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Appendices / Executive Summary
Introduction

The Clemson University Sustainability Plan

The idea of creating a Sustainability Plan for Clemson University emanates from the institution’s stewardship responsibility. Clemson is a land grant university that has deep and broad ties to the land and environment. From its earliest days, the faculty, staff and students have worked to understand and protect the environment in order to provide knowledge for a growing society. More than ever, Clemson continues this endeavour, even as issues of ever-increasing energy costs, foreign imports and the specter of climate change alter the landscape and the way of life in our community.

In 2007 President Barker, along with more than 600 other Presidents, signed the American College and University Presidents Climate Commitment, joining a coalition of colleges and universities concerned about the impacts of global warming and dedicated to reducing their institutions' greenhouse gas emissions. As a signatory, Clemson University demonstrated its commitment to addressing the issue of climate change, and agreed to reduce and ultimately neutralize its greenhouse gas emissions. The ultimate goal is to operate a “carbon neutral” campus.

Clemson University’s participation in the Presidents Climate Commitment builds upon prior campus work on sustainability and environmental stewardship. Since 1997 there has been significant and broad-based action first through the Sustainable Universities Initiative, and then through the Clemson University Environmental Committee. Many tangible actions developed through these groups have had a lasting effect both on campus and across the state of South Carolina.

One of the critical aspects of the University’s Sustainability Plan is the objective of creating a campus-wide sustainability-conscious culture. To create this culture, Clemson will foster the environment of a Living/Learning Laboratory. The Sustainable Universities Initiative of South Carolina states, “We will have succeeded if we eventually don’t need a program to teach sustainability. It will be so ingrained in our behaviors, curriculum, and operations that we don’t have to think about how to be sustainable — we will simply do what is right as a matter of course.”
The University as a Living/Learning Lab

As Clemson University charts a sustainable path forward, an ideology that balances the environment, economics and social equity will serve as a guide. The concept of the University as a living/learning lab will facilitate study of all aspects of life and learning across campus. Sustainability initiatives will be the natural result of ongoing dialogue. The following principles will serve as filters through which ideas will be sifted:

**Organizing Principles**
Students are the highest priority.

Sustainability is valued. It is not only the right thing to pursue, it is the responsible thing for an institution of higher learning.

Integrated solutions are significantly better than piece-meal approaches.

The University is in the forever business. Strategies have to make sense in the long term, not necessarily next month or next year.

Sustainability will be integrated into every department.

The campus is to provide for social and intellectual interaction. A “place for learning” is an important concept that will be integral to the plan.

The culture and history of the campus is important and will be given appropriate weight in the consideration of carbon neutrality planning.
Sustainability Planning and Implementation

Iterative model
To achieve our sustainability objectives, Clemson will use an iterative process: First we will analyze and formulate our plan; Next we will implement the plan; Next we will assess our implementation; Finally we will adjust our methods based on the assessment and begin the process again.

Campus Community Planning
Sustainability Planning will be considered on a broad scale. Many people should be engaged in the process of developing the plan, because ultimately, if the plan is to be successful the whole community will be affected, and should have a voice in future plans.

Clearinghouse
Planning of sustainable initiatives is not focused on one department or division. Sustainable initiatives will come from all sectors of the institution. The intent is to provide a framework through the sustainability plan that will empower everyone to take steps in the right direction. There will be a method for collecting information on sustainable initiatives through the PCS website.

Milestones
It is important to mark progress along the way to sustainability. We expect to achieve a 20% reduction of energy consumption from baseline 2000 levels by 2020. Clemson’s goals in regard to carbon neutrality are more aggressive than the typical university’s goal to achieve carbon neutrality by 2050.

Clemson will achieve carbon neutrality by 2030.
Sustainability Planning and Implementation

Organization
The President’s Commission on Sustainability (PCS) will function as a facilitator to enable the collaboration of the many groups, organizations, entities and agencies that influence the multitude of sustainability efforts across campus. The Commission consists of members from the many facets of campus life and includes students, faculty and staff. The PCS also calls on ex-officio individuals with specific interests or expertise as need arises.

Additionally, the PCS partners with groups across the Clemson community. The effort to integrate such a cross section of the Clemson Community will help to assure efficient efforts and assist with coordinating and empowering groups across campus to work together for common goals.

These groups include but are not limited to:

<table>
<thead>
<tr>
<th>Students for Environmental Action</th>
<th>Student Affairs</th>
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<tr>
<td>Food from Dirt</td>
<td>Clemson University Facilities</td>
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<td>Solid Green</td>
<td>Net Zero/GE</td>
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<td>Clemson University Environmental Committee</td>
<td>City of Clemson Green Ribbon Committee</td>
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Historical Background

Clemson University’s history and heritage are rooted in sustainability. The University began with a land bequest from Thomas Green Clemson. The early days of Clemson’s history as an agricultural institution mean that the roots of Clemson are deep within the land. It is natural that Clemson’s heritage would be one of appreciation and stewardship of the land and natural resources.

In recent years, Clemson has made quiet progress in sustainability goals, working steadily toward specific goals toward sustainability since 1997.

In 2009 President Barker established the President’s Commission on Sustainability. The PCS is an appointed collection of people from many aspects of campus life - all bonded together with the common intent of leading the campus forward in sustainability for the coming generations. In his charge to the PCS, President Barker reminded members of the agricultural roots of the University and stated that

“The essence of sustainability is within the DNA of Clemson’s ideology.”

Clemson’s Sustainability Plan builds on the long-range Vision, Mission and Goals of the University. Clemson has historically fostered a philosophy of equity and inclusion. Thousands of students from all walks of life have been afforded education, opportunity and a possibility to change the world. This is the platform from which all the sustainability efforts are launched.

“We have not inherited the earth from our ancestors; we have borrowed it from our children.”

Kashmiri proverb

“Clemson University will become a model of affordable, fiscally responsible, environmental sustainability for public institutions of higher education.”

— President’s Commission on Sustainability Charter
Education & Research

Vision: Sustainability will be an integral part of the educational experience for all members of the Clemson family, including current students, alumni, faculty, staff, supporters and the people of South Carolina.

Expand educational requirements and opportunities related to sustainability
Currently, Clemson students can choose from dozens of sustainability-related courses in various majors and minors. “Sustainable environment” is one of the university’s eight emphasis areas and researchers are active in fields from renewable energy to green building to sustainable agriculture. Numerous other teaching, research and service activities deal with sustainability without explicitly mentioning it by name.

Despite these efforts, many Clemson students graduate without considering sustainability issues. By signing the Presidents’ Climate Commitment, Clemson has committed to making sustainability part of the curriculum and other educational experiences for all students.

The action items in this section will help the University uphold its commitment and expand it to all members of the Clemson family. These action items include:
- Curricular and co-curricular requirements and opportunities,
- Leadership and outreach; and
- Structure to encourage the cross-disciplinary collaboration that is essential to sustainability education.
Education Strategies

The most direct way to achieve the vision for sustainability education at Clemson is through the classes students take. The action items in curricular requirements and opportunities meet the need for sustainability to be addressed specifically and are also integrated across the curriculum.

1. Implement a series of major-specific courses that address sustainability concepts within the context of Clemson’s fields of study.
2. Include sustainability as a theme in Science, Technology & Society courses.
3. Expand and highlight opportunities to integrate sustainability into other courses or to develop new sustainability-focused courses, concentrating on first and second-year courses that reach a broad audience.
4. Support faculty who incorporate sustainability in their courses.
   - Offer incentive funding for revising courses to include sustainability.
   - Continue and expand Office of Teaching Effectiveness and Innovation workshops in “teaching sustainability across the disciplines.”
   - Offer a faculty support network through a new or rechartered Center or Institute that will focus on sustainable education.

Co-curricular requirements and opportunities
Activities outside of the classroom are typically the most memorable part of students’ college experience. The action items for sustainability education in co-curricular activities are designed to take advantage of this reality.

- Make sustainability an integral part of the service requirement for undergraduate students.
- Expand collaboration with the administrative side of Clemson on issues related to sustainability. For example, engage student teams to perform energy audits.
- Expand collaboration with facilities at Clemson as part of the CURIOUS (Clemson University Initiative for Our Undergraduate Students) campus initiative.
- Continue and expand the number of Creative Inquiry Teams undertaking intensive, discovery-oriented approaches to learning.
Education Strategies, cont’d

**Leadership and outreach**

To limit sustainability education to our campus is to ignore the global scope of the problems we are trying to address through sustainability. The action items for leadership and outreach in sustainability education are designed to reach Clemson alumni and supporters as well as the people of South Carolina, the United States and the world.

- Make classes with a sustainability theme available online for free (through a proposed Institute for Sustainability Education).
- Offer a network of speakers on various issues related to sustainability for free to any organization in South Carolina (through a Center or Institute for Sustainability Education).
- Offer courses through continuing education on various issues related to sustainability.

**Structure to encourage collaboration**

Sustainability education requires an understanding of issues that stretch across traditional disciplinary boundaries. The action items in this section will help encourage the collaboration that is essential for a balanced view of these issues.

1. Funding to enable faculty collaboration
   - Provide incentives for developing new sustainability-themed courses to co-teach with faculty across departments.
2. Faculty evaluation of work
   - Give enhanced/special recognition in annual evaluations for interdisciplinary education activities (e.g. mentoring students outside the home department; course offerings that attract students from other disciplines; and supporting students outside the home discipline.)
3. New faculty positions
   - Commit to interdisciplinary position descriptions.
   - Form search committees composed of half members from outside the main department.
4. Formal Memorandum of Understanding across departments/colleges to track and exchange co-teaching and cross-enrollment. For example, develop a course of study that integrates classroom, research and internship experiences.
Energy & Environment

Carbon Neutrality Plan

Vision
Clemson University will become carbon neutral by 2030.

Overview
This carbon neutrality plan is a broad umbrella touching every aspect of life at the University. Whether it is how the grass is fertilized, how we travel, construct buildings, or turn on the lights, it is encompassed by this plan. This plan shows how the University can become carbon neutral through initiatives in six major areas:

- Carbon-free energy sources
- Energy system efficiency
- Building energy efficiency
- Transportation energy efficiency
- Conservation/Resource Management/Waste Elimination
- Carbon offsets

Within these areas, carbon neutrality will require a series of more than 20 major initiatives, each with multiple sub-activities. These include changes to major infrastructure, building systems, commuter behavior, forest management, and many others.

The plan is aggressive. It shows how the University eliminates or offsets more than 150,000 tons of carbon emissions in one generation while allowing for growth and change of the institution. Clearly, there will be significant hurdles to clear in order to achieve the plan goals, but it can be done.

Approximately 75% of the University’s greenhouse gas emissions are generated either through purchased electricity or on-campus stationary sources like buildings. This makes the issue of energy the single most important subject regarding carbon emissions for the University. Both the source of energy and how it is used must be addressed. Getting to neutrality by using 100% renewable energy is certainly a strategy worth considering, but not an optimal solution economically. The actual solution will be much more involved and complex. We will think strategically and in terms of years and decades to effect sustainable change on the scale that we project.
Living / Learning Laboratory

Clemson University is committed to the idea that we will transform the University’s main campus into a model of energy sustainability: a “Net Zero” carbon neutral campus. **Clemson will take a comprehensive approach, partnering with leaders in the energy industry to utilize its campus as a renewable energy and energy efficiency laboratory.** In addition to reducing the University’s net carbon emissions to zero, the long term initiative will engage faculty and students in significant research and educational opportunities and provide corporate partners with innovative solutions, technology testing opportunities and demonstration sites for pilot programs.

Clemson’s utility infrastructure and unique university community environment are an ideal incubator that can be leveraged for the purposes of education, research, and ultimately economic development related to energy production, distribution, efficiency and conservation – while simultaneously meeting the University’s basic utility needs through a long range integrated and comprehensive energy and infrastructure plan focused on our “Net Zero” concept.

To read the white paper identified in the sidebar follow this link:
Carbon Neutrality Plan
Carbon Emissions Inventory & Trend

Clemson University currently emits approximately 150,000 Metric Tons of Carbon equivalent every year. The charts to the right show what sources are contributing to the emissions. The chart below describes how the emissions will trend upward to approximately 225,000 Metric Tons if nothing is done to stop this trend.

**Carbon Emissions in Context**

- One metric ton of CO₂ is equivalent to driving 2,400 miles in a car.
- One metric ton of CO₂ is equivalent to 1/2 ton of coal.
- One metric ton of CO₂ is equivalent to burning a 60 watt compact fluorescent light bulb continuously for 4,800 days.
Carbon Neutrality Plan
Present Condition and Near Term Trend

Even as square footage of buildings continues to rise, the overall emissions are falling since 2007.
Carbon Neutrality Plan
The Big Picture

The big idea is to drive emissions to zero. This will involve a host of initiatives ranging from those that are simple and immediately save money, to those that are complicated and require long-term financial planning. These initiatives are divided into the five broad categories listed to the right and described in more detail in the pages that follow. These initiatives, if all are enacted over a twenty year period, will bring us to our goal of carbon neutrality.
Carbon-free energy sources

Clemson University needs energy to function as a leading education and research institution. Achieving carbon neutrality will require sources of energy that are carbon-free. Clemson currently has a long-range goal of increasing its acquisition of energy from renewable resources by 10% by 2025. Two major efforts will help to drive the use of renewable energy well beyond this level:

Energy Purchased from Duke Energy
Over half of Clemson’s 140,000 metric ton carbon footprint is directly attributable to Duke Energy’s use of coal, gas, and oil energy production. Duke Energy has articulated a plan and is tracking progress towards a major reduction in carbon emissions. In their Sustainability Plan and Progress Report (http://sustainabilityreport.duke-energy.com/downloads/downloads-home.asp), the company describes their plan to cut emissions in half by 2030. This will be done primarily through an increase in the use of nuclear power, and also through a growing use of renewable energy, and through major energy efficiency initiatives.

Redefinition of Energy Sources
Clemson will also pursue opportunities to produce our own carbon-free energy through three primary approaches:
- Determine “big-swing” projects to source renewable/demand-supply at or less than or equal to current prices.
- Evaluate other sourcing alternatives.
- Evaluate possible on-site power generation and/or energy storage options including: combined heat and power (CHP), including microturbines; geothermal heat pump systems (heating and cooling); biofuels; solar thermal and photovoltaics; and energy storage alternatives (batteries and thermal)
Carbon-free energy sources

**Summary Component Plan**

Goal: 100% of University carbon emissions will be from renewable sources or will be offset through local or regional initiatives.

Near Term Actions (1-5 years)
- Replace Coal fired boilers with carbon neutral alternative
- Phase 1 Net-Zero Energy Initiative implementation

Mid Term Actions (6-10 years)
- Encourage and track Duke Energy’s progress on their plan to reduce carbon emissions.
- Phase 2 Net-Zero Energy Initiative
Energy System Efficiency
Sources of carbon free energy are less plentiful and more expensive than traditional sources of energy. Efficiency is typically the more cost-effective option to reduce carbon emissions. Achieving carbon neutrality will not happen without drastically improving the efficiency with which we manage energy use on campus.

Real Time Energy Management
An effort is underway to ensure a real-time system in-place for Clemson’s entire energy infrastructure. This will enable control & monitoring of the entire campus from a single interface; System access for research purposes; and Data collection aimed at modifying behavior. This system will also serve as a backbone for future utilities/facilities projects.

Alignment of Incentives to Allow Market Mechanisms to Function
We are working to break down barriers to people recognizing the cost of their energy use. For example, departments currently pay a set percentage for energy use, which means they have no financial incentive to reduce energy consumption of their operations. A student-led initiative seeking to address this issue would realign the costs of this energy with the actual use of individual departments.

Summary Component Plan
Goal: Develop a highly efficient energy system that is both smart and interactive.

Near Term Actions (1-5 years)
- Implement real time energy use monitoring.
- Restructure the authority and responsibility for utilities to be close to the source.

“...”
Albert Einstein
Building Energy Efficiency

Existing Buildings
Clemson’s campus is comprised of more than 6,600,000 square feet of academic, research, housing, student life, and athletic spaces. The average age of these facilities is close to 40 years, even considering renovations. This means that the buildings are in large part designed for a different economic and environmental age. When many of the buildings on campus were designed and built, energy costs were a fraction of what they are today and the idea that CO₂ could lead to climate change was not a consideration.

Tremendous energy and cost savings are possible by improving energy efficiency in our existing buildings. To meet the requirements of South Carolina Legislative Bill H4766 which became effective June 11, 2008, a campus-wide Sustainable Energy Policy was approved by the Administrative Council with a goal of reducing energy consumption per gross square foot of building space on average by 1% per year beginning July 1, 2008.

By adhering to this policy, the university’s ultimate goal is to reduce total energy consumption by 20% by 2020 relative to the fiscal year 2000 baseline. Clemson plans to achieve this goal by promoting sustainable energy initiatives designed to lower the consumption of energy on campus. By implementing operational changes, such as installing high efficiency fluorescent lighting in classrooms and facilities.

(Link to “Sustainable Energy Policy”)

Energy Conservation Education
An ongoing effort seeks to reduce energy use on campus by 20% through educating students and faculty on how to reduce their energy use through behavioral changes such as turning off lights, computers and other office equipment.
Building Energy Efficiency, cont’d

New Buildings and Major Renovations
Energy-efficient buildings reduce the amount of energy wasted in buildings through efficient heating, cooling or lighting systems. New buildings and major renovations can also be constructed using less carbon-intensive materials.

Clemson demonstrates its commitment to environmental, economic and social stewardship through building green. Sustainable building includes not only energy use reductions, but also integrates building materials and methods that promote environmental quality, economic vitality and social benefit. A building’s site, water management, energy performance, the materials and resources from which it is constructed, and the indoor environmental quality all play a part in a building being environmentally responsible.

Sustainable Building Policy
Clemson University is a leader in Green Building among universities across the country, implementing a Sustainable Building Policy in March of 2005. The policy makes a clear statement that the University embraces these priorities and will invest in them on every major building project. (see link)

In new construction and major renovations, the University follows the U.S. Green Building Council’s Leadership in Environmental and Energy Design (LEED®) rating system to provide healthy environments for students, faculty, staff and visitors. LEED is a certifying system designed for rating new and existing commercial, institutional, and multi-family residential buildings. Clemson aims to achieve a LEED Silver rating for all newly constructed buildings and large renovations.
Our LEED Certified Buildings

Advanced Materials Research Lab
The AMRL was the first LEED-certified public building in South Carolina. The project is located in the Clemson Research Park and is an 111,000 square foot building housing Clemson’s Center for Optical Materials Science and Engineering Technologies (COMSET). The surrounding area of the building includes more than 20 acres of maintained open/green space. The building also consists of recycled construction materials including ceiling tiles and structural steel. Several other sustainable techniques were used in the project.

Baruch Institute
This project includes the construction of a new state of the art office/classroom building for natural resources research at Hobcaw Barony and the renovation of the existing facility. The renovation phase of the project will include improvements to the existing structure including the two laboratories. This renovation will accommodate two new researchers and several additional graduate students and doctoral candidates.

Fraternity Quad
The Fraternity Quad maintains the rich architectural traditions of Clemson while embracing a green building commitment. Originally built as barracks in 1935, the quad dormitories were later designed for some of Clemson’s fraternities. After two years of renovations, the quad reopened and achieved LEED-certification at the Silver level. To see more on how this project obtained LEED silver certification, please visit the Fraternity Quad project page.

Graduate Engineering Center
This project consists of approximately 90,000 square feet of office and lab space housing the graduate program in automotive engineering. It is located on the CU-ICAR campus. The project achieves LEED Silver Certification.
Our LEED Certified Buildings, cont’d

**CU-ICAR Parking Structure / Office**
The center is a model for sustainable, economic development that minimizes environmental impact and that seeks to restore and balance the environmental resources of the site. Several sustainability approaches are used and planned for this project, and it has achieved LEED Gold certification. These approaches can be found at the ICAR project page.

**Packaging Science Building**
This project includes approximately 28,000 square feet of space housing components of the Packaging Science and Graphic Communications departments. The building has three levels and is located immediately south of the Fluor Daniel Engineering Innovation Center. The facility houses studios, labs and offices that will regularly serve up to 500 students every year.

**Rowing Facility**
A 10,000 square foot rowing facility was constructed on East Bank with a workout area, athletic training room, and offices and meeting areas. This new facility, the on-campus training center, Lake Hartwell and the racecourse are major draws for recruits.

**Sandhill Conference Center**
The Sandhill master plan represents an evolutionary step for the Extension movement, which helped transform agriculture in South Carolina over the last century. By engaging the university, the global research community and the public in a worthy cause - creating a better South Carolina through education, interdisciplinary collaboration, stewardship and communication - Sandhill will promote sustainability as a basic value, ethic and strategy, with relevant applications for responsible economic and community growth.
Building Energy Efficiency

Summary Component Plan

Goal: Reduce energy consumption by 20% by 2020 and by 40% by 2030.

Near Term Actions (1-5 years)
- Increase the minimum energy efficiency of new buildings to include a minimum requirement of 60% of all LEED energy points.
- Implement Phase 1 Net Zero Energy Initiative

Mid Term Actions (6-10 years)
- Initiate continuous/retro commissioning for all buildings.
- Initiate annual infrared flyover and develop energy projects based on reports.
- Require all new buildings to be “carbon neutral”.
- Implement Phase 2 Net Zero Energy Initiative
Transportation Energy Efficiency
At the root of sustainability for transportation are options, such as choice of route and choice of mode. This plan optimizes the number of options for moving people and goods efficiently, economically and safely. The plan establishes a balance and will utilize Travel Demand Management (TDM) methodology.

Travel Demand Management Priorities
The Parking and Transportation Master Plan acknowledges the need to limit or reduce auto dependence and encourage the use of alternative transportation alternatives through a coordinated and fully-supported TDM program. Within that plan, a wide range of TDM programs and activities are recommended to help reduce single occupancy vehicle travel. It is recommended that many of these programs be introduced to the university community in a phased approach over several years to help build support and momentum for the overall program. TDM is a relatively new concept for many within the university community, and will require proper marketing and communication to ensure success.

The most critical step to be taken by the University is to broaden the responsibilities of Parking Services to include TDM Services. The expanded Transportation Services Department will house the TDM program, transit coordination, fleet services, and parking enforcement. Including the TDM program in an overall transportation services department facilitates coordination and cooperation among parking, transit, and alternative transportation. This expanded department must be staffed by capable professionals able to champion these new transportation alternatives and effectively market them to a community that is relatively unfamiliar with TDM best practices. Once in place, this new department must explore grant opportunities and both internal and external revenue sources to help advance the strategies critical for success.
Transportation Energy Efficiency, cont’d

**Develop support system to accommodate and promote increased ride-sharing to and from campus.**
- Explore and invest in web-based rideshare program to facilitate increased carpool/vanpool opportunities. A growing number of rideshare software options including ZimRide, GoLoco, Avego, and others are being employed on campuses nationwide. Clemson University must invest in such software to accommodate both planned and ‘on-the-fly’ ridesharing.
- Expand incentives to increase participation in carpools/vanpools. Offer preferred parking, reduced parking permit fees, expanded guaranteed ride home program, vanpool subsidies, etc.
- Improve efforts to communicate rideshare incentives and benefits. The university must use websites, email campaigns, and other marketing techniques to communicate the financial and environmental benefits of ride-sharing.

**Implement a parking management plan that encourages greater use of transit or TDM (Transit Demand Management) programs.**
- Explore fee structures that discourage SOV travel by making HOV travel more convenient and less expensive.
- Consider proximity-based parking fee structure that increases fees for single-occupancy vehicles parked in preferred, core campus parking lots.
- Explore methods to reduce SOV travel for major event parking – develop park-and-ride lots supported by transit, coordinate event-specific rideshare programs, etc.

**Develop incentives and opportunities to bike or walk to campus.**
- Improve infrastructure to encourage cycling or walking to, from, around campus. Continue to seek grant funding opportunities to facilitate infrastructure improvements such as bike lanes, pedestrian pathways, bike lockers, bike racks, etc.
- Develop and promote cycling incentive programs such as zero-interest bicycle loan programs or bike share programs.
Transportation Energy Efficiency, cont’d

Consider implementation of a compressed work week/class schedule or
- Explore options and determine feasibility of reducing vehicle trips by compressing the work week/class schedule within 4 days.
- Develop the IT infrastructure necessary to make telecommuting, web conferencing, or distance learning more accessible to reduce travel needs.

Develop and implement a plan that will limit on campus parking
- Explore elimination of freshman parking
- Explore limitation of sophomore parking to only those living on campus

University Fleet/Service Vehicles – GHG (Green house Gas) Reduction Strategies
- Phase out fuel-inefficient vehicles and replace with compact, hybrid, or more fuel-efficient vehicles when feasible.
- Provide a more robust range of options to accommodate group travel.
- Encourage the conversion of transit fleet vehicles to more fuel-efficient or alternative fuel vehicles.

Clemson’s CAT Bus lines are free to all students and members of the surrounding communities. The Routes provide transportation connectivity to Tri-County Technical College, Anderson University, Southern Wesleyan University as well as nearby communities of Clemson, Pendleton, Central, Anderson and Seneca.
Transportation Energy Efficiency, cont’d

Air Travel
A significant portion of Clemson University’s carbon emissions are generated by airline travel. Two strategies will be implemented to address this:

Increase the availability and use of virtual meetings and teleconferences through better technology and management in existing facilities and through new facilities that may come on line.

Purchase carbon offset credits with every airline ticket so that offsets and carbon emissions are balanced with each other.

Summary Component Plan
Goal: Reduce commuting on campus by 25% by 2020 and 50% by 2030.

Near Term Actions (1-5 years)
- Implement a Transportation Demand Management program
- Begin a process to engrain the idea that telecommuting is a viable option
- Identify and implement a project that will advance the pedestrian campus idea.
- Limit and reduce the amount of parking on campus.
- Begin a process to fully offset Airline travel

Mid Term Actions (6-10 years)
- Fuel Mix – 80% reduction of bus fleet emissions
  - i. Phase 1 - Buses & Campus Vehicles run on Biodiesel.
  - ii. Phase 2 – Buses run on Electricity
Carbon Offsets

No matter how well we do in achieving substantial short and long-term energy efficiencies in buildings and transportation and in maximizing the use of renewable energy, we will use carbon offsets of some kind to achieve climate neutrality by our target date.

A carbon offset is a reduction in emissions of carbon or greenhouse gases made in order to compensate for an emission made elsewhere. One carbon offset represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases. Offsets are typically achieved through financial support of projects that reduce the emission of greenhouse gases in the short- or long-term. We will consider supporting the following types of offset projects.

Renewable energy
Renewable energy offsets commonly include wind power, solar power, hydroelectric power and biofuel. Some of these offsets are used to reduce the cost differential between renewable and conventional energy production, increasing the commercial viability of a choice to use renewable energy sources.

Energy efficiency
Carbon offsets in this category fund projects such as cogeneration plants, which generate both electricity and heat from the same power source, thus improving upon the energy efficiency of most power plants which waste the energy generated as heat.

Destruction of industrial pollutants
Industrial pollutants such as hydrofluorocarbons (HFCs) and per fluorocarbons (PFCs) have a global warming potential many thousands of times greater than carbon dioxide by volume. Because these pollutants are (relatively) easily captured and destroyed at their source, they present a large and low-cost source of carbon offsets.

Other offsets
Some other potential offset projects include the combustion or containment of methane generated by farm animals (by use of an anaerobic digester), landfills or other industrial waste. Therefore, actions such as the installation of methane digesters at the Starkey Swine Center and other actions at the Farms Operations are also possible. In addition, with the advent of a new wind turbine project at the coast, Clemson will seek out partnering relationships that may enable the University to share the carbon offset credits associated with wind farms.
Carbon Offsets in the Experimental Forest

**Strategy for Carbon Offsets using the Clemson Experimental Forest**

It is estimated that the existing growing stock of wood in the Clemson Experimental Forest exceeds 250,000 tons, which is a credit to the sustainable forest management activities that have occurred throughout the forest over the past 80 years. While this growing stock cannot be used as a carbon offset because it is existing growing stock, the difference between what we grow annually (in terms of tons of carbon) and what we harvest annually (in order to sustain the forest’s many education and research activities) may be used as an offset if we decide to manage part of this ONLY for carbon offset.

Our preliminary data suggest that we are growing on average 1.25 tons of carbon per acre per year. Clemson, with the largest University forest that is contiguous with the campus in the country, is in a unique position to determine the actual difference between this growth and harvest and investigate the potential offset in its overall balance of carbon use. Therefore, we plan to refine and document these numbers using the 50 years of accumulated data. All present and future forest management activities will be evaluated for their sustainability for building a carbon surplus and at the same time providing for the sustainability of the Clemson Experimental Forest’s soils, water resources, wildlife, recreation, educational and research activities.

A forest management plan developed by staff foresters and in concert with the Sustainable Forestry Initiative (with which Clemson is a partner) will ultimately lead to the Clemson Experimental Forest becoming certified as a Sustainable Forest under the Sustainable Forestry Initiative. This plan, in concert with the recently completed natural resource inventory, will assure the overall sustainability of the Clemson Experimental Forest. Part of the plan may involve prescriptions for managing only for carbon offset as a natural product of its forest management.
Carbon Offsets
Summary Component Plan

Goal: Identify and use local or regional offsets to balance University carbon emissions.

Near Term Actions (1-5 years)
   - Policy Review and Modification
   - Focused expert studies
     - Sequestration enhancement planning
     - Identification of additional lands for forestry or other sequestration material.
   - Investment in offset strategies or Renewable Energy Credits

Mid Term Actions (6-10 years)
   - Continue to implement sequestration plan
   - Identify regional renewable energy projects for investigation and review.
Conservation, Resource Management and Waste Elimination

Clemson purchases food from 22 local sources, and makes its own bread and dairy products. Meat and organic produce come from an on-campus farm.

Post-consumer food scraps from two dining halls become compost daily. Removal of trays reduced water consumption by 1,814,800 gallons in 08/09. Food management software ensures that food production matches demand. New composting equipment will recycle 1500 pounds of food waste from two dining facilities daily.

An end-of-year move-out program diverts students’ unwanted goods from the waste stream.

The Recycling Program takes 26% of regular materials out of the campus waste stream.
Conservation, Resource Management and Waste Elimination, cont’d

Solid Waste in Landfills Reduction By Maximizing Sustainable Diversion Methods

Americans spend millions of dollars each year mining, harvesting, manufacturing, shipping and selling materials designed to be thrown away. The entire consumer model is based on a model of consumption and the most aggressive economic plans call for an acceleration of consumption as means of stimulating the world economy. The entire convenience driven, disposable products marketing plan is contrary to sustainability.

At Clemson University, we understand that to build a Sustainable Campus, we need to do more than look at our energy consumption. We need to take a fresh look at everything we purchase and determine if it is the best choice for us. Sometimes the lowest price has a hidden cost that must be considered. We have learned that to build a building to be energy efficient may cost a little more during construction, but rewards are reaped for many years to come. That is true in other purchases as well from writing instruments to paper, from vehicles to fuel types and from food to computers.

The University will develop a culture of procurement that asks the important questions and seeks ways to reduce our waste from packaging reduction to life-cycle cost comparisons. What is no longer needed will be reused as a first choice, recycled where possible, researched for alternative energy as the final means of diversion and only buried when necessary.
Strategies to Expand Recycling Efforts

Develop a “Bring Your Own Cup” (BYOC) strategy in our dining halls and meeting rooms.
Expand “Trayless” dining program
- We will convert the remaining dining halls to a plate only dining experience.
- We will market to both current and prospective students the sustainable choice of this program.

Develop a “Need it – Use it” program for office supplies
- Collect unneeded items from across the campus to a convenient location to be shopped by departments.
- Market the program and include incentives for departments to participate.

Expand recycling in all the buildings
Implement current student pilot program removing trash cans from class rooms and offices while retaining the quality of spaces in campus buildings.
- Market the sustainability value of the program.
- Treat all paper documents as secure documents requiring destruction / recycling and prohibiting throwing in waste cans.
- Provide incentives for innovative ways to increase recycling rate.
- Set a goal of 75% recycling rate by 2020.

Enforce the Construction & Demolition recycling plan on all projects.
Raise the goal to 100% recycling rate with 75% as the minimum.

Increase research in composting of food waste.
- Integrate in-vessel compost program with class studies.
- Integrate mushroom compost research with on-campus composting.

Research alternative energy as a means of diverting material not recyclable or compostable.

Bury only the items that cannot be managed by one of the other methods.
Culture & Leadership

As one of this nation’s top Public Universities, with particular emphasis on the sciences, engineering and economic development, Clemson University has both the capability and the obligation to help develop a sustainable world through:
1. the education of its students (future decision makers and citizens),
2. cutting edge research,
3. outreach beyond the campus,
4. developing a campus culture of conservation and green decisions, and
5. establishing world leadership in a Green Economy.

As stated in a recent Clemson white paper on Clean Energy:
“It is not only appropriate for Clemson to be involved in the development of the green economy, it is mandatory.”

We recognize that this process will not be easy or quick. For too many years, energy has been too cheap, life styles too carefree, and the environment too neglected. However, one of the best organizations to initiate change is a university. It is here that young people learn the way in which the world works, and where they establish their adult life style. It is here that bright minds produce new ideas and it is here that educators can seek to interface with the world beyond the campus.

Clemson is already a leader in many areas of sustainability.

In the areas of engineering, science and economic development:
- International Center for Automotive Research (CU-iCAR)
- Clemson University International Center for Wind Energy Systems
- Recognition as a Center of Excellence for Watershed Management (by EPA)
- Advanced Materials Center
- Spiro Institute for Entrepreneurial Leadership
- Small Business Development Center
In the area of student development:
- Creative Inquiry program where undergraduate teams solve open ended problems
- Many courses related to sustainability
- Service opportunities for undergraduate students

In campus culture through peer and campus organizations:
- Solid Green campus organization to emphasize sustainable practices
- Clemson Student Chapter of the Wildlife Society
- Tigers for Tigers
- Beyond Carbon
- USGB Youth Student Chapter
- Entomology Club
- Students for a Sustainable Earth
- Creative Inquiry Teams
- C.A.T. Citizen Action Team
- Clemson Student Chapter of the Society of American Foresters
- Clemson Dirt to Food

While this is a good start, it is just the tip of the proverbial iceberg with respect to the efforts outlined in this plan. This comprehensive approach requires the students, faculty and staff of Clemson be committed and involved. It cannot be accomplished through individual efforts, but requires collaboration and cooperation. As a result, Clemson will provide a model of sustainability leadership in the five areas listed above. In addition to the specific goal of carbon neutrality for the University, Clemson will increasingly develop outreach activities to both public and private sectors within South Carolina as well as nationally. The competitive spirit which is ever present at Clemson will serve to drive these accomplishments.
Students for Environmental Action

Among the many student organizations on Clemson's campus, Students for Environmental Action (SEA) has become a leading force. Since 1990, Clemson students have been working on environmental and sustainability issues. When a group of students identify an issue they want to address, and then take the initiative to work on it, great things happen. For the last 20 years, Students for Environmental Action (SEA) has been taking such initiative. Along the way, other student groups have come and gone, but SEA has remained strong and has worked to become the student backbone of sustainability at Clemson.

Today SEA is the largest and most active environmental organization on Clemson's campus. SEA is recognized as critical to the growth of Clemson and its goal to be a top 20 University. Clemson requests SEA members' expertise and influence on many of its committees, currently including:

- Clemson University Environmental Committee
- Tree-Campus USA
- Solid Green
- The President's Commission on Sustainability
- Resident Assistant Green Squad
- Clemson's Education Committee
- Clemson Dirt to Food

SEA believes Clemson is bound together by a culture that nurtures innovation, shared commitment to excellence, collaboration, and by challenging students to enrich their education with active, hands-on involvement in real sustainability issues.

Talking about the student sustainability movement will result in talking about a SEA action groups. Recognizing the ties between health, the environment, education and social justice within the Clemson Community, SEA has taken a directed, intentional approach to a wide range of issues by dividing into action groups.
Other Student Organizations
Many of the most significant sustainability efforts at Clemson have been initiated by student organizations of all sorts.

**Solid Green** is all about taking pride in Clemson’s campus, taking responsibility for keeping it clean and taking action to help sustain the environment for a better future. The goals of Solid Green are to raise awareness of littering on campus, recycling, energy and water conservation and other environmental issues; to promote clean-up activities and other events and to support student groups that promote environmental awareness. In the fall of 2010 Solid Green started its own student club under the same name.

**Clemson Dirt to Food** has a mission to advance a culture of health and sustainability by connecting community members and creating opportunities to experience fresh, locally grown food. Our goal is to create a vibrant local food system that provides the structure needed for members of our community to make healthier and more sustainable food choices.

**Beyond Carbon** was founded in the spring of 2010 and has since then worked with Clemson University toward a quick safe transition away from using coal on campus. Until the day Clemson completely stops funding Appalachian coal mining this group will work hard to make sure students know the problems with coal. This group has found support by becoming its own chapter of the Sierra Student Coalition. Its mission is to work with Clemson in its transition to clean energy sources.

**Earth Day** is a part of Earth Week at Clemson. At the end of the spring semester the campus gets together and celebrates Clemson’s efforts toward sustainability. Students work with others across campus to make this happen.

Farm Aid is an annual benefit festival put on by SEA to raise money and attention to the Clemson University Student Organic Farm. The Farm Aid Fest held in the fall is critical to funding the Stu-
Create a Culture of Healthy, Sustainable Living

There is a clear connection between campus ecology and the health of campus community members. There is also a correlation between the health of our students and their success and wider implications for the overall health of the faculty, staff and community members. If we organize the systems and policies that drive our community in an environmentally, socially and economically sustainable way, we will have a society that is healthier and more socially just. As Anthony Cortese writes in Higher Education’s True Role: Creating a Healthy, Just and Sustainably Society, “Higher education leaders...recognize that education for and practicing how to achieve a healthy, just and sustainable society are critical to meeting higher education’s social responsibility of providing the knowledge and educated citizenry for a thriving civil society.”

It is imperative that we address the ecology of the community as a whole and evaluate what is conducive to or counter to our overall health. Using this framework gives us the support needed to look at all facets of the very complex issue of health, it challenges all of us to look at these problems not just on our campus but from a global perspective as well. It asks that we improve upon our change agent skills and to put those skills to positive use. It means that we examine our own values and evaluate whether or not we are living in congruence with those values. It forces us to think about complex systems, interrelationships, unexpected consequences and then to imagine innovative solutions that will make our world a better place.

Vision

Clemson University will be optimally and sustainably organized to support, strengthen and enhance a culture of health and sustainability enabling all members of the campus community to achieve, learn and serve. These strategies will not only improve the health of the campus population, they will reduce our carbon footprint.
Strategies
Create social and physical environments that promote health, safety and learning
- Assess the feasibility of a pedestrian only campus.
- Limit on-campus parking.
- Provide more incentives for walking and biking on campus and in the Clemson Forest, including more bike racks and a bike rental or bike share program.
- Reduce toxic chemicals used on all campus grounds.
- Move toward a landscape that favors permaculture.
- Establish policies that require dining services to use a significant percentage of locally and/or organically grown food.
- Assess feasibility of replacing the sale of disposable water-bottles with reusable, free-refill drinking containers.
- Establish stress-management workshops open to all campus community members.
- Work with HR to address health issues among faculty and staff and establish incentives that encourage increased physical activity and healthy diet.
- Emphasize student use of the Clemson Experimental Forest.
Expand innovative civic engagement and leadership opportunities and establish Service Requirements related to Sustainability

Clemson University has a rich tradition of civic engagement. Whether through community service, philanthropy or advocacy activities, Clemson values service to others. Requiring all students to participate in a service learning activity will further our already strong commitment to public service and also provide the rich, out-of-the-classroom experiences that lead to the deep learning that makes a lifelong impact. To make these experiences as meaningful as possible, they will be integrated into other aspects of campus life, either by being a part of introductory level courses within majors, part of other leadership and global citizenry workshops or campus-wide service programs. This will ensure that faculty and staff are actively involved in the process, including the documentation and verification of the experience, and will include them as reflection facilitators so that the entire campus community will benefit from the learning and insight that result from such experiences.

Vision
*Sustainability Service Learning will be an integral part of the educational experience for students, faculty, staff and alumni.*

Strategies for civic engagement and leadership
- Establish Eco-Rep program to provide peer-delivered sustainability education campus-wide.
- Create research apprenticeships and internships for graduate and undergraduate students in the Institute for Sustainability Education.
- Expand support for student organizations related to sustainability.

Strategies for service requirement
- Establish a Day of Service for the entire campus to include students, faculty, staff, and alumni to address an environmental issue within the campus and surrounding community.
- Weave service learning components into introductory level courses so that they may be verified and evaluated within the context of a course within a student’s major.
- Incorporate service experiences into the e-portfolio requirement.
- Build upon service learning opportunities already available so that students may continue to pursue service activities related to sustainability.
- Establish a system that is in place and ready respond quickly to natural disasters such as the BP Oil spill.
• Engage alumni in the process by providing a framework and guidance for how to establish sustainability related service activities in their hometown or workplace.
• Engage the athletic department to harness the competitive spirit associated with college sports to establish sustainability service competitions during sporting events.

Sustainability-focused Living-Learning Community
By signing the College and University Presidents’ Climate Commitment, we have committed ourselves to making sustainability an integral part of the educational experience for all Clemson students. A sustainability-focused Living-learning community creates a unique experiential learning opportunity for community members to deepen their understanding of social, economic and environmental sustainability. Members will also develop the skills to become leaders for intergenerational equity and to drive sustainability efforts on the Clemson campus. Clemson’s Sustainability Living-learning community will launch Fall 2011.

Goals
To prepare our students to be leaders, innovators and responsible global citizens, Clemson University includes sustainability as an academic emphasis area. Accordingly, the Sustainability Living-learning community provides a residential experience based on the concept of sustainability. Participants, representing Clemson’s diverse student body, will learn how principles of economic, social, and environmental sustainability apply in contexts ranging from personal lifestyle choices, to the structure of the built environment, to the operation of public and private institutions. Participants will also develop and practice skills to act as agents of change in the University and the broader community.
Learning outcomes
Student Learning Outcomes Based on American College Personnel Association’s (ACPA) Sustainability Task force, 2006.
1. Each student will be able to define sustainability.
2. Each student will be able to explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability.
3. Each student will be able to utilize their knowledge of sustainability to change their daily habits and consumer mentality.
4. Each student will be able to explain how systems are interrelated.
5. Each student will learn change agent skills.
6. Each student will learn how to apply concepts of sustainability to their campus and community by engaging in the challenges and solutions of sustainability on their campus.
7. Each student will learn how to apply concepts of sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.
Facilitate Community Development (PSA)
Financing the Plan

Financing Clemson’s Sustainability Plan will require creative networking on large and small levels; strategic efforts will be required to embrace local, regional and global partners. As we move forward, each mechanism will be evaluated for its appropriate relationships to the fundamental vision that is Clemson.

- Among the mechanisms that will be utilized, as appropriate, include:
  - Cost savings resulting from conservation efforts
  - Grant funding through Federal and State sources
  - Private Sector Endowments
  - Entrepreneurial possibilities
  - Revenue sharing as a result of Green Industry public/private partnerships
  - Revolving Loan Pools

Some proposed initiatives and activities will have little or no cost. These will be pursued enthusiastically and immediately.
Conclusion

The issues of sustainability touch everyone. The issues related to sustainability are infinitely large as well as infinitely small; and these issues affect all areas of life and living – on and off campus.

As Clemson makes plans for its sustainability future, we do so with a sense of our place in the world as a leading education and research institution. We are aware of our responsibility to take a place of leadership in education and culture for our community, state, nation and the world. As we do so, we recognize our interdependence on the greater global community.

We make these plans at this particular “place” in history, and that this “place” is limited by our geographic, cultural, technological and philosophical landscape. But, this current paradigm in which we function frames only the present; not the future. As Clemson moves forward in resolving our sustainability issues, we will be constrained only by the limits of our imagination. As Albert Einstein said, “imagination is more important than knowledge”.

Clemson has been long on the path of solving sustainability issues. But we have only begun to imagine how we may resolve so many of the environmental, economical, and societal issues we face in making decisions that shape a sustainable future. And we have only begun to learn how we will work together across disciplines, across cultures, and across continents to find solutions.

We recognize that we are working with the knowledge base we have available to us at this point in history, and that in some senses it is a best guess at the future. As we look to the issues concerning sustainability, we are confronted with the reality that how we plan use of resources will have ramifications for generations to come. We are aware that new technologies of which we have not yet dreamed could be developed. And, we are aware of the requirement for patience as we implement changes and find solutions to problems that have been created over a long period of time.

It is our aim to conscientiously and responsibly be united as One Clemson in moving forward with this Sustainability Plan, considering the lives and futures of our children and grandchildren.

“We did not inherit the world from our ancestors.
We borrowed it from our children.”
Appendix