

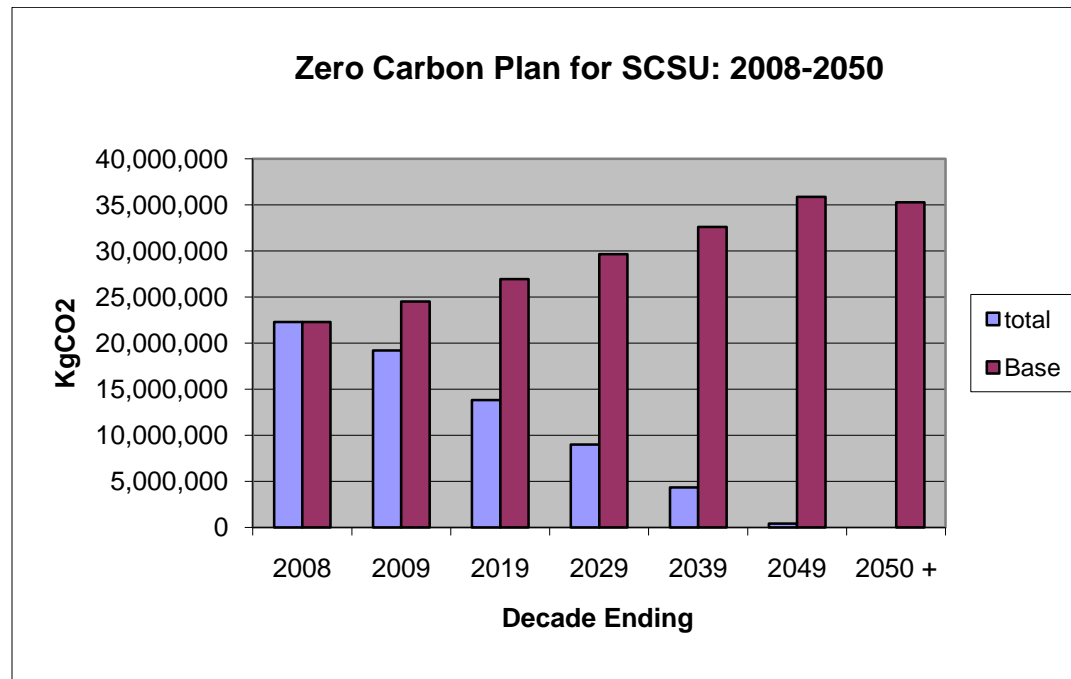


Southern Connecticut  
State University

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# Achieving Climate Neutrality: Foundations for a Sustainable Future

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# Achieving Climate Neutrality: Foundations for a Sustainable Future at Southern Connecticut State University

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## I. Introduction

## II. SCSU’s Commitment to Climate Neutrality

### Before the Presidents Climate Commitment

- Campus Profile ..... 5
- Overall Growth in Building Square Footage..... 6
- SCSU Early Efficiency Upgrades..... 10
- The Partnership with ECSU’s Institute for Sustainable Energy ..... 10
- The Green Campus Initiative..... 11

### The Formalized Commitment: An Overview

- The Presidents Climate Commitment ..... 12
- Methods of Reporting ..... 13
- *CSU 2020*: Funding Energy Efficiency and Renewable Energy Production ..... 14
- The Current Budget Crisis and the Presidents Climate Commitment ..... 15

### III. Achieving Climate Neutrality:

#### The Physical Plant: Greenhouse Gas Emissions at SCSU

- Overview and Interim Targets ..... 16
- Energy Use Profile 2000-2008..... 17
- CO<sub>2</sub>e Emissions per Square Foot..... 18
- Total Carbon Emissions by Energy Sector..... 19
- Energy Consumption at SCSU by Sector..... 20
- Planned Greenhouse Gas Emission Reductions at SCSU..... 23
- Decade Carbon Reduction Summary..... 25

#### IV. 2009- 2050: Building a Culture of Conservation

- Curriculum and Research..... 33
- Administrative Structure..... 35
- Recycling and Solid Waste Reduction..... 37
- Community Conservation..... 40

#### V. Conclusion

- Using the Climate Action Plan as a Community Tool..... 41
- Acknowledgements..... 42

## I. Introduction

Southern Connecticut State University recognizes the urgency of global warming, the catastrophic costs of inaction, and the pressing risks of delaying ambitious pursuit of implementing solutions. In signing the American College and University Presidents Climate Commitment in September of 2007, President Cheryl Norton pledged on behalf of the entire SCSU community to join a cooperative and collaborative effort by more than 630 institutions of higher learning in the United States and Canada to assume a leadership role in strategically establishing a clean energy future to stem the worst effects of global warming. SCSU recognizes that effective solutions already exist, and that supporting emerging clean energy markets and investing university resources and research in further development of clean energy technology is both a responsibility of the university and a practical means toward ensuring a healthy future. Colleges and universities play a societal role that is uniquely suited to facilitating the widespread societal reform needed to curb global warming. Institutions of higher learning serve as critical centers of workforce training, of unbiased research in all academic disciplines with access to cutting edge equipment, and as a gathering place of young adults making important decisions about shaping their perspectives and beliefs about the world around them and their roles in it. Finally, colleges and universities as physical entities have the needed critical mass to impact markets. Collectively, these institutions are large enough to influence markets and create change through purchasing power and through a unified call for action.

The Union of Concerned Scientists writes that “no region can expect a costless adaptation to a rapidly changing climate.”<sup>1</sup> However, by assuming a leadership role in helping catalyze sweeping changes needed in the energy economy, SCSU is underwriting a legacy of sustainability for present and future generations which twenty years from now will appear to be a comparative bargain. The return on investments, the least of which is money, is limitless, while the costs associated with delay are potentially catastrophic. The following pages

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<sup>1</sup> [ucsusa.org/global\\_warming/solutions](http://ucsusa.org/global_warming/solutions)

outline SCSU's commitment to climate neutrality—zero net greenhouse gas emissions—as soon as possible or by 2050 at the latest. SCSU has developed an ambitious range of short-term emission reduction strategies to be carried forth by 2020. We have also developed long-range reduction targets and strategies which can be met only through building community infrastructure now which will be needed in coming decades to sustain broad investment of university resources in renewable energies, efficient facilities, and the development of sustainability as a core of academic curricula and university life.

## II. Southern Connecticut State University's Commitment to Climate Neutrality

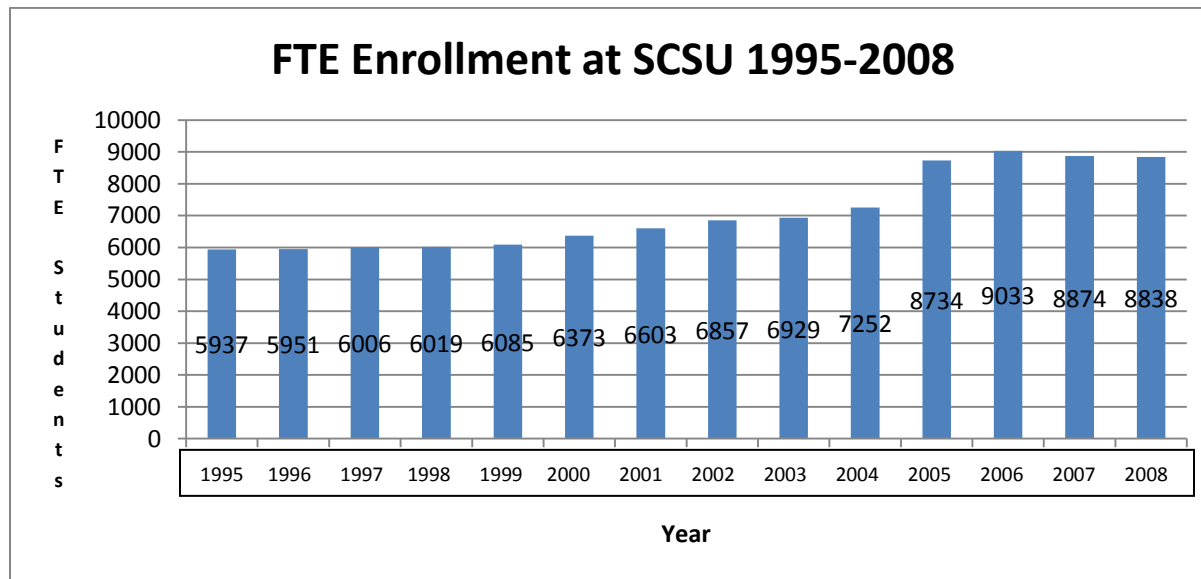
### Campus Profile

Southern Connecticut State University is one of four comprehensive universities in the Connecticut State University System (CSU), the largest public university system in Connecticut. With a total population of more than 36,000 students, Southern, Central, Eastern, and Western Connecticut State Universities offer graduate and undergraduate programs in more than 160 subject areas.

SCSU was founded in 1893 as a two-year teachers' training normal school and has maintained its ties to shaping public education in the state of Connecticut ever since. Southern is well known for its high-quality teacher certification and masters programs in education. Located in New Haven, Southern is an urban



coeducational institution offering 116 undergraduate and graduate degree programs in the full range of academic and professional disciplines. Courses are available full time, part time, and online. Southern boasts a wide range of internships and research opportunities, a highly qualified faculty, and a dynamic campus life. In 2008, a total of 8,841 full time equivalent students enrolled. The chart below shows demographic information and growth in Southern’s population and enrollment over the last thirteen years. The sharp increase in full time enrolled students between 2004 and 2006 coincides with a square footage increase in facilities. Since the 2006 peak, enrollment has dipped slightly.



### Overall Growth in Facilities Square Footage

Over the last twenty years, the campus has grown from 1.2 million square feet of facilities to over 2.5 million square feet in 2008. The campus, covering 172 acres, has expanded around Beaverdale Memorial Park and lies adjacent to a wetland nature preserve. The SCSU campus currently includes nine residence halls, community gathering places including one central dining hall, one student center, one library, one field house/ athletic complex, and one arts center. There are six classroom buildings including one laboratory science building, and administrative buildings, warehouses, and student service buildings. There are four major parking lots throughout campus, numerous smaller lots, and two parking garages.



**Southern Connecticut  
State University Campus:**

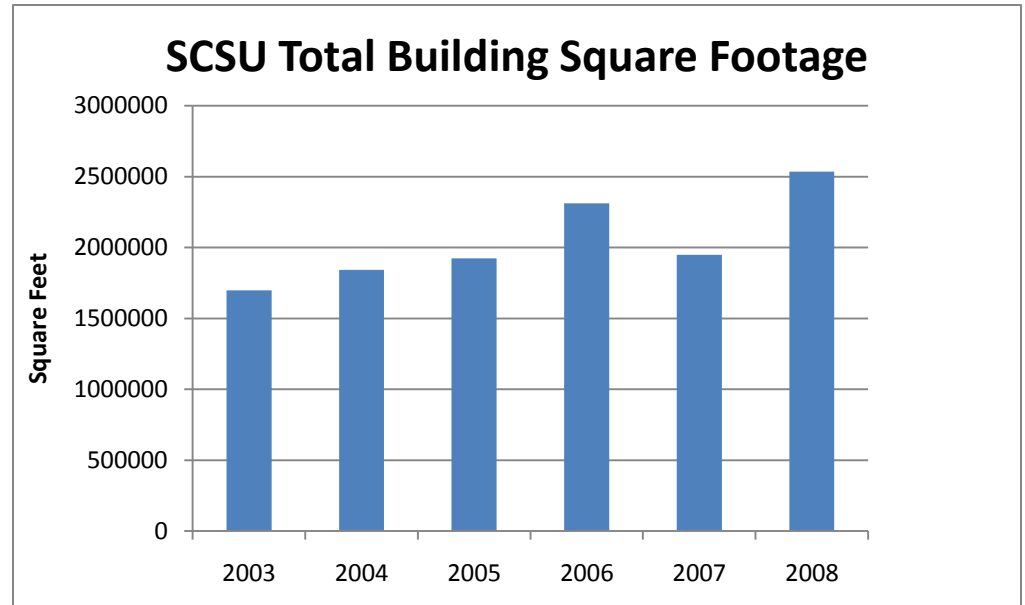
- East Campus**
- 1 Facilities Operations
  - 2 Nursing Classroom Building
  - 3 Davis Hall
  - 4 Parking Garage - Rich Street
  - 5 Felt Gymnasium
  - 6 TE-7 - Temporary Building 7
  - 7 Jennings Hall
  - 8 Merrill Hall
  - 9 Seabury Hall
  - 10 TE-B - Classroom Building B
  - 11 Former Student Center
  - 12 Engleman Hall
  - 13 Bulky Library
  - 14 Lyman Center for the Performing Arts
  - 15 Earl Hall
  - 16 Adair Student Center
- West Campus**
- 17 Connecticut Hall - Food Service
  - 18 Schwartz Hall - Residence Hall and Housing Office
  - 19 Ethnic Heritage Center
  - 20 Admissions House
  - 21 Lang House - Department of Social Work
  - 22 Orlando House - Department of Public Health
  - 23 Brownell Hall - Residence Hall
  - 24 Farrham Hall - Residence Hall
  - 25 Wilkinson Hall - Residence Hall
  - 26 Chase Hall - Residence Hall
  - 27 Parking Garage - West Campus
  - 28 Hickerson Hall - Residence Hall
  - 29 Neff Hall - Residence Hall
  - 30 West Campus Residence Complex
  - 31 University Police and Granoff Student Health Center
  - 32 Office Building 1
  - 33 TE-6 - Temporary Building 6
- North Campus**
- 34 Energy Center
  - 35 Moores Field House
  - 36 Wintergreen Building
  - 37 Jess Dow Field
  - 38 North Campus Residence Complex

**Parking Information:**  
 Carregille parked on campus must have a current SCSU Parking Permit. Visitors to the campus must obtain a visitor pass at the University Police Department prior to parking. Specific instructions are contained in the Campus Parking and Traffic Regulations.

-  Faculty and Staff Parking
-  Commuter Students Parking
-  Residence Hall Students Parking
-  Bus to off-campus parking at the St. Whitney Regional Vocational School
-  Shuttle Bus Stop
-  Municipal Bus Stop
-  Emergency Phone

As shown in the chart at the right, growth in SCSU's square footage accelerated rapidly starting in 2003, and has continued ever since. In 2008, Southern's total building square footage was 2,535,501 square feet. Much of this facilities expansion predates the Presidents Climate Commitment but coincides with Southern's initial Green Campus Initiative, an institutional dedication to energy efficiency and reduction of the university's environmental footprint.

The coming decade will be characterized by continued significant expansion of facilities and square footage, major improvements in energy efficiency to decrease overall demand, the introduction of on-site renewable energy production, and the demolition/ deconstruction of the oldest, least efficient buildings on campus.



## Early Efficiency Upgrades

Three of Southern's most important improvements to energy efficiency predate the Presidents Climate Commitment. First, in late 2003, a new **Campus Energy Center** was commissioned to replace the outdated central power plant. The Energy Center houses a high temperature forced hot water system which now heats most buildings on campus. While cogeneration of electricity and heating is not possible with this system, SCSU chose it for its high efficiency, relative simplicity, and low maintenance requirements. Over time, energy loss due to difficulty of upkeep will be significantly lower with this type of system, and because this system is a closed loop with minimal energy loss, it is 40% more efficient than the old system. At the same time the Energy Center was built, the underground distribution system was replaced, minimizing heat loss due to faulty pipes.



Second, in 2004, the 140,000 square-foot **West Campus Dormitory** was constructed to meet LEED Silver standards, becoming the first state-owned building to do so. Third, Southern constructed a highly efficient Facility Operations Building in 2001 which features a **Direct Digital Control (DDC)** automation system to centrally monitor and manage heating, ventilation, and cooling (HVAC) on campus. This system has capabilities to manage energy use on a building-by-building basis. It enables proactive evaluation of completed energy efficiency and conservation projects, and allows Facility Maintenance to identify and respond to problems.

## The Partnership with Eastern Connecticut State University's Institute for Sustainable Energy

In 2005, Connecticut's Governor M. Jodi Rell requested that all State of Connecticut agencies and organizations identify short-term strategies to reduce energy costs and develop long-range plans to reduce energy consumption. Since the time of the Governor's request, Southern's Sustainable Climate Committee has partnered with Eastern



Connecticut State University's Institute for Sustainable Energy (ISE) to review campus expansion initiatives, determine the relative efficiency of existing buildings, and to draft short- and long- term energy related conservation and sustainability plans. After President Norton signed the PCC, ISE has collaborated with Southern to inventory Southern's greenhouse gas emissions and to develop this Climate Action Plan. ISE Director William Leahy also oversaw the collection of the data needed to compile campus CO<sub>2</sub>e emissions inventories, and was aided by student interns from ISE and from Southern.

## The Green Campus Initiative

In the summer of 2005, with the support of ISE, SCSU management adopted a Conservation Charter calling for the establishment of a Green Campus Committee. The Conservation Charter Statement of Commitment is as follows:

*SCSU is committed to developing and maintaining a sustainable and energy conservation/ environmentally responsible mode of operation, within the context of its educational mission, fiscal constraints, and responsibilities to students, faculty, staff, alumni, and the local community. SCSU's commitment to energy/ environmental responsibility is intended both to educate the SCSU community about energy conservation /environmental issues and to minimize the university's adverse impact on the environment.*

(Conservation Charter, 2005)

This committee was renamed the Sustainable Climate Committee after President Norton signed the PCC in September 2007. Comprised of twelve to sixteen members from across the university community, the Sustainable Climate Committee now meets once a month throughout the academic year and is chaired by Executive Vice President of Financial Affairs James Blake and Associate Vice President for Facility Operations and Capital Budget Robert Sheeley. Committee members include the Recycling Director, the Department Chair of Science Education and Environmental Studies, a senior faculty member from the Department of Geography and Urban Studies, several students,

and representatives from Public Affairs, Purchasing, Student Affairs, and the Office of Information Technology. The Sustainable Climate Committee has continued its partnership with ISE to annually audit SCSU's greenhouse gas emissions, to conduct and analyze a walk-through of campus buildings to identify efficiency needs, and to strategically prioritize energy efficiency installations and retrofits in renovations and new construction throughout campus. These analyses formed the basis of Southern's short- and long-term prioritization of energy efficiency projects described in this Climate Action Plan.

## The Formalized Commitment: An Overview

### The Presidents Climate Commitment

In September 2007, Southern Connecticut State University formalized its commitment to sustainability when President Cheryl Norton signed the American College and University Presidents Climate Commitment (ACUPCC) on behalf of the entire university community. In so doing, Southern added a target of climate neutrality as soon as possible, or 2050 at the latest, to its previous pledge to unify and develop sustainable principles and practices in all modes of university life and operations. The passage below is an excerpt from the PCC, and is the heart of the mission which Southern has adopted toward embracing sustainability:

*We believe colleges and universities must exercise leadership in their communities and throughout society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve climate neutrality. Campuses that address the climate challenge by reducing global warming emissions and by integrating sustainability into their curriculum will better serve their students and meet their social mandate to help create a thriving, ethical and civil society. These colleges and universities will be providing students with the knowledge and skills needed to address the critical, systemic challenges faced by the world in this new*



*century and enable them to benefit from the economic opportunities that will arise as a result of solutions they develop.<sup>2</sup>*

The following pages document Southern’s strategic plan to achieve climate neutrality and meet the challenges set forth in the Presidents Climate Commitment. While it is not feasible to outline specific measures which the university will undertake decades from now, it is both necessary and prudent to plan comprehensively through 2020, and to create the academic, social, economic, and administrative infrastructure necessary for identifying and meeting future objectives in the most ecologically, socially, and economically sound means possible. This includes ongoing annual assessment of greenhouse gas emissions, improved and centralized communication among diverse offices and departments regarding the development and implementation of sustainable initiatives, and participation in cooperative and collaborative efforts locally, regionally, nationally, and globally. While Southern has for years made energy efficiency and reducing the campus ecological footprint priorities in construction, renovations, and daily operations, the university is in the early stages of fostering a culture of sustainability on campus and in the community at large. This report is intended to be a useful tool for Southern to institutionally promote sustainability as a core value and to minimize greenhouse gas emissions as efficiently and quickly as is feasible. This report will change and adapt over time, in relation to changing and developing renewable energy technology, sustainable social values and practices, and markets for environmentally friendly products.

## **Methods of Reporting**

SCSU assesses its Scope 1 and Scope 2 emissions. Scope 1 emissions include all direct carbon emissions produced by the university, which in Southern’s case include fossil fuels used to produce heat and hot water in campus buildings, and to power its vehicle fleet. Scope 2

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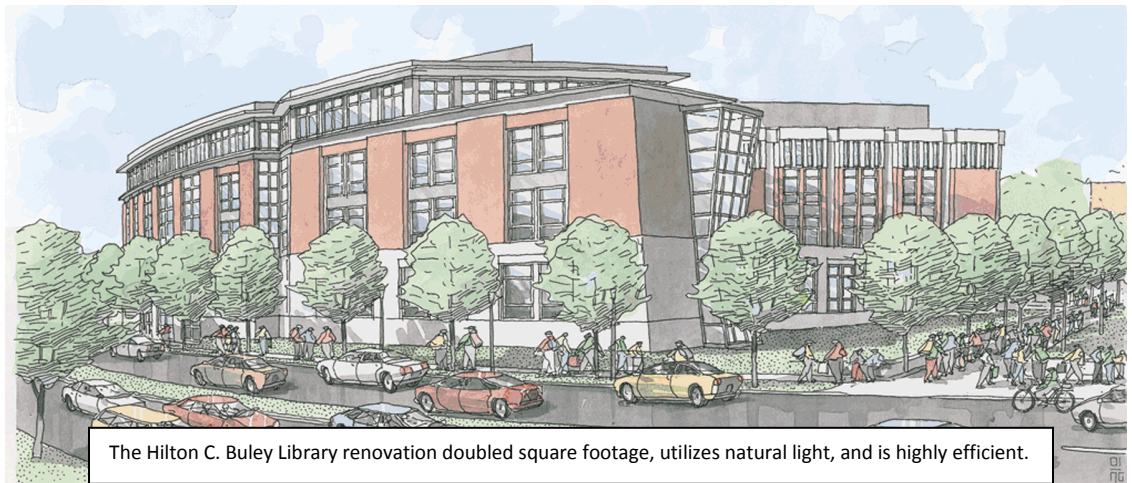
<sup>2</sup> [presidentsclimatecommitment.org/about/commitment](https://presidentsclimatecommitment.org/about/commitment)

emissions include indirect emissions resulting from electricity use at the university. Southern has begun gathering data on certain Scope 3 emissions caused by official university travel in order to develop strategies to reduce or offset them. At this time, the university is not monitoring or addressing commuter emissions, even though Southern has a large base of commuter students. With the understanding that Scope 3 emissions are substantial and should be addressed, the university has taken steps to reduce the number of commuter vehicles on campus and to encourage the use of public transport and ridesharing. Southern will address Scope 3 emissions more fully in the future.

The information presented in SCSU's Greenhouse Gas Emissions Inventories and Climate Action Plan were processed and analyzed using Clean Air- Cool Planet's eCalculator software. The updated Greenhouse Gas Emission Inventory was compiled using version 6.2 of the Clean Air-Cool Planet software.

## **CSU 2020: Funding Energy Efficiency and On-Site Renewable Energy Production**

In November 2007, Connecticut's Governor M. Jodi Rell signed *CSU 2020* into law. *CSU 2020*, passed by the state legislature in near-unanimous bipartisan agreement, bonded nearly one billion dollars for comprehensive long term capital infrastructure improvements to Connecticut's four universities in the CSU system. Southern was allocated \$250 million in this bonding package, a substantial portion of



which is funding energy efficiency improvements and on-site renewable energy installations on campus in the next decade. According to Connecticut state law, any construction or building renovation project totaling \$5 million or more that receives state funding must meet a minimum of LEED Silver standards. Three projects planned for Southern which will be funded by *CSU 2020* fall into this category: a new laboratory science building, a new building for Health and Human Services, and the renovation of the former student center for the School of Business. All three of these buildings will incorporate photovoltaic solar panels and vegetated roofs into their designs. A more detailed summary of these projects and other efficiency upgrades which *CSU 2020* will fund is provided in the decade summary of this report.

### **The Current Budget Crisis and the Presidents Climate Commitment at SCSU**

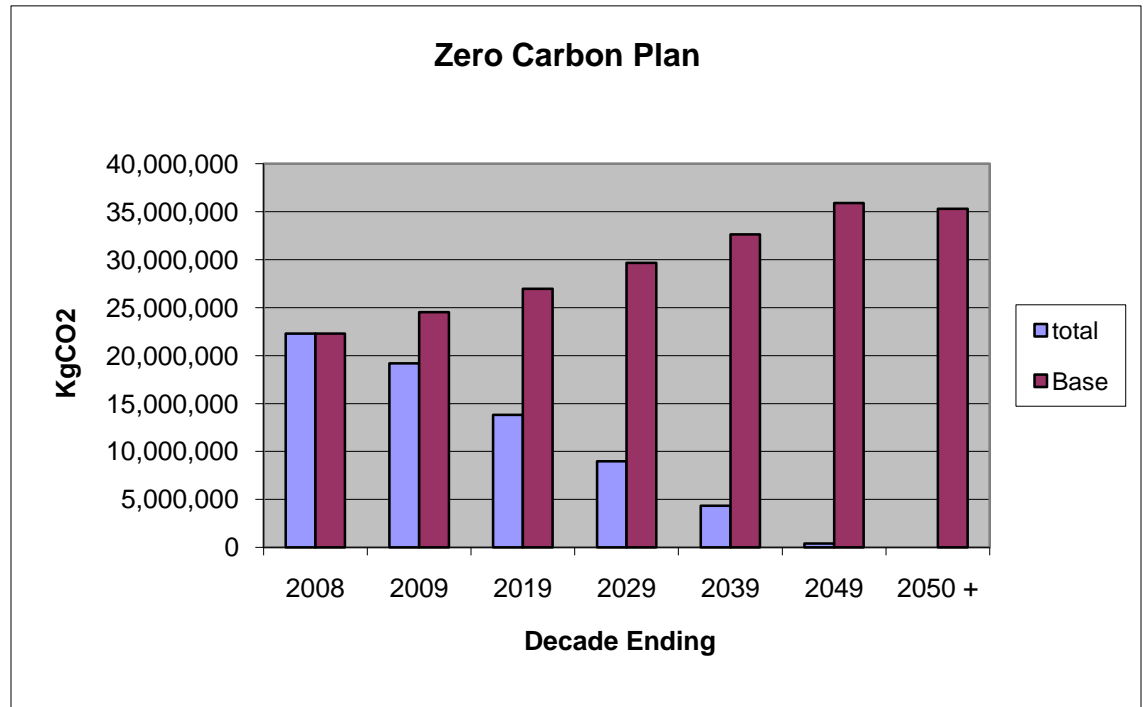
Beginning in the spring of 2009 and continuing for the foreseeable future, a hiring freeze is in place at SCSU as a measure toward balancing Connecticut's budget. The Sustainable Climate Committee has discussed developing the position of Sustainability Coordinator at Southern. At present, the university is unable to fund this hire, but is moving forward with grant proposals to do so on an interim basis. For the 2009-2010 academic year, a graduate student in the Environmental Studies program has interned as Sustainability Coordinator.

While Connecticut's budget crisis has heavily impacted SCSU, it has in other ways helped begin to bring campus sustainability to the community's attention, and helped engrain public awareness of the need for limitations to consumption and conservation of resources. The university-wide focus on cutting costs at SCSU has resulted in progress with such sustainability initiatives as paper reduction and wider community awareness of conservation. Southern will continue to build on this increased community awareness and has several strategies in mind for the spring of 2010. These measures are more fully described in *Building a Culture of Conservation*.

### III. Achieving Climate Neutrality at SCSU

#### Overview and Interim Targets

The bar graph to the right represents projected decreases in Southern’s CO<sub>2</sub>e emissions over time (blue) compared to the projected rise in CO<sub>2</sub>e emissions which would occur with a “business-as-usual” approach (maroon). Southern’s carbon emissions peaked in 2007 and have begun to decline. Between now and 2050, Southern predicts that overall, annual CO<sub>2</sub>e emissions will average approximately 3.7 tons per square foot, compared to an average of 17.14 tons per square foot per year which would result from a “business as usual” policy and campus expansion.



Through strategies described in the **Decade Summary**, SCSU will meet the following interim carbon emission reduction targets below 2007 levels:

**June 2010: 10%**

**June 2020: 40%**

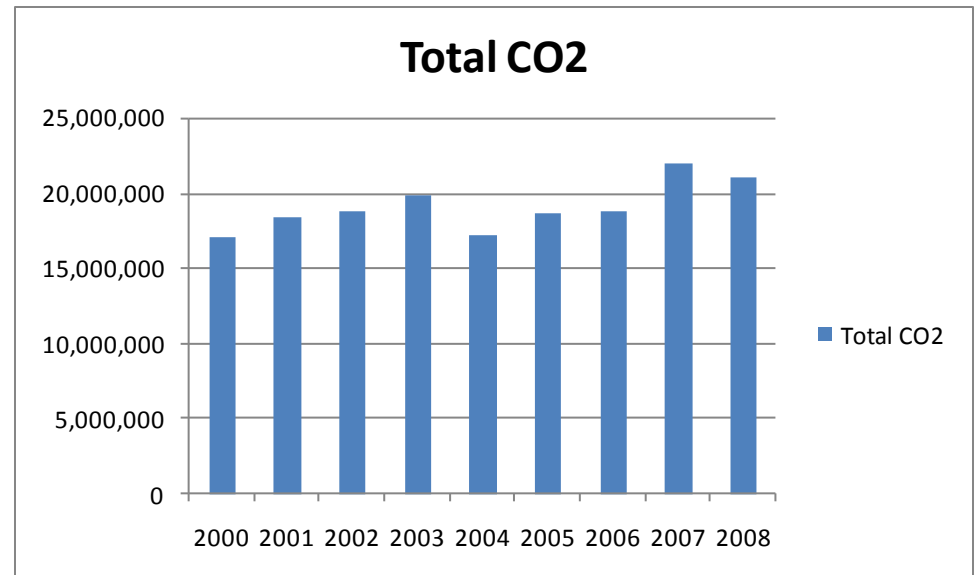
**June 2030: 60%**

**June 2040: 80%**

**June 2050: Carbon Neutral**

## Energy Use Profile: 2000-2008

The bar graph at the right represents total annual carbon emissions for SCSU for the years 2000-2008. The overall increase in emissions up to 2007 is caused for the most part by increased building square footage. The drop in emissions in 2004 came from the increased efficiency of the new Campus Energy Center, which generates heat for nearly the entire campus. The Energy Center also enabled Southern to switch from heating oil to natural gas as its primary heating fuel source. After peaking in 2007, carbon emissions began to fall in 2008 despite a square footage increase that year.



Carbon reductions in 2008 are the result of energy efficiency improvements, conservation efforts utilizing DDC capabilities, and reduction in vehicle fleet size.

### CO<sub>2</sub>e Emissions per Square Foot of Building Space

2000-2008 is marked by building expansion of over 900,000 square feet, and total average enrollment growth of approximately 2,500 FTE students. During this time period, Southern's CO<sub>2</sub>e emissions per square foot decreased. While overall there has been a rise in electricity use during this period to power added space since 2000, the Campus Energy Center's increased efficiency and its capability to use natural gas instead of heating oil decreased carbon per square foot starting in 2004. Between 2004 and 2007, campus expansion outpaced efficiency improvements. The decrease of nearly 900,000 kWh per year between 2007 and 2008 is a result of efficiency improvements and campus-wide moderation of heating and cooling. Reductions in gasoline and diesel use in 2008 are caused by cuts in the size of the vehicle fleet.

|             | Total Building Square Footage | Gasoline Fleet (gal) | Diesel Fleet (gal) | Distillate Oil #2 (gal) | Natural Gas (MMBtu) | Purchased Electricity (kWh) | kgCO <sub>2</sub> e / sq. ft. |
|-------------|-------------------------------|----------------------|--------------------|-------------------------|---------------------|-----------------------------|-------------------------------|
| <b>2001</b> | 1,634,900                     | 38,237               | 8,672              | 655,131                 | 31,890              | 19,148,001                  | 11.26                         |
| <b>2002</b> | 1,633,120                     | 36,678               | 11,528             | 410,999                 | 62,737              | 21,381,412                  | 11.28                         |
| <b>2003</b> | 1,698,809                     | 35,979               | 11,813             | 533,508                 | 65,238              | 20,759,540                  | 11.65                         |
| <b>2004</b> | 1,843,311                     | 36,972               | 12,719             | 271,090                 | 89,425              | 18,341,140                  | 9.35                          |
| <b>2005</b> | 1,922,571                     | 42,918               | 14,179             | 295,498                 | 83,921              | ---                         | 9.67                          |
| <b>2006</b> | 2,312,998                     | 43,361               | 13,460             | 157,213                 | 113,117             | ---                         | 8.1                           |
| <b>2007</b> | 1,947,787                     | 40,485               | 12,314             | 90,644                  | 161,145             | 26,033,184                  | 11.25                         |
| <b>2008</b> | 2,535,501                     | 37,945               | 9,573              | 96,161                  | 152,317             | 25,152,685                  | 8.3                           |

Estimated values for 2005 and 2006, see p. 20

## Total Carbon Emissions by Energy Sector

At the right is a breakdown of carbon emissions by energy sector. The **Decade Summary** of this report details SCSU's approaches to mitigating carbon emissions through efficiency improvements, community conservation, decreased carbon intensity, and on-site generation of renewable energy.

| Total Carbon Dioxide emissions in kgCO <sub>2</sub> by Sector |                      |                    |                                |                   |                             |            |
|---|----------------------|--------------------|--------------------------------|-------------------|-----------------------------|------------|
|   | Transportation       |                    | On-campus                      |                   | Purchased Electricity (kWh) | Total      |
|   | Gasoline Fleet (gal) | Diesel Fleet (gal) | Distillate Oil (#1 - #4) (gal) | Natural Gas (mcf) |                             |            |
| 2000  | 321,014              | 102,817            | 2,045,717                      | 5,217,428         | 9,404,470                   | 17,091,446 |
| 2001  | 332,767              | 86,611             | 6,542,792                      | 1,682,366         | 9,776,478                   | 18,421,015 |
| 2002  | 319,246              | 115,134            | 4,104,652                      | 3,309,736         | 10,916,801                  | 18,765,570 |
| 2003  | 312,777              | 117,980            | 5,328,147                      | 3,441,681         | 10,599,289                  | 19,799,875 |
| 2004  | 321,904              | 127,023            | 2,707,373                      | 4,717,689         | 9,364,516                   | 17,238,505 |
| 2005  | 373,671              | 141,606            | 2,951,140                      | 4,427,315         | 10,701,195                  | 18,594,927 |
| 2006  | 377,528              | 134,425            | 1,570,087                      | 5,967,571         | 10,701,195                  | 18,750,807 |
| 2007  | 352,488              | 122,980            | 905,262                        | 8,501,324         | 12,037,875                  | 21,919,929 |
| 2008  | 330,373              | 95,606             | 960,360                        | 8,035,596         | 11,630,728                  | 21,052,663 |
| * Estimates for 2005 & 2006                                   |                      |                    |                                |                   |                             |            |

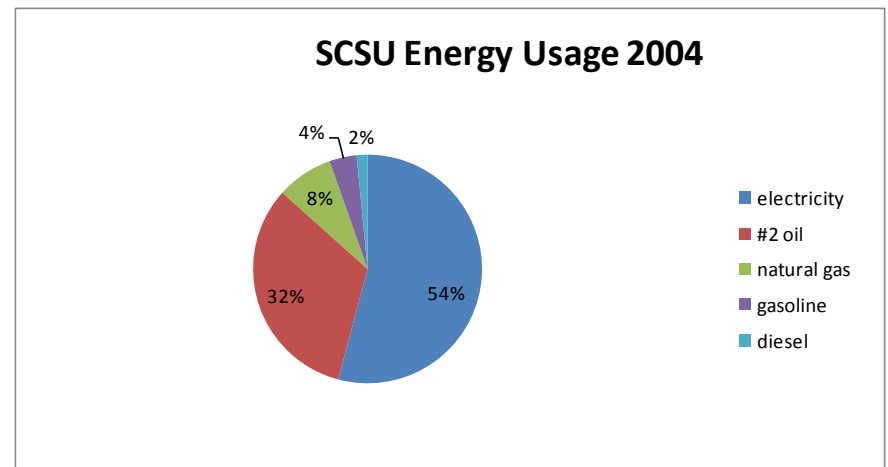
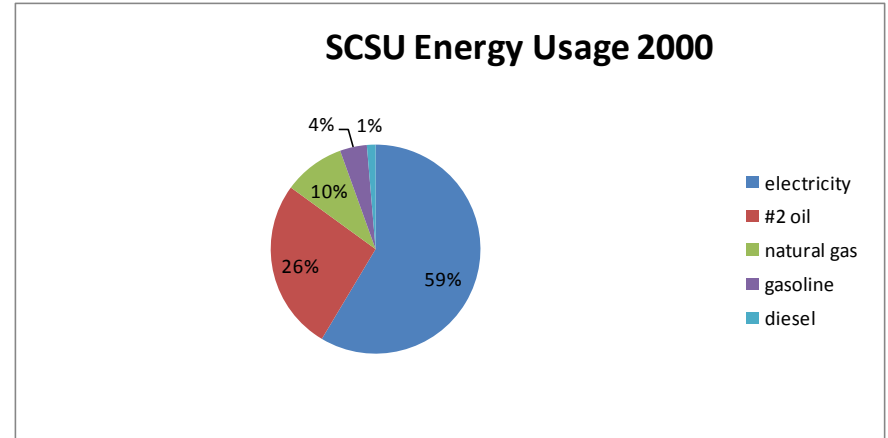
## Energy Consumption at SCSU by Sector

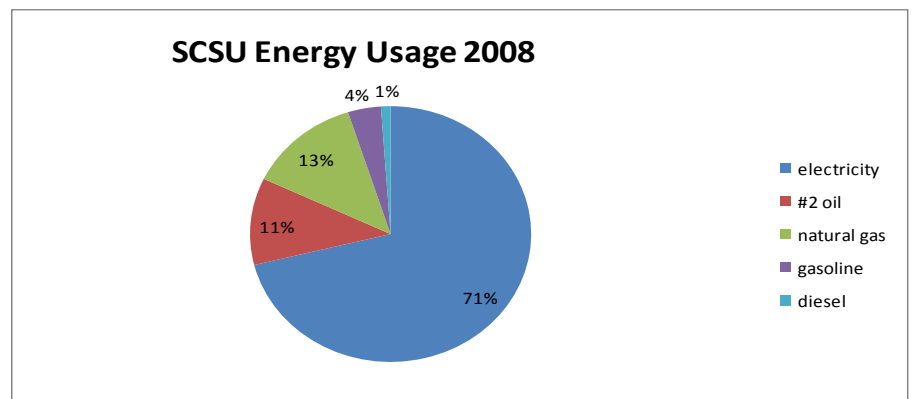
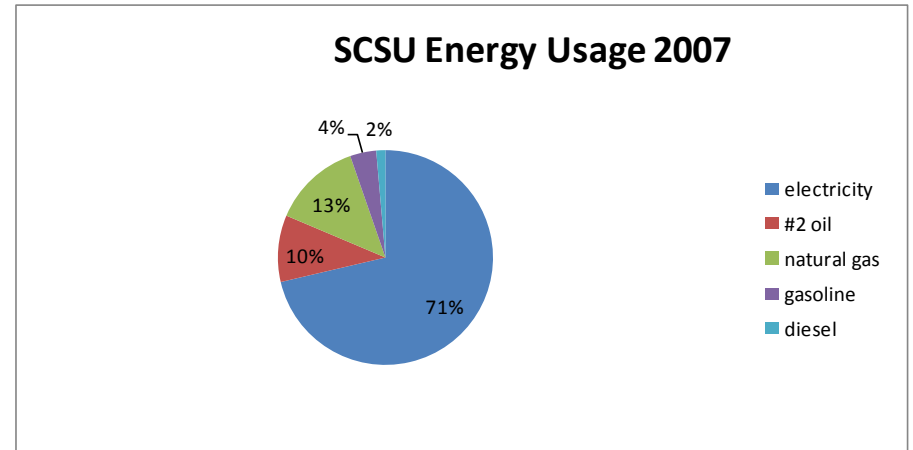
Shown below are break downs of energy use by sector, expressed in MMBtus. This table accentuates the critical importance of prioritizing energy efficiency and conservation in campus buildings: electricity use makes up the largest category of carbon emissions at Southern by a wide margin.

**Energy Consumption at SCSU in MMBtu**

|             | 2000      | 2001      | 2002      | 2003      | 2004      | 2005      | 2006      | 2007      | 2008      |       |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
| electricity | 62,865.39 | 65,352.13 | 72,974.76 | 70,852.31 | 62,598.31 | 75,724.78 | 75,724.78 | 88,851.26 | 85,846.11 | MMBtu |
| #2 oil      | 28,408.97 | 90,860.05 | 57,001.49 | 73,992.22 | 37,597.42 | 40,778.72 | 21,695.39 | 12,508.87 | 13,270.22 | MMBtu |
| natural gas | 10,186.48 | 3,284.64  | 6,461.91  | 6,719.52  | 9,210.79  | 8,643.86  | 11,651.05 | 16,597.94 | 15,688.65 | MMBtu |
| gasoline    | 4,459.57  | 4,622.83  | 4,434.41  | 4,349.89  | 4,469.95  | 5,188.79  | 5,242.34  | 4,894.64  | 4,587.55  | MMBtu |
| diesel      | 1,427.83  | 1,202.78  | 1,598.87  | 1,638.40  | 1,763.97  | 2,041.38  | 1,866.77  | 1,707.83  | 1,327.68  | MMBtu |

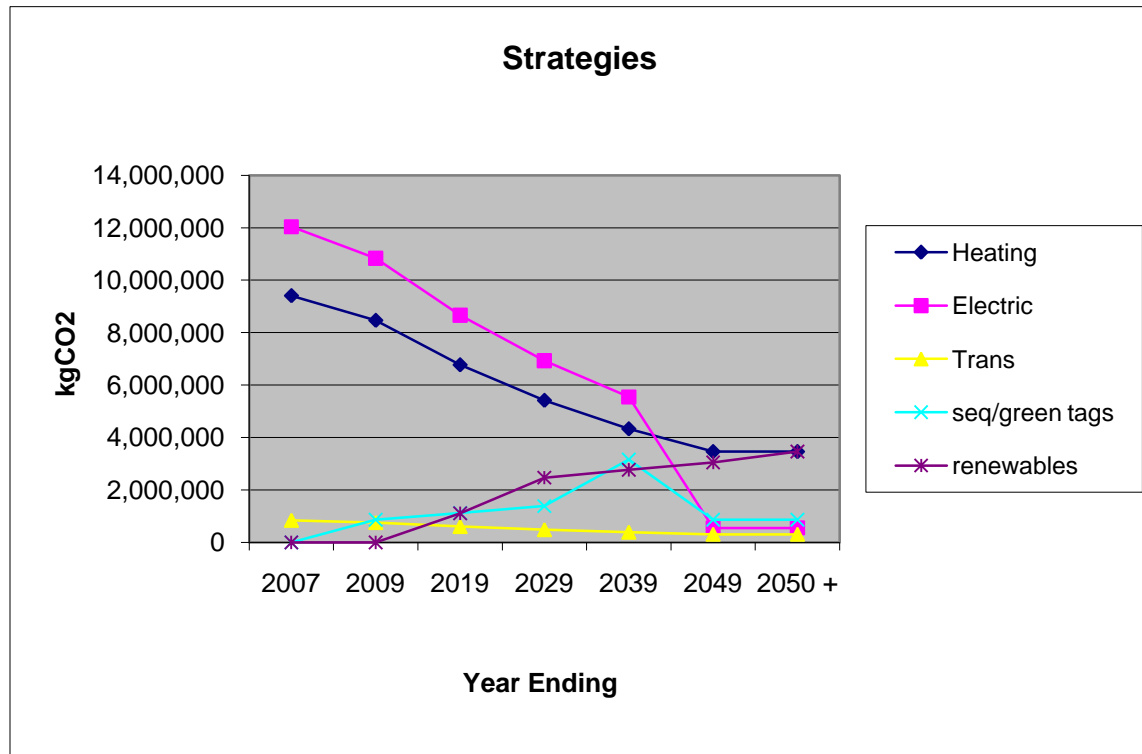
The four pie charts at the right show the trend of growth in electricity consumption as the largest source of annual carbon emissions at SCSU from 59% in 2000, to 71% in 2007 and 2008. This growth in total percentage again reflects campus expansion, and underscores the need to purchase a larger percentage of the university's electricity from renewable sources in coming years, which Southern is planning to do. It also underscores the critical importance of growth in community conservation and sustained energy efficiency improvements in coming decades. **The Decade Summary** more fully explains SCSU's plans to reduce carbon emissions by sector to achieve climate neutrality.





## Planned Greenhouse Gas Emission Reductions for SCSU

The following chart shows emission reductions by category which Southern will implement over time to reach carbon neutrality.



**Electricity:** Steady declines in electricity use (pink) until 2039 will decrease overall energy load in preparation for a comprehensive renewable energy or cogeneration installation when the current boiler system is predicted to need replacement. These steady declines in electricity use will result from efficiency improvements and community conservation. The sharp decline between 2039 and 2049 will result from completion of a large on-site renewable or co-generation installation.

**Heating:** Carbon emission reductions (blue) will result from increased efficiency (improved HVAC, insulation, windows, and doors), community conservation, centrally controlled (DDC) moderation of heating and cooling, and increased use of biofuels to replace natural gas and heating oil.

**Transportation:** Short-term emission reductions (yellow) come from reductions in the size of the vehicle fleet. Mid- and long-term reductions will come from gradual fleet replacement with hybrids, low-emission, or emission-free vehicles, use of biofuels in diesel vehicles, and offsets to emissions from official university travel.

**Sequestration/ Green Tags:** (aqua) Between now and 2040, SCSU will steadily increase the percentage of purchased electricity which is generated by renewable sources. This percentage will peak by 2040 at nearly 100%, at which time the university projects it will generate its own power through renewable sources. The reason this line drops off between 2040 and 2050 is that SCSU will not have to purchase as much electricity after that time.

**On-site Renewable Energy Generation:** (maroon) During the summer of 2010, Southern will install its first set of photovoltaic solar panels. Between 2010 and 2040, the university will continue to install solar panels on all roof replacements, as well as on new construction meeting LEED standards. Between 2040 and 2050, the university plans to install on-site power generation through renewable sources or through co-generation of heat and electricity.

## Decade Summary

The following decade summary outlines strategies which Southern has in place or will introduce in the future to achieve carbon neutrality by 2050. The 2007 – 2008 academic year represents the **base year** for initiating Southern’s strategic plan to reach zero-carbon.

### 2007 – 2008: The Base Year

President Cheryl Norton signed the Presidents Climate Commitment and Southern renamed its Green Campus Committee as the Sustainable Climate Committee. In 2007 and in prior years, Southern’s Department of Facility Operations identified energy efficiency as a priority and initiated many energy efficiency projects including lighting retrofits, HVAC upgrades, installation of sub-metering and DDC control. In 2004, Southern replaced its main heating plant and switched its primary heating fuel from #6 and #4 fuel oil to natural gas. 2007 was also the year when Southern hired a part-time Recycling Coordinator and opened the LEED Silver-certified West Campus dormitory.

### 2007 – 2009

Following the signing of the Presidents Climate Commitment, SCSU’s administration, supported by the Sustainable Climate Committee, began the process of developing a long range strategic plan to achieve climate neutrality, as well as developing a 2010 list of projects to reduce energy consumption by 10% below 2007 levels, and a 2020 list to achieve a 40% reduction. Projects on the 2010 list include energy efficiency improvements, increased REC purchases from the competitive electric market, increased campus recycling, and adoption of other cost effective conservation strategies that ultimately reduce carbon emissions on campus. Projects include:

1. Annually tracking electricity, fossil fuels, recyclables and carbon through use of Clean Air-Cool Planet Campus Calculator.

2. Continuing to retrofit obsolete lighting with T-8, T-5 and LEDs. As of 2009, approximately 50% of the lighting on campus has been retrofitted. Many buildings on campus have motion sensors for lighting, and flush-o-meters for toilets. Southern works closely with its electrical supplier, United Illuminating, to take advantage of rebates, and there is a budgeted five-year replacement schedule for lighting on campus to ensure that the most efficient technology is in place.
  
3. Retrofitting HVAC systems, including installing new VAV boxes and controls, replacement of windows and doors, electrical upgrades.
  
4. Increasing the percentage of purchased electricity from renewable energy suppliers from 7% to 15%. The current contract remains in effect through 2010. The state requirement for renewable purchased electricity in state-owned buildings is 7%.
  
5. Improving recycling from 5% to 20% of disposables.

## 2010 – 2020

During the decade from July 2010 to June 2020, the primary carbon reduction strategies will include:

1. Reducing energy consumption in existing buildings by 25% over the decade by installing energy efficiency retrofits using commercially available technologies. Lighting retrofits to five buildings are budgeted (Energy Center, Fitch Street Garage, West

Campus Garage, Moore Field House, and Pelz Gymnasium). Total cost will be \$430,140 with a \$172,055 rebate. Annual savings are projected to be \$187, 546 with an 80% efficiency gain. The payback period is expected to be just over two years.

2. Utilizing LEED Silver for the two planned new buildings and when renovating the former student center “as new” for the School of Business. 5% of efficiency savings in existing buildings will offset added load of new buildings.
3. When reroofing older buildings, Southern will add insulation, reflective surfaces, and add solar photovoltaic panels to supply 5% of electricity.
4. Using B10 biodiesel in place of #2 fuel oil.
5. Purchasing 20% of the electric supply from renewable energy sources.
6. Convert 25% of all campus vehicles to hybrid, electric plug-in or B5 biodiesel.

### **Schedule of Budgeted Campus Energy Efficiency Installations and Retrofits: 2010-2020**

Between 2010 and 2020, Southern will continue with expansion and renovation of university facilities and demolition/ deconstruction of the oldest, least efficient buildings on campus. Overall square footage at Southern will increase with construction of two classroom

buildings and an additional parking garage, but overall campus energy efficiency improvements to be completed by 2020 will outpace added energy load caused by increased square footage. Projects to reduce energy consumption and carbon are budgeted in the ten-year capital plan. Below is a table of budgeted projects which will improve energy efficiency. Three projects in the next decade will be LEED-Silver certified: the renovation of the former student center renovation for the School of Business, a new science laboratory, and the new Health and Human Services Building. All three of these projects will include P/V solar roof installations, highly efficient HVAC, high “R” value insulation, enhanced commissioning of building systems, control of heat gain through automatic window blinds, and the installation of vegetated roofs. In addition to these three projects, there are many other renovation projects scheduled for the next decade which will improve the university’s energy efficiency. The chart below summarizes the construction and renovation schedule for projects which include energy efficiency improvements to be completed by 2020.

|  | Brownell Hall | Farnham Hall | Wilkinsn Hall | Chase Hall | Davis Hall | Old Student Center** | Science Lab** | Health / Human Services** | Moore Field House | Pelz Gymnasium | Lot1 Garage | Lot7 Garage | Seabury Hall |
|--|---------------|--------------|---------------|------------|------------|----------------------|---------------|---------------------------|-------------------|----------------|-------------|-------------|--------------|
| P/V Roof Panels                                  |               |              |               |            | Phase 1    |                      |               |                           |                   |                |             |             |              |
| Improved Roof Insulation                         |               |              |               |            | Phase 1    |                      |               |                           |                   |                |             |             |              |
| Improved Insulation: Exterior Walls              |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Heating and Cooling Replacement Floors 1,2       |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Heating and Cooling Replacement: Entire Building |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Ventilation System w/ Heat Recovery              |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Enhanced Commissioning                           |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Vegetated Roof                                   |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |
| Mechanical/ Electrical Upgrades                  |               |              |               |            | Phase 2    |                      |               |                           |                   |                |             |             |              |
| High Efficiency Lighting                         |               |              |               |            | Phase 2    |                      |               |                           |                   |                |             |             |              |
| Automatic Blinds/ Heat                           |               |              |               |            |            |                      |               |                           |                   |                |             |             |              |

|              |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Gain Control |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Demolition/  |  |  |  |  |  |  |  |  |  |  |  |  |  |

### University Vehicle Fleet and Fuels

The maintenance fleet is operated and maintained by the Department of Facility Operations, and in 2008, the fleet was reduced in size by 20%. At present, Southern does not purchase biofuels or own hybrid vehicles. The university is “watching and waiting” regarding biofuel use in boilers and diesel-powered vehicles. There is a proposal in the nearby town of Hamden for a biofuel refilling station which would enable the university to easily access a sufficient supply of B-20.

This year, SCSU expanded university shuttle routes to meet the transportation needs of freshmen, who are now prohibited from keeping cars on campus. The decrease in the number of vehicles on campus will more than offset the increase in fuel use from shuttles.

### Future Plans

- Pending grant approval, Facility Operations would like to replace the maintenance fleet with electric vehicles (golf carts) and a solar array to recharge their batteries.
- Pending grant approval, SCSU will build an off-road shuttle system utilizing electric or biofuel powered vehicles. This system would greatly reduce shuttle delays and engine idle times caused by traffic congestion on campus.
- Southern will phase in hybrid or alternate fuel technology vehicles (electric, hydrogen) gradually as fleet vehicles need replacing, and as economic feasibility allows.

## 2020 – 2030

During this decade, the primary carbon reduction strategies include:

1. Reducing energy consumption in existing buildings by 25% over the decade by installing cost-effective energy efficiency retrofits and adopting new emerging technologies
2. Adopting new LED lighting technology and harvesting natural lighting to reduce campus lighting electric load by 20%
3. Utilizing LEED Silver for all new buildings and when renovating buildings “as new.” 5% of efficiency savings in existing buildings will offset added load of new buildings.
4. When reroofing older buildings, adding insulation, a reflective surface and solar photovoltaic panels to supply 20% of campus electricity
5. Using B20 biodiesel in place of #2 fuel oil
6. Purchasing 20% of the electric supply from renewable energy sources
7. Converting 25% of all campus vehicles to hybrid, electric plug-in or B10 biodiesel vehicles.

## 2030 – 2040

During this decade, the primary carbon reduction strategies include:

1. Reducing energy consumption in existing buildings by 25% over the decade by installing cost-effective energy efficiency retrofits and adopting new emerging technologies,
2. Adopting LED lighting and harvesting natural lighting to reduce electric consumption for lighting by 60%
3. Utilizing LEED Gold for all new buildings and when renovating buildings “as new.” 5% of efficiency savings in existing buildings will offset added load of new buildings.
4. When reroofing older buildings, adding insulation, a reflective surface and solar photovoltaic panels to produce 30% of electricity
5. Replacing boilers with high-efficiency Combined Heat and Power for 90% thermal load and 30% of electricity
6. Replacing existing boilers and generating 90% of thermal loads and 50% of the remaining electric supply from natural gas combined heat and power generating sources
7. Converting 25% of all remaining campus vehicles to hybrid, electric plug-in or B20 biodiesel vehicles.

## 2040 – 2050

During this decade, the primary carbon reduction strategies include:

1. Reducing energy consumption in existing buildings by 25% over the decade by installing cost-effective energy efficiency retrofits and new technologies
2. Utilizing LEED Gold for all new buildings and when buildings are renovated “as new.” 5% of efficiency savings in existing buildings will offset added load of new buildings.
3. When reroofing older buildings, add insulation, a reflective surface and add solar photovoltaic panels for 40% of electric loads
4. Operating high efficiency Combined Heat and Power for 90% thermal load and 50% of electric requirements
5. Purchasing 100% of any remaining electric supply from renewable energy sources
6. Converting all remaining campus vehicles to hybrid, electric plug-in or hydrogen-powered vehicles
7. Reducing trash by recycling 50% of all disposable materials
8. Reducing carbon through the purchase of green tags or community projects to offset any remaining carbon from CHP (white tags).

During the years following 2050, the primary carbon reduction strategies include:

1. Continuing to install all cost-effective energy efficiency retrofit technology in existing buildings as new technologies emerge
2. Utilizing LEED Platinum or Zero Carbon standards for all new buildings and LEED Gold for buildings renovated “as new”
3. When reroofing buildings always include additional insulation up to R38, a reflective surface, and solar photovoltaic panels to contribute at least 10% of electric demand.
4. Operating high efficiency Combined Heat and Power for 100% thermal load and 50% of electricity
5. Purchasing 100% of any remaining electric supply from renewable energy sources
6. Converting all remaining campus vehicles to hybrid, electric plug-in or hydrogen powered vehicles
7. Reducing trash by recycling 50% of all disposable materials
8. Reducing carbon through the purchase of green tags or community projects to offset any remaining carbon from CHP (white tags)

### III. 2009- 2050: Building a Culture of Sustainability

*“The best approach to teaching environmental literacy and social responsibility/ civic engagement is to combine strategies to include sustainability by incorporating multiple approaches simultaneously.”*

-Dr. Debra Rowe, *“Environmental Literacy and Sustainability as Core Requirements: Success Stories and Models,”* 2002

#### Curriculum and Research

##### Undergraduate Curriculum:

- **Environmental Studies** is offered as a freestanding minor with *any* undergraduate major at Southern.
- Undergraduates may concentrate in **Environmental or Marine Studies** as part of the Biology, Chemistry, Earth Science, or Geography majors.

##### Graduate Curriculum:

- **The Master of Science in Environmental Education** is one of a small number of graduate masters degree programs in Environmental Education in the United States. This is a rigorous inter-disciplinary program designed to enhance students' understanding of environmental sciences, policy development, environmental economics, belief systems, and environmental teaching



methods. Southern is integrally involved in developing Environmental Literacy standards in public education in the state of Connecticut. Though this master's program was originally developed for classroom teachers, individuals with a wide variety of professional backgrounds matriculate.

- **The Master of Science in Urban Studies** prepares students for careers in city planning, urban revitalization, urban government management, human resource services, urban education, inter-group relations, and community development.

**The Center for Coastal and Marine Studies (CCMS)** was established in 2005 to enhance undergraduate and faculty engagement in coastal and marine environmental/ ecological research and education by providing undergraduate students with opportunities to engage in independent scholarship in conjunction with faculty guidance. Center research focuses on trying to better understand the pressures of human development on natural habitats and finding ways to protect the delicate balance between the two. Undergraduates participate directly in ongoing research related to environmental and coastal issues of local, regional, national, and global importance. Interdisciplinary collaboration and site-based research and analysis form core methods of operation. The Werth Family Foundation of Woodbridge, CT, recently donated \$170,000 to CCMS and most of this funding supports student research.

**The Center for Environmental Literacy and Sustainability Education (CELSE)**, pending approval, will serve the university community by providing an infrastructure to coordinate sustainability initiatives on campus and in the local community. CELSE will also work with the campus community to integrate concepts and principles of sustainability education into interdisciplinary curricula and research at SCSU. The Center will work with K-12 teachers and informal environmental educators to help prepare them to support the integration of environmental literacy skills in K-12 schools. Pending a faculty development grant approval, CELSE will offer three on-campus seminars in the spring of 2010 that center on integrating sustainability into interdisciplinary curricula.

**Classroom Practices:** A growing number of SCSU professors post syllabi, assignments, and study guides online, and allow students to turn in assignments electronically instead of in print.

### Administrative Infrastructure

The Sustainable Climate Committee will continue to oversee all progress toward achieving climate neutrality at SCSU, and to seek a balance between grassroots community participation in sustainability and a “top-down” administrative approach. An effective balance provides room for collaborative and creative problem solving throughout the community within a sound, established organizational structure providing accessible resources and information exchange. The committee is charged with maintaining this Climate Action Plan as a living document and a useful tool adaptable to SCSU’s needs and capabilities in the future. The Committee Chairs communicate regularly with the university President, keeping her apprised of progress and plans.

In November 2009, SCSU launched a Sustainability Web page on the campus Web site ([southernct.edu/campus\\_sustainability](http://southernct.edu/campus_sustainability)) to serve as a central means of communication and education regarding sustainability and climate neutrality on SCSU’s campus and in the wider community. The Climate Action Plan will be posted on this site as of January 2010. For the academic year 2009-2010, a graduate student in the Environmental Education masters program has interned as Sustainability Coordinator. With dual academic and administrative reporting responsibilities, she has been responsible for collaborating with the Office of Public Affairs to design the Sustainability Web page, and working with the Sustainable Climate Committee to write the Climate Action Plan. For the first time, Southern was represented at the September 2009 *Greening of the Campus VIII* conference in Indianapolis. In the spring of 2010, the Sustainability Coordinator will collaborate with Student Affairs to involve resident undergraduates in conservation initiatives. Also hired for the current academic year, an undergraduate journalism major covers sustainability initiatives at SCSU which are submitted to various campus publications including the weekly student newspaper and the quarterly alumni magazine.

## Future Plans:

In order to more effectively infuse sustainability as a core value on campus and to achieve climate neutrality, SCSU seeks to make the following administrative changes:

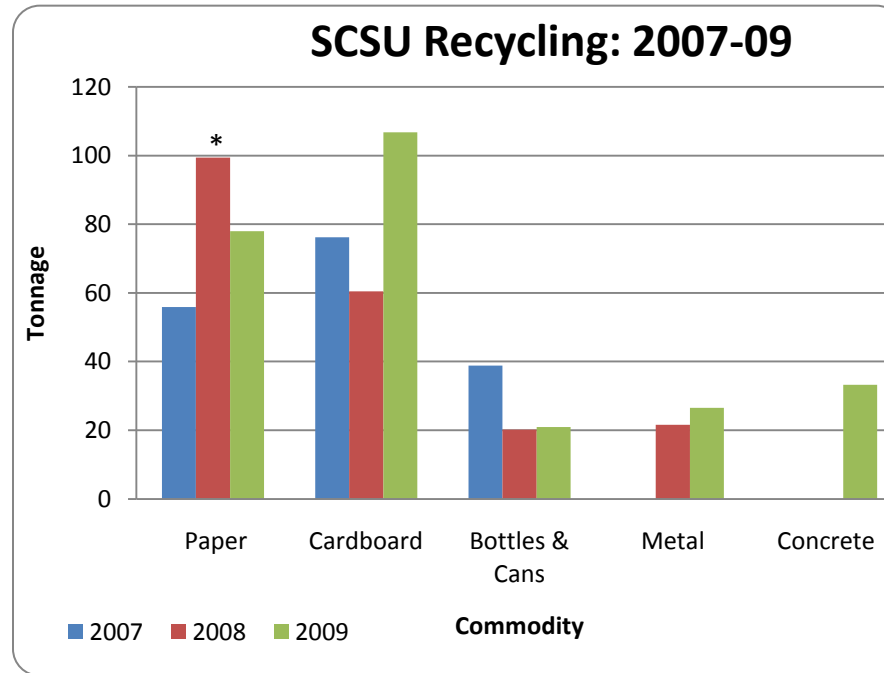
- Hire an interim Sustainability Coordinator through grant funding for the 2010-11 academic year, followed by permanent university hire once the current hiring freeze is lifted. Initial and ongoing responsibilities of the Sustainability Coordinator will be to create a legacy document outlining the process used to update the annual greenhouse gas emissions inventory, to participate in regional and national collaborative sustainability efforts through AASHE and other non-profit organizations devoted to sustainability in Higher Education, to maintain and update the SCSU Sustainability Web page, and to build a culture of sustainability within the SCSU community through ongoing conservation efforts and initiatives.
  
- Realign and expand SCSU's Center for the Environment to be The Center for Environmental Literacy and Sustainability Education (CELSE). CELSE will be integrally involved with Connecticut's Environmental Literacy standards for public education and with integrating sustainable principles and practices into SCSU's interdisciplinary curricula and research. Dependent upon acceptance of a pending faculty development grant proposal, CELSE will offer three on-campus faculty development workshops throughout the spring of 2010, centering on the integration of sustainability into interdisciplinary curricula.
  
- Adopt a Faculty Senate resolution in support of the Presidents Climate Commitment and establish an ad hoc Faculty Sustainability Committee to aid in incorporating sustainability into curricula and research. The Senate will also pledge to adopt one or more sustainable practices in their personal lives.

## Recycling and Solid Waste Reduction

In 2007, Southern hired a part-time **Recycling Coordinator** to oversee campus recycling and municipal solid waste reduction. The Recycling Coordinator reports to the Associate Vice President of Facility Operations and Capital Budget, and is responsible for managing all activities related to recycling and solid waste reduction on campus, including contracts with haulers, purchasing and mapping placement of recycling receptacles throughout campus, monitoring volume of MSW and recycling, and promoting the annual **Recyclemania Challenge**. Since the creation of this position, Southern has developed an extensive and continually growing recycling program. At the facilities level, Southern now recycles cardboard, plastic, paper, scrap metals, batteries, fluorescent bulbs and ballasts, motor oil, e-waste, concrete, bottles and cans, wood pallets, and mineral spirits. The campus community recycles bottles and cans, plastics, white paper and newspapers, cell phones and batteries, and there are small and large receptacles near all dormitories and throughout campus. In addition, there are numerous community collection drives throughout the year for recycled materials and/or donations. All campus mowers redistribute grass clippings as mulch.



The Chart below shows total volume of SCSU recycled materials since 2007.



\*Includes library “purge” in 2008. 2009 totals through November.

Note that the spike in recycled paper in 2008 reflects a library “purge,” when the campus library was remodeled, and the 2009 paper recycling tonnage total does not include December. Paper recycling throughout the community rose significantly in 2009 from 2007 levels—there was no library purge in 2009 to boost tonnage.

**Paper source reduction** has also become a priority for Southern. Business and administrative offices have streamlined invoicing and recordkeeping to eliminate redundancy. Administrative and business offices are transferring recordkeeping to computers and streamlining

purchase orders in order to eliminate redundancy and minimize paper use. Email is the official mode of communication, and the entire community has been asked to print only when necessary. At present, Southern purchases office paper which contains 30% post-consumer recycled content.

**Food Waste reduction:** In early 2008, Connecticut Hall (Southern’s central dining hall) went “trayless,” and food waste dropped 30%.

### **Future Plans**

In the spring of 2010, two classroom buildings will be piloted for classroom bottle and can receptacles in addition to the receptacles in hallways on each floor. Plans also include:

- Increased student participation in the Recyclemania challenge
- Sending food waste to an instate composting facility
- Diverting a portion of food waste to compost the campus organic vegetable garden
- Integration of student projects and initiatives including cradle-to-cradle analysis of waste
- Deconstruction of buildings rather than demolition, and recycle of construction materials according to financial feasibility

## Community Conservation

The Sustainable Climate Committee realizes that widespread and consistent community involvement in conservation is critical to achieving GHG reduction targets and to fulfilling SCSU's Strategic Initiative 2007-2012. Within this mission, Southern seeks to "ensure a campus that is environmentally responsible" (Goal J) and to "explore new ways to improve energy conservation, sustainability, and greening of the campus" (J3). The university has also committed to "become a leader in the employment of best practices in energy conservation, the preservation of nature, and environmental responsibility." (CITE).

**Sustainability Website:** Southern's Sustainability Web site aids in centralizing and coordinating communication regarding sustainability on campus and in surrounding communities. The Web site can be viewed at [www.southernct.edu/campus\\_sustainability](http://www.southernct.edu/campus_sustainability). Website design and updates are a joint effort between the Sustainability Coordinator intern and the university's Office of Public Affairs.

### Conservation and Campus Life:

In the spring of 2010, the Sustainable Climate Committee will develop plans for incenting energy conservation in dormitories for the 2010-11 academic year. These plans include student Eco-Reps for each dormitory through the Office of Student Affairs, conservation competitions throughout the academic year, accessible information and promotional resources such as posters, stickers, and signage which encourage conservation, display results of conservation efforts, and show why reduced consumption is important. The SCC is in the beginning stages of looking into the feasibility of a "Green Dorm." Energy conservation efforts will include encouraging and incenting



turning off lights, electronics, televisions, unplugging appliances and chargers when not in use, encouraging reduction in hot water use in showers, faucets, and laundry, and reporting leaky faucets and malfunctioning fixtures and equipment to the facilities office.

The university offers free morning and late afternoon shuttle service between campus and New Haven’s Union Station for Southern community members who commute by train. Southern also has a book buy-back policy at the university bookstore.

## V. Conclusion

### Using the Climate Action Plan as a Community Tool

Southern’s goal of becoming a climate neutral institution by 2050 is only achievable through coordinated, sustained, strategically planned efforts throughout the university community. While these changes in many cases are not easy to plan or to complete, the process of becoming a climate neutral institution has the potential to enhance Southern’s curricula and campus life. An effective community agenda for climate neutrality can provide access to skills, knowledge, and experiences the community will need to become engaged and informed global environmental citizens. Not only will implementing the Climate Action Plan create environmental benefits critical to a healthy sustainable future, it also lays necessary groundwork to provide students, faculty, and staff with educational opportunities to make Southern a “learning laboratory” in environmental improvement.

Southern has set interim carbon reduction targets below 2007 levels at:

- 10% by 2010
- 40% by 2020
- 60% by 2030

- 80% by 2040
- Carbon Neutrality by 2050

In coming years, the Sustainable Climate Committee at Southern anticipates the need to adapt this plan to the rapidly developing technological innovation in the energy sector and changing energy markets. The Sustainability Committee will review the Climate Action Plan annually and make revisions as needed. Southern will continue to monitor and assess greenhouse gas emissions annually in a collaborative partnership with the Sustainable Energy Institute at Eastern Connecticut State University. The plan is a useful community tool and will be made available online on the SCSU Sustainability Web site in January 2010. In the spring of 2010, and at regular intervals in the future, Southern will hold town meetings open to the entire campus community to review the plan and seek comments and feedback.

## Acknowledgements

The Sustainable Climate Committee at Southern Connecticut State University would like to thank William Leahy, Director of the Sustainable Energy Institute at Eastern Connecticut State University, for his expertise and guidance throughout the last five years in assessing Southern's energy efficiency needs and potential for reducing greenhouse gases, and in helping the Sustainable Climate Committee shape this Climate Action Plan. In 2009, Leahy was aided by ISE staff intern Alicia Anania in gathering and analyzing Southern's carbon emissions data and using the Clean Air Cool Planet Campus Calculator version 6.2.

The Climate Action Plan was developed by the Sustainable Climate Committee under the guidance of Committee Chairs James Blake, executive vice president of Financial Affairs, and Robert Sheeley, associate vice president of Facility Management and Capital Budget. The plan was written and edited by SCSU graduate student Suzanne Huminski as part of a one-year internship as Sustainability Coordinator. Huminski is a second-year graduate student in the Environmental Education masters program, and collaborated with the Sustainable Climate Committee to complete this project.

Finally and most importantly, the Sustainable Climate Committee would like to thank Southern Connecticut State University President Cheryl Norton. With her bold and pragmatic leadership, Dr. Norton had the foresight necessary to attempt the ambitious goal of climate neutrality to create a healthy, more sustainable future.

