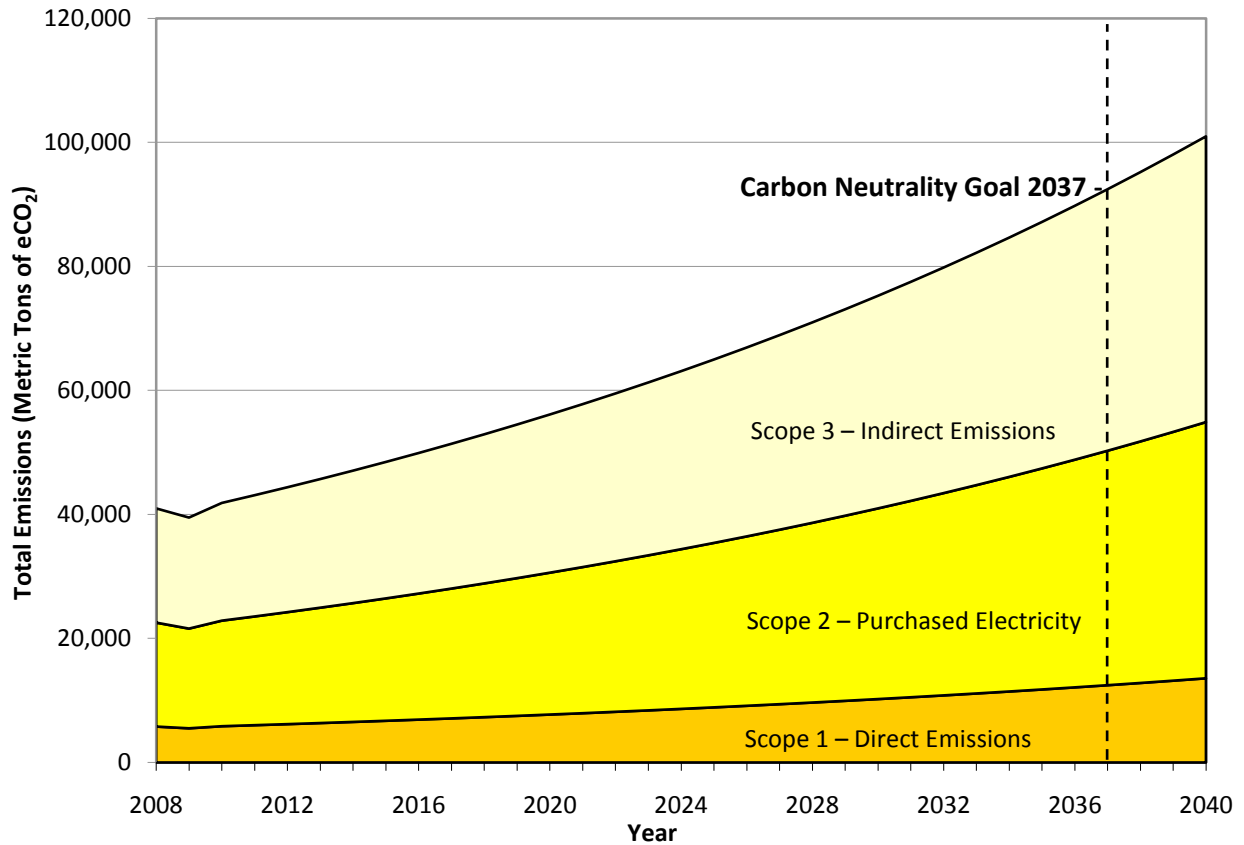


Figure 4: Projected Emissions (Business as Usual)

This business as usual scenario emphasizes the need to quickly begin emission reduction projects and continue them to work toward the goal of carbon neutrality. It also illustrates the importance of planning for carbon neutrality with future campus expansions.

Emission Reduction Strategies

Energy

Overview

Energy consumption is the largest source of Elon's GHG emissions. The business as usual case indicates emissions from energy consumption in 2037 are projected to be 43,213.1 MTCDE. Given this, aggressive steps will need to be taken to reduce energy consumption in order to achieve the goal of carbon neutrality. This plan outlines several strategies utilizing existing technologies, which will reduce energy consumption. However, the plan will need to be reviewed periodically to take new technology and incentives into consideration. Future technologies in all areas, not just energy, will contribute to Elon's long-term reductions in carbon emissions.

Strategies

Energy Efficiency and Conservation in Existing Buildings

Reducing energy consumption in existing buildings is a key strategy. Elon has historically sought and implemented opportunities to reduce energy consumption, such as lighting retrofits, motion sensors, HVAC system upgrades and building envelop improvements (e.g., roof, windows and insulation). This will need to continue aggressively and expand to include exterior lighting and a focus on building controls and scheduling. It is estimated that an initial combination of high-priority energy conservation measures (ECMs) would generate a savings of 10% from current energy expenditures over a 15 year period. Elon must carefully consider the best process for implementing and financing these ECMs. Additional ECMs will continue to be sought and implemented to further reduce energy consumption.

An approach to reducing energy consumption that may be considered in the future is retro-commissioning of older, high energy using buildings. Retro-commissioning is a systematic, documented process for restoring buildings to their optimal performance through operational and maintenance improvements. This approach is dependent upon the process utilized for and the outcome of previously mentioned ECMs.

With these measures, the goal is to reduce Elon's 2037 emissions from energy consumption by 20%.

Energy Conservation through Behavior Modification

The use of behavior modification to conserve energy is a commonly recognized strategy. It can be challenging to affect such a change in behavior as well as monitor and measure it. However, it is expected that some reduction in energy consumption will come from changes in behavior among campus community members. A cohesive program addressing faculty, staff and students will need to be developed and appropriate marketing funds allocated. To be successful, the program will need to be supported and promoted throughout campus at the institutional and departmental level.

The goal is to reduce Elon's 2037 emissions from energy consumption an additional 10% through behavior modification.

Green Building

Elon's Green Building Policy calls for LEED certification of new construction projects and major renovations consisting of 8,000 or more square feet of conditioned, occupied space. LEED Silver certification is the strongly preferred level and in no case will such projects achieve less than LEED Certified certification. The design and construction team should strive for a higher level of certification whenever project resources and conditions permit. New projects less than 8,000 square feet and minor renovations must follow the University's Sustainability Design Standards at a minimum, including the submission of a completed LEED Checklist during project programming and with the Construction Documents submittal. This policy lays the groundwork for construction of future facilities but additional measures will need to be taken to achieve carbon neutrality. The following recommendations expand upon the existing policy.

Consider adding energy efficiency requirements to the Green Building Policy to ensure new facilities are highly energy efficient. For example based on LEED v3, new facilities could be required to be at least 28% more efficient than a standard code building and strive for 40% more efficiency (or better).

To help achieve reductions, renewable energy should be given serious consideration for all new facilities. Specifically, solar thermal for water heating should be investigated for new residential and dining facilities as they have large hot water needs. Geothermal and/or solar photovoltaic panels should be explored as applicable for all new facilities.

There is uncertainty as to the impact of this strategy on energy consumption emissions in 2037. Additional research and investigation is needed. However, the goal, based on a rough estimate, is for green building to reduce Elon's 2037 projected energy consumption emissions by 4%.

Standards and Policies

Achieving carbon neutrality requires a new way of thinking about campus operations. New standards and policies will help facilitate this shift and formalize existing good practices. The following recommendations address energy consumption:

- Revise the existing design standards to include equipment and systems minimum efficiency requirements that apply to new construction, renovations and maintenance replacements.
- Develop and implement a heating and cooling policy, which identifies appropriate temperature set-points and building schedules.
- Develop and implement an Energy Star purchasing policy that requires all new applicable purchases to be Energy Star rated.
 - This should be a part of a broader Environmentally Preferable Procurement (EPP) policy or green purchasing policy. Such a policy should include requirements for products beyond energy consuming products and address issues of recycled content, toxicity

levels, packaging and recyclability of products and energy and water savings, among others.

Savings from Standards and Polices are considered in the Energy Efficiency and Conservation in Existing Buildings section above.

Green Information Technology (IT)

There are also opportunities within Information Technology (IT) to conserve energy and/or avoid energy usage. The following strategies build upon existing efforts and identify additional opportunities for further investigation.

Virtual Servers

Virtual servers allow several servers to run on one machine reducing operating and hardware costs. Elon has an existing virtual server infrastructure which has already provided energy savings. Updating this system and virtualizing more servers may provide some additional savings but will avoid energy usage by reducing the need for additional individual servers.

Desktop Virtualization

Desktop virtualization eliminates the need for hard drives at individual work stations as they are completely dependent upon the server for processing power. This saves energy at the work station but does require more server processing power so actual energy savings may be small. However, beyond energy savings desktop virtualization reduces hardware costs and increases software accessibility.

EPA Energy Star Computer Settings

The Environmental Protection Agency (EPA) has recommended computer power management settings to save energy. These settings should be adopted at Elon and publicized to the campus community along with easy to use 'How To Guides' that walk faculty, staff and students through the process of setting them on the computer they most frequently use. This will require an educational campaign and appropriate marketing funds. To be successful, the campaign will need to be supported and promoted throughout campus at the institutional and departmental level. Energy savings from this are considered in the Energy Conservation through Behavior Modification section above. University computer labs already utilize computer power management settings, but they should be reviewed and, if needed, made consistent with the EPA settings.

Policy for New Purchases

As previously noted, reaching carbon neutrality requires a new approach to campus operations, and new policies will help facilitate that shift and formalize existing good practices. The EPP policy recommended above should include IT and specify energy efficiency requirements for new IT equipment and systems utilizing Energy Star and/or Electronic Product Environmental Assessment Tool (EPEAT), where applicable. The IT section should also address the use of retired or replaced equipment and

indicate a preference for it to be removed from campus when appropriate rather than re-purposed on campus, which will help with the realization of energy savings.

Computer Power Management Software System

A computer power management software system allows power management settings to be set remotely from a main terminal and applied to several computers in a network. Such a system would be the most advantageous for university owned faculty, staff and student associate desktop computers. The computer lab computers are already controlled with common power management settings. Additional research is needed to determine the cost effectiveness and potential energy savings of this strategy.

The savings from Green IT are considered in the Energy Efficiency and Conservation in Existing Buildings section above (unless otherwise noted).

Renewable Energy

On campus renewable energy will be needed to reach carbon neutrality especially as the campus continues to grow. Solar photovoltaic panel, solar thermal and geothermal systems are the most likely on campus renewable energy technologies in the near-term.

The installation of solar photovoltaic ground mounted arrays is currently being considered through a third party partnership. Proposals have been received for up to 4 MW of DC rated solar power. With a third party partnership, Elon would not own the solar installations for the first 10 years but be leasing the land for them to the third party. During those 10 years, the proposed systems would be providing a reduction of approximately 1,800 MTCDE per year, which would benefit the region and reduce the need for fossil fuel based energy. After 10 years, Elon would have the opportunity to purchase the systems. Upon doing so, Elon would then be able to claim those carbon savings in the annual GHG emissions inventory. Additional or other solar photovoltaic installations are a possibility for the future, including roof mounted solar photovoltaic panels.

Solar thermal systems for water heating are being investigated for existing facilities. One existing proposal is for a total of 90 solar thermal panels to be installed on three separate facilities with the potential to reduce emissions about 49 MTCDE per year. Additional facilities will be considered in the future, particularly residential and dining facilities.

Geothermal technology for existing facilities and possibly new facilities is also being explored. An initial study was conducted for the North Area of campus and found that over 90,000 MCF of natural gas and 1.9 million kWh of electricity could be saved annually versus the existing systems of five facilities. Such a reduction in energy consumption would result in an emissions reduction of 1,500 MTCDE per year. Since that initial study, Elon's Facility Master Plan has been completed, which calls for significant reconfiguration of the North Area of campus. However, the initial study will help inform decisions made during the reconfiguration of the North Area of campus and provide information for other areas of campus.

Off campus renewable energy is also a possibility through partnerships with other colleges and universities in the region or other third parties. The preference for off campus renewable energy is for it to be in North Carolina or at least the southeast.

The goal is for renewable energy to reduce Elon's 2037 emissions from energy consumption by 30%.

Renewable Energy and Energy Efficiency Portfolio Standard (REPS)

North Carolina has a 12.5% Renewable Energy and Energy Efficiency Portfolio Standard. This requires all investor-owned utilities in the state to supply 12.5% of 2020 retail electricity sales (in NC) from eligible energy resources by 2021. Eligible energy resources include solar-electric, solar thermal, wind, hydropower up to 10 MW, ocean current or wave energy, biomass that uses Best Available Control Technology (BACT) for air emissions, landfill gas, combined heat and power using waste heat from renewables and hydrogen from renewables. Up to 25% of the requirements may be met through energy efficiency technologies, including combined heat and power systems powered by non-renewable fuels. Elon will benefit from this state-wide standard through a reduction in carbon intensity of the electricity purchased from Duke Energy.

It is reasonable to expect the REPS to increase in the future. The current renewable standard in other states varies but many are 15% or more. In 2037, it is expected that the REPS in North Carolina will be at least 25%.

Transportation

Overview

Transportation is the second largest source of Elon's emissions. Most of Elon's transportation emissions come from Scope 3 sources, such as commuting and study abroad travel. Scope 3 emissions are challenging to address because the university does not have direct control over them like it does with the Scope 1 source of transportation emissions – the university fleet. However, strategies have been proposed to reduce or offset emissions from each source of transportation emissions.

Strategies - Commuting

Increase Use of Alternative Transportation

Reducing the number of single occupancy vehicles used for commuting to and from campus will reduce emissions. The best way to do this is to facilitate and encourage the use of alternative transportation. There are a number of ways to approach this.

The Town of Elon adopted the Bicycle, Pedestrian and Lighting Plan: An Alternative Transportation Strategy in the fall of 2008, which makes recommendations for improvements in all three areas. The university has supported this initiative from the beginning and should continue to do so as implementing this plan will make the campus and surrounding community more bicycle and pedestrian friendly.

As the campus expands, it will be important to plan for bike lanes and racks as well as sidewalks to facilitate a bicycle and pedestrian friendly campus environment.

Incentives could help increase interest in alternative transportation mainly carpooling, bicycling and taking the Biobuses and have been used successfully at other institutions. Additional research is needed to develop the appropriate incentives program for Elon. The incentives for faculty and staff would likely be slightly different from those for students.

Expanding marketing efforts around alternative transportation would also help increase participation. Such efforts could include a dedicated web site with information on alternative transportation options, health and environmental benefits, a carbon calculator allowing individuals to determine the impact of their commuting patterns and maps indicating well traveled cycling and walking routes with appropriate lighting.

As previously noted, new policies will help facilitate the transition to carbon neutrality. A new policy on parking fees could encourage more students to utilize alternative transportation. The existing fee structure could be revised to incentivize alternative transportation. Additionally, a review and revision of the existing rules regarding student parking permits could increase student use of alternative transportation. For example, the radius within which students are not allowed to purchase a commuter permit could be expanded and more strongly enforced. This, of course, would need to be complemented by the suggested carpool program and other alternative transportation options included in this plan.

The Elon Commitment strategic plan calls for more on campus housing, which will likely increase the use of bicycling, walking and other forms of alternative transportation. However, it will impact the university's emissions in other categories mainly energy consumption.

Additional specific strategies for certain alternative transportation modes follow.

Carpooling/Vanpooling

A comprehensive carpool program should be developed with an on-line ride matching program, incentives and cohesive marketing strategy.

An on-line ride matching program could greatly increase participation in carpooling, based on experience at other institutions. Elon launched a Rideshare page within E-net (the on-line campus communication portal) in the fall of 2009. Elon's Rideshare page provides a secure place only open to campus community members to post requests for a carpool partner. Individuals can post one-time trip and regular commuting requests. Utilization of this page will be monitored and assessed to determine if a more sophisticated system would be worthwhile. There are several outside service providers that have such systems. Initial research into them has been done, and more will be done pending the utilization of the existing Rideshare page.

If carpooling expands enough to make vanpooling an option for some areas, research into options with potential third party partners should be done.

Taking the Biobuses

The Biobuses currently provide to and from campus transportation primarily geared toward student use. Additional routes for faculty and staff use should be investigated. Adding routes would require additional buses, which would increase university fleet emissions. However, if enough faculty and staff switch from single occupancy vehicle commuting to taking the Biobus, there could be an overall emission reduction for commuting. Additional routes for students should also be investigated. There are residential areas close to campus in which students live that are not serviced by the existing Biobus routes.

Bicycling

Many cyclists do not like to leave their bikes out in the elements, especially when it is raining. Providing covered bike racks where appropriate could increase the number of those who chose to cycle on inclement weather days. Adding bike racks to the Biobuses could also prove beneficial to Elon's overall goals to increase alternative transportation.

Elon's existing bike rental program is quite popular. Expanding it could facilitate an increase in bicycling to campus.

The goal is to reduce Elon's 2037 emissions from commuting by 20% utilizing these alternative transportation strategies.

Increase Fuel Efficiency of Commuter Vehicles

There will be an increase in fuel efficiency of vehicles due to new Corporate Average Fuel Economy (CAFE) standards, which will help reduce commuting emissions. In 2007, the Congress passed the Energy Independence and Security Act (EISA). This law mandates that, as part of the Nation's efforts to achieve energy independence, the Secretary of Transportation prescribe annual fuel economy increases for automobiles, beginning with model year 2011, resulting in a combined fuel economy fleet average of at least 35 miles per gallon by model year 2020. This will result in a 40% increase in mileage per gallon and reduction in emissions from commuting.

To make Elon's commuting information more specific to the campus, a system could be developed to capture and record miles per gallon information for vehicles used on campus, perhaps through the parking permit process.

Expanding the existing low-emitting vehicle parking space program could also help encourage the use of low-emitting vehicles, which will reduce commuting emissions.

Strategies – University Fleet

Improve Fuel Efficiency of Fleet Vehicles

Improving the fuel efficiency of fleet vehicles will require the replacement of existing vehicles with more fuel efficient vehicles. The university should continue to purchase electric vehicles to replace Cushman and hybrid vehicles for the fleet with the phase out of non-hybrid vehicles.

Elon's Biobus fleet runs on B20, which is 20% biofuel and 80% ultra low sulfur diesel. This is the highest mix of biofuel that can be used in the buses without a modification to the engine. B20 is cleaner burning than straight diesel fuel but still produces emissions. Some of the other initiatives recommended in this plan will likely increase Biobus use causing emissions to increase for the university fleet while other emission categories may decrease. The university should investigate the feasibility of hybrid buses for new buses and replacements to existing Biobuses to minimize the emissions from the Biobuses as much as possible.

It will be important to keep current with emerging technologies, such as solar, electric, new hybrid and hydrogen so they can be utilized if and when they become available and appropriate for campus use.

Policy for New Purchases

As previously noted, reaching carbon neutrality requires a new approach to campus operations, and new policies will help facilitate that shift and formalize existing good practices. The recommended EPP policy should include vehicles or equipment and specify consideration of emissions for new vehicles and equipment (landscaping, etc.) with the goal of lowest emissions possible for the desired function taking into consideration life-cycle costs.

The goal is to reduce Elon's 2037 emissions from the university fleet by 40% taking into consideration an increase in the fleet's size, CAFE standards and a policy for new purchases.

Strategies – Faculty and Staff Travel, Athletic Team Travel

Travel is a necessary part of many university employees' jobs and Elon's athletic teams so it will be difficult to reduce. However, there are steps that should be taken to facilitate a reduction in travel emissions where possible.

Promote and Encourage Virtual Meetings

Elon has the equipment and facilities to facilitate virtual meetings between individuals and groups. Utilizing these should be encouraged and promoted among faculty and staff. Capabilities should be expanded to meet demand as appropriate.

Promote and Encourage Alternative Transportation

Using alternative transportation for business travel and athletic team travel should be encouraged and promoted. This should include providing information on the various options and benefits such as

carpooling, taking the train or driving vs. flying and using the Zipcar. Biodiesel charter bus service should also be explored specifically for the athletic teams.

Combine Trips through Scheduling

The Athletic Department and other departments who travel frequently (e.g., Admissions and Advancement) should consider the impact of scheduling on their travel needs and work to combine trips, when possible.

Utilizing the above strategies, the goal is to reduce Elon's 2037 emissions from faculty, staff and athletic team travel by 14%.

Strategies – Study Abroad

Elon is ranked number one in the nation among masters – level universities for study abroad programs by the Institute of International Education. About 71% of Elon students study abroad at least once during their time at the university. Reducing the number of students who study abroad is not an option given the prestige and importance of this program. In fact, the number of students studying abroad will likely increase in the future as providing access to study abroad to 100% of Elon students is a priority in The Elon Commitment strategic plan. However, there are steps that can be taken to educate students about the impact of study abroad, to develop creative ways to offset study abroad travel emissions and to identify logistical opportunities for efficiency.

Incorporate Climate Change Education

One approach would be to incorporate climate change education into study abroad experiences. There are a variety of ways to accomplish this and it could vary by program or faculty leader. An existing program that could be used is the Green Passport Program, which focuses on raising awareness of the social and environmental impacts of traveling abroad. Another approach that could be explored is including service projects in the local area of study abroad trip destinations that address issues of climate change.

Offset Emissions

All emissions from study abroad will likely have to be offset. There are several potential ways to address offsets for study abroad travel, including, but not limited to, voluntary contributions from students who study abroad, an added fee for study abroad trips and creative approaches involving student projects. If addressed through student contributions, there should be a way for students to indicate their preference of offset program or type. Given the offsets would be for study abroad travel, international offsets could make a nice fit, if an appropriate offset program or partner is identified.

A structure for study abroad offset purchases should be put in place in the near-term. The goal of such a program could be to begin in 2012 with yearly offset purchases at 20% of study abroad emissions. The amount of offsets purchased each year could begin to increase by an additional 20% in 2021 with

additional increases every 4 to 5 years until 2035 when all study abroad emissions are offset and then continue to be offset annually.

Logistical Analysis

Another approach to reducing study abroad emissions is to consider conducting a logistical analysis of study abroad to identify opportunities for efficiency, such as consolidation of hub-to-hub travel.

Elon's 2037 emissions from study abroad travel are projected to be 19,156.9 MTCDE.

Solid Waste

Overview

Solid waste is a small portion of Elon's GHG emissions; however, it is still important to work toward reducing it even further. Landfill diversion in FY 2009 was about 31% (excluding construction debris).

Strategies

Reduce Solid Waste

Reducing solid waste will require continuing the expansion of Elon's recycling program, expanding the composting program, decreasing the use of disposable materials and increasing efforts to reuse materials (when appropriate). To facilitate these efforts, a dedicated recycling coordinator should be hired and a robust marketing campaign developed and implemented.

As previously noted, the recommended EPP policy should include requirements for less packaging and recyclability of products to reduce the amount of solid waste that enters campus.

The goal is to reduce Elon's 2037 emissions from solid waste by 80%.

Other Sources

Overview

Elon's other sources of emissions including fertilizer application, refrigeration and wastewater are projected to be slightly less than 1% of Elon's overall emissions in 2037. However, reducing them will contribute toward Elon's overall emission reduction goals.

Strategies

Reduce Fertilizer Application

Reducing fertilizer application will require the use of more organic fertilizer products, where appropriate. Using vegetation types that require small amounts of fertilizer would also contribute to this strategy.

Minimize the Impact of Refrigerants

Elon is already utilizing refrigerants with smaller global warming potentials in many locations. This trend should continue for existing and new facilities as well as preventative maintenance to prevent unintentional refrigerant spills.

Reduce Water Use

The use of low-flow plumbing fixtures should be continued and expanded. Non-potable water is used for the automatic irrigation system. This system should be expanded so that additional landscaped areas can also be served. Continuing and expanding the use of vegetation that needs minimal amounts of water would also contribute to this strategy.

The goal is to reduce emissions from these other sources 60% by 2037.

Offsets

Overview

Offsets are a necessary component of reaching carbon neutrality.

Elon intends to utilize offsets *only* after reducing emissions on campus as much as possible through the strategies outlined in this plan. There is a strong preference for offsets to be as local as possible. However, international offsets may make a nice fit for Elon's strong study abroad program.

Strategies

Composting yard waste will continue to be a source of offsets for Elon. The process has been improved with the opening of Elon's own facility. Offsets from yard waste composting are projected to be 128 MTCDE in 2037.

Additional offset strategies will be investigated to identify the best options taking into consideration the desire for high-quality offsets that are as local as possible. Those strategies include, but are not limited to:

- Purchasing offset credits (retail or wholesale) from third-party providers
- Investing in projects directly (without a third-party provider)
- Developing projects independently

The offset market has evolved substantially in the last couple of years and will continue to do so. Maintaining knowledge of its evolution will be necessary as Elon moves toward the goal of carbon neutrality.

Summary and Targets

As previously noted, Elon’s goal is to reach carbon neutrality by 2037. Emissions in 2037 are projected to be 93,034 MTCDE, which is more than two times the emissions in FY 2008, Elon’s baseline year. If the strategies outlined above are implemented and the goals met, Elon’s gross emissions are estimated to be about 32.2% *lower* in 2037 than in FY 2008. Projected 2037 emissions will be reduced by approximately 65,238 MTCDE or 70%. During this time, the campus is estimated to grow over 2 million square feet. See Table 1 for a summary of the reduction goals. The reduction goals are per emission category from 2037 emissions as indicated in the previous section. See Figure 5 for the percentage reduction by category from overall 2037 projected emissions.

<u>Emission Category</u>	<u>Reduction Goal</u>
Energy Reductions	
Energy Efficiency and Conservation (includes T&D)	20%
Energy Conservation through Behavior Modification	10%
Green Building	4%
Renewable Energy	30%
Renewable Energy & Energy Efficiency Portfolio Standard	25%
Future Technologies (based on 2037 projected total)	12%
Transportation	
Commuting – Alternative Transportation	20%
Commuting – Fuel Efficiency of Commuter Vehicles	40%
University Fleet	40%
Faculty/Staff and Athletic Team Travel	14%
Study Abroad	0%
Solid Waste	80%
Other Sources (fertilizer, refrigeration, wastewater)	60%

Table 1: Summary of Reduction Goals

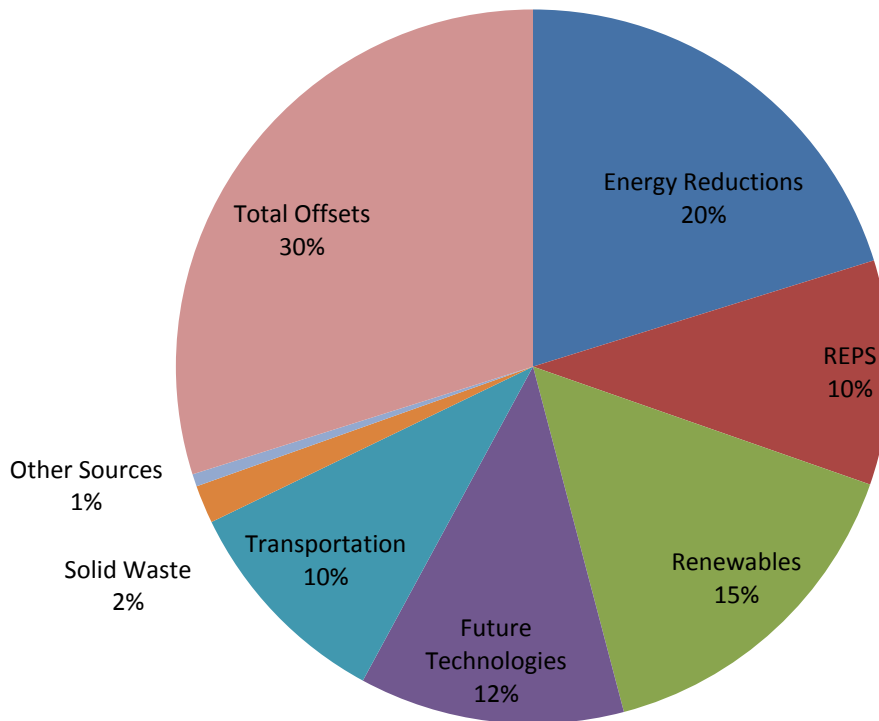


Figure 5: Percentage Reduction by Category from 2037 Projected Emissions

The remaining amount (27,668 MTCDE) excluding expected yard waste composting offsets will need to be offset to achieve carbon neutrality. Of the remaining amount, 19,156.9 MTCDE is projected to be emissions from study abroad travel. Using a rough estimate of \$15/ton in 2008 with a 5% yearly increase, it would cost Elon approximately \$1.71 million to purchase offsets for the remaining emissions in 2037 to reach carbon neutrality. A yearly offset purchase will be necessary to maintain carbon neutrality.

Near-term interim emission reduction targets for net emissions (including yard waste composting offsets) will guide Elon's progress toward the goal of carbon neutrality in 2037. These targets calculated from a FY 2008 baseline are as follows:

2015 – 5%

2020 – 18%

As previously mentioned, it is suggested that Elon begin offsetting study abroad emissions in 2012 with a yearly purchase of offsets equal to 20% of Elon's study abroad emissions. The amount of offsets purchased each year could begin to increase by an additional 20% in 2021 with additional increases every 4 to 5 years until 2035 when all study abroad emissions are offset and then continue to be offset

annually. Taking these recommended offset purchases into consideration, Elon's targets for net emissions (including yard waste composting and study abroad offsets) are as follows:

2015 –10%

2020 – 23%

It is important to note that there are many factors that could affect Elon's carbon emissions and the ability to meet the goals and interim targets set forth in this plan. Most notably, campus growth estimates and economic conditions. Additionally, many of the goals identified for Elon are dependent upon factors outside of the university's direct control, such as the REPS and CAFE standards. It is quite possible for these programs to be extended beyond their current reach, which would facilitate Elon's carbon reduction goals. Conversely, the expected contribution of renewable energy and future technologies to overall emission reductions in 2037 may be hindered by unforeseen future conditions. Passage of a climate change bill or national renewable energy portfolio standard would certainly impact the strategies outlined in this plan, as well. In summary, there is a great deal of uncertainty regarding many of the elements in this plan, which is why periodic reviews and updates will be necessary to take evolving external factors and emerging technologies into consideration.

Education, Research and Community Outreach

Education

Co-Curricular Programs

Elon has a number of co-curricular programs related to sustainability and climate change already in place. Sustainability is included in Resident Assistant and Orientation Leader training so new students and returning students are informed about sustainability. Information about Elon's sustainability program, including the Zipcar program, is sent to new students the summer before they matriculate. The Sustainable Living Learning Community provides students with an opportunity to further their knowledge of sustainable living and educate others. Elon's Sustainability Pledge encourages all campus community members to take personal sustainability actions to reduce their environmental impact.

The Eco-Reps program is a student peer education program dedicated to sustainability and promoting environmentally friendly behaviors. The Eco-Reps provide an interactive Sustainable Living lesson, upon request, to classes such as Elon 101, a freshmen seminar class that most students take, and GST 110, a required freshmen course. The Eco-Reps also work with Residence Life personnel to promote and encourage sustainable behaviors in the residential facilities.

Elon participates in RecycleMania each spring – a 10 week nation-wide recycling competition. During this time, a campus-specific competition is also held to determine which residential area can recycle the most per capita. Elon also has a 7 week residential energy competition in the spring called POWERless. The residents compete to determine which residential area and building will have the greatest percentage energy reduction.

Elon has several student organizations that address issues of sustainability and climate change, including Sierra Student Coalition, Elon Volunteers! Green Team, Students for Peace and Justice, Elon Community Garden, Elon Outdoors and Habitat for Humanity

Lindner Hall (Elon's first LEED Gold building) is available for tours to the campus community and the greater community. Student organizations, classes, other campus groups and community groups take advantage of this opportunity to learn more about sustainable design and construction practices.

Elon hosts a number of sustainability-related events each year. There are activities and speakers on topics related to climate change and the annual Fall Environmental Forum. The specific topic for the Forum varies year to year but in general it addresses sustainability and issues related to climate change.

The Kernodle Center for Service Learning provides students with a number of service and educational opportunities some of which address issues of sustainability. The Green Team, a group within Elon Volunteers!, specifically addresses environmental stewardship.

The Office of Civic Engagement is another entity on campus that demonstrates Elon's strong commitment to preparing students to be global citizens and informed leaders. The Office coordinates and supports a number of programs in the surrounding communities some of which address issues of sustainability.

The above programs have laid a good foundation from which to develop new programs and strengthen existing ones. The following recommendations will enhance co-curricular programs related to sustainability and climate change.

- Expand the role of sustainability in Resident Assistant and Orientation Leader training to ensure all new and returning students are informed about sustainability and how they can participate in sustainability efforts at Elon.
- Continue and enhance sustainability-related programming (speakers, conferences, etc.) designed for the campus and greater community to enhance knowledge and understanding of sustainability and climate change.
- Continue and expand the use of Lindner Hall (and future LEED buildings) as a teaching tool for sustainable design and construction practices.
- Expand the Eco-Reps program.
- Continue and enhance the annual resource competitions (RecycleMania and POWERless).
- Strengthen and further develop community service opportunities related to climate change and sustainability through the Kernodle Center for Service Learning and Office of Civic Engagement.
- Support and facilitate the efforts of student organizations to affect change on issues of sustainability and climate change.
- Investigate the development of a peer education program on sustainability for faculty and staff.
- Continue and expand promotion of how individuals can make a difference through the Take Action section of the Sustainability Web site and the Sustainability Pledge.
- Investigate feasibility of including sustainability in new employee orientation and training.

Curriculum

Elon's Environmental Studies department offers a major in environmental studies with two degree options – B.A. and B.S. – which both address issues of sustainability and climate change. A new B.S. major in environmental and ecological science was recently approved as well as a minor in environmental and sustainability studies. The Love School of Business recently adopted the Principles of Responsible Management Education (PRME), which have a focus on global social responsibility and sustainability. The Love School has started the process of incorporating the PRME into the curriculum.

Elon's Sustainability Faculty Scholars program identifies, supports and recognizes faculty who are interested in incorporating or enhancing a focus on sustainable principles and practices in their courses, and exploring a range of pedagogies to develop this theme. Each participant identifies a course to modify or new course to teach utilizing the principles of sustainability. Many participants end up using what they learn in the program for several of their courses. The program is in its third year and has had over 20 participants from a wide range of disciplines.

Several departments offer courses that focus on sustainability-related topics ranging from development and ecology to global environmental change. Some of these courses utilize Elon's campus for their research projects to get hands on experience with sustainability issues. In addition, many faculty members include class projects on topics of sustainability even if the entire course is not dedicated to sustainability.

The following recommendations will expand existing efforts and deepen Elon students' knowledge and understanding of sustainability and climate change, which will prove very valuable in our ever changing environment and world.

- Consider the inclusion of sustainability or environmental literacy in the General Education requirements.
- Continue and enhance the Sustainability Faculty Scholars program.
- Investigate the feasibility of a new major in sustainability or sustainability science or studies.

Research

Conducting research is an integral part of the educational experience for many of Elon's students. There is great interest in sustainability and climate change research from both students and faculty. While there are existing efforts in this area, more are expected in the future.

The Center for Environmental Studies was created to provide a regional focus for activities and interests, which meet the environmental needs of the community in the upper Piedmont of North Carolina. The initial work of the Center focused on preservation of the Haw River corridor and development of outdoor recreation opportunities, such as low impact hiking, biking and canoeing. These efforts have provided research opportunities for Elon students.

The Class of 2010 is creating a sustainability research grants fund as its class gift. It will provide funding to students (on a competitive application basis) to conduct sustainability-related research geared

toward advancing the university's sustainability efforts and/or climate change. Specific details of the fund and how it will be distributed are currently being developed.

Elon's Visions Magazine, The World We Live In and The World We Want To Live In, is a faculty-student organized and operated publication, which features the work of Elon University students and student-faculty collaborations. Its content is primarily related to environmental issues.

The following recommendations build upon existing efforts and will facilitate more research in the area of sustainability and climate change.

- Encourage and fund student research projects on campus sustainability issues and/or climate change. Continue and expand the effort started by the Class of 2010 through their class gift.
- Expand the Center for Environmental Studies' sustainability-related research efforts.
- Encourage and support faculty research projects related to issues of sustainability and climate change.
- Create an award for outstanding research in sustainability-related research.

Community Outreach

Elon engages in community outreach involving sustainability and climate change in a number of ways, including educational programs, community partnerships and service projects.

Elon hosts a number of sustainability-related events each year, which are open to the public. There are individual speakers on topics related to climate change and the annual Fall Environmental Forum. The specific topic for the Forum varies year to year but in general it addresses sustainability and issues related to climate change.

The university's Sustainability Web site is a resource for the campus and greater community to learn about sustainable practices and how one can incorporate them into his/her life. Lindner Hall, Elon's first LEED Gold building, is available for community tours to educate them on the benefits of sustainable design and construction. A detailed web site is available for those who cannot visit campus as well as an online video describing the building's sustainable features.

The Town of Elon had a study conducted to identify and prioritize key opportunities for improving the Town of Elon's bicycle, pedestrian and lighting systems over the next 20 years. The resulting plan (Bicycle, Pedestrian and Lighting Plan: An Alternative Transportation Strategy) was adopted by the Town of Elon in the fall of 2008. The university has supported this initiative from the beginning. Efforts to secure funding for the plan are ongoing.

The Kernodle Center for Service Learning provides students with a number of curricular and co-curricular service and educational opportunities in local communities and beyond some of which address issues of sustainability. The Green Team, a group within Elon Volunteers!, specifically addresses environmental stewardship. Elon's Habitat for Humanity chapter builds a home each year for a family in Alamance County.

The Office of Civic Engagement is another entity on campus that demonstrates Elon's strong commitment to preparing students to be global citizens and informed leaders. The Office coordinates and supports a number of programs in the surrounding communities some of which address issues of sustainability.

The following recommendations will strengthen the university's connection with the community and advance sustainability.

- Continue to work with the Town of Elon to implement the Bicycle, Pedestrian and Lighting Plan adopted by the Town in the fall of 2008.
- Continue and enhance sustainability-related programming (speakers, conferences, etc.) designed for the campus and greater community to enhance knowledge and understanding of sustainability and climate change.
- Strengthen and further develop community service opportunities related to climate change and sustainability through the Kernodle Center for Service Learning and Office of Civic Engagement.
- Develop a "Campus Sustainability Guide" accessible from the Sustainability Web site.

Financing Options

This plan will be funded through several mechanisms, such as annual capital project requests for efficiency improvements, third party partnerships for large projects (e.g., renewable energy and campus wide energy efficiency projects) and rebate programs provided by Duke Energy (when applicable). In addition, appropriate grants will be sought and applied for as they become available. It is also recommended that creating a Green or Sustainability Fund dedicated to emission reduction and sustainability projects be investigated. This fund would provide potential donors with an interest in sustainability a clear way to know their donation would be used for such purposes.

Tracking Progress and Future Steps

The progress of this plan will be tracked through Elon's annual GHG emissions inventory. As previously noted, Elon will continue to develop strategies and stay abreast of new technology developments, which could further emission reduction goals. In addition, it will be important to monitor the offsets market and legislative changes as both will impact Elon's path to carbon neutrality. This plan will be reviewed periodically and revised as appropriate to take new technologies, incentives and developments into consideration.