



## Office of Energy Management Strategic Energy and Water Plan Update

Fiscal Year 2005-06

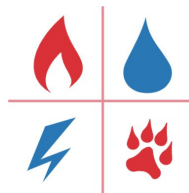
[Save\\_energy@ncsu.edu](mailto:Save_energy@ncsu.edu)

Edward J. Sekmistrz  
Energy Management Engineer  
[edward\\_sekmistrz@ncsu.edu](mailto:edward_sekmistrz@ncsu.edu)  
(919)515-2188

Christine C. Maurer  
Energy Conservation Coordinator  
[cmaurer@ncsu.edu](mailto:cmaurer@ncsu.edu)  
(919)513-7492

Promoting campus sustainability through the managed use of energy !

**NC STATE UNIVERSITY**



**ENERGY  
CONSERVATION**  
NC STATE UNIVERSITY

## Table of Contents

Executive Summary .....	i
Highlights of Trends in Fiscal Year 2005-06 .....	ii
Key Performance Indicators 2005-06 .....	ii
Activities in Our Focus Areas.....	iii
Introduction .....	1
Activities and Accomplishments 2005-06 .....	2
Highlights from the accomplishments for FY 2005-06.....	2
Data Management .....	2
Supply Management .....	2
Energy Use in Facilities.....	3
Equipment Efficiencies.....	3
Campus Integration.....	3
Table of Activities in Five Focus Areas 2005-06 .....	4
Charting NC State's Utility Consumption.....	6
Facts about Energy and Water Consumption at NCSU in 2005-06.....	6
Total Energy and Water Consumption 2005-06.....	7
Key Performance Indicators 2005-06 .....	8
Trends in Energy and Water Consumption at NCSU .....	9
Trends in Energy and Water Costs at NCSU .....	10
Avoided Costs: Rate Negotiations.....	10
Fiscal 2006-07 Estimated Activities and Expenditures .....	11
The Strategic Energy and Water Plan .....	14
Glossary of Terms.....	16
Abbreviations in Activities Table .....	16
Definitions .....	16

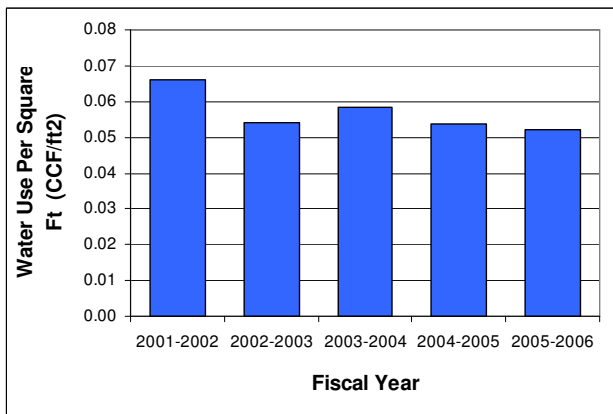
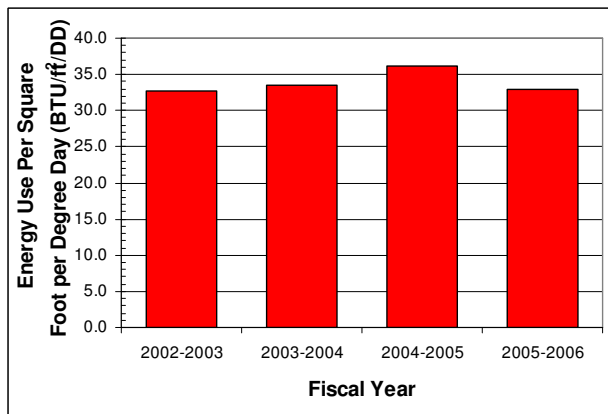
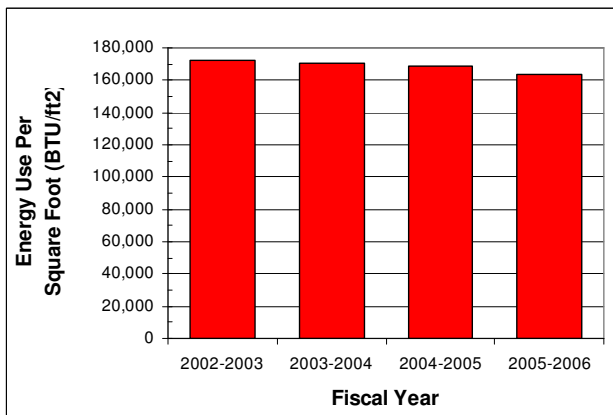
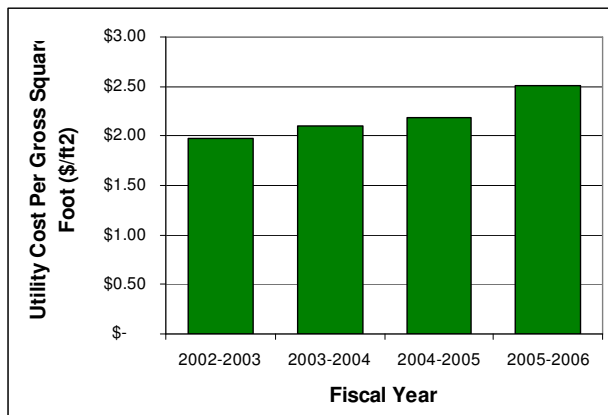
Attached: Strategic Energy and Water Plan Commitment for NC State University

# Executive Summary

The Office of Energy Management at NC State University recognizes that by being good stewards of our energy and water resources we will maintain a quality environment while reducing consumption and controlling costs. In the Strategic Energy and Water Plan Commitment for NC State University, we have established the goals of reducing:

- the Aggregate Annual Energy Consumption per Gross Square Foot, adjusted for weather, by a minimum of 4% over a ten year period from baseline year 2002-03
- the Annual Water Consumption Per Gross Square Foot by a minimum of 10% over 2001-02.

Presented below are four charts showing the trends in utility (including electricity, natural gas, oil, and water) costs and energy and water consumption at NCSU through fiscal year 2005-06. More details about these trends are provided in the body of this report.



### Highlights of Trends in Fiscal Year 2005-06

- The expenditures for utilities increased from \$24.1 million in 2004-05 to over \$29 million in 2005-06, with a \$3.6 million budget shortfall in funding utilities.
- The cost of natural gas increased considerably in Fall 2005 due to Hurricanes Katrina and Rita. Prices had dropped by Spring 2006 due to a mild winter. For the year, the cost for natural gas was up 38%.
- The energy consumption in BTU per gross square foot has declined by 4.7% since 2002-03.
- NC State University is currently meeting and maintaining the goal for water consumption per square foot, down 20% from baseline year 2001-02. The total water consumption was down 3% over 2004-05.
- While total utility costs increased, the university avoided paying about \$1 million for utilities through rate schedule changes and gas/oil negotiations.
- The utility cost per square foot has increased 26% overall and 15% in the last year. The cost per unit of energy and water has both increased.
- The NC State campus has grown by 20% since 2001-02. Student enrollment has remained fairly constant; therefore, the utility cost per full time student has increased dramatically, nearly by 50% since 2002-03.
- The energy consumption in BTU per gross square foot adjusted for weather has increased overall by 0.4% from 2002-03, but has declined from 2004-05.

### Key Performance Indicators 2005-06

We track our progress on our commitment by the Key Performance Indicators listed in the table below.

	Utility Cost per GSF	Energy Cost per Thousand GSF per DD	Energy (BTU) Consumption per GSF	Energy (BTU) Consumption per GSF per DD	Water Cost per GSF	Water Consumption (CCF) per GSF	Heating and Cooling Degree Days (DD)	Campus Area, Gross Square Feet (GSF)	Sponsored Award Activity (Million \$)	Utility Cost per Student (\$/FTE)
2005-06	\$ 2.50	\$ 0.47	163,756	32.9	\$ 0.14	0.052	4978	11,723,681	\$ 207.0	\$ 1,043
% Change from 2004-05	15%	8.2%	-2.9%	-8.9%	5.2%	-3.1%	6.6%	6.0%	3.8%	22%
% Change from Baseline <sup>1</sup>	26%	33%	-4.7%	0.4%	20%	-21%	-5%	20%	22%	49%
<small>Note 1: Baseline year for Water Cost per GSF and Water Consumption per GSF is 2001-02 because of Governor Easley's Executive Order Number 26. For all other KPI, the Baseline Year is 2002-03.</small>										

## Activities in Our Focus Areas

This Strategic Energy and Water Plan guides our activities in five focus areas:

- Energy Data Management
- Energy Supply Management
- Energy Use in Facilities
- Equipment Efficiency
- Campus Integration

Below is a summary of activities that occurred during 2005-06 and planned activities for 2006-07 in the five focus areas.

### Energy Data Management

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
KPI-Benchmarking	Review Key Performance Indicators Quarterly	N/A	Labor	N/A
Monthly Bills (Internal)	Review meter variances monthly	N/A	Labor	Operating
Monthly Bills (Internal)/ Accessibility	New EBS software for internal billing into production	Labor - N/A	\$ 174,000	Operating
Sub-metered data	Handheld computer internal meter reading (Datamatic), tracking 54 more meters (475 total)	Labor - N/A	\$ 25,000	Operating

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Monthly Bills	Purchase invoicing upgrade for accounts receivables and contractors	Labor and improved collections	\$ 18,000	Operating
Monthly Bills (Payable) / Accessibility	Pay utilities through billing system and make all utility information web accessible	Labor - N/A	\$ 19,000	Operating
Sub-metered Data	Purchase Modbus Interface for eDNA and Cutler Hammer electric meters in Yarbrough plant - connect 50 Meters total for real-time	Labor - N/A	\$ 40,000	COP
Sub-Metered Data	Purchase and install 60 electric and wet meters for buildings and wet meters on central plant. (Ref-Kling Projects)	N/A	\$ 470,000	COP

\*Glossary of Funding terms is provided at the end of the report

## Activities in Our Focus Areas

### Energy Supply Management

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Demand-Supply Optimization	Converted eight buildings on main campus to chilled water central loop	N/E	N/E	N/E
Demand-Supply Optimization	Report for Chilled Water Master Plan was delivered, reviewed, and adopted for main campus (Ref. RMF Study)	N/A	\$ 24,000	Operating
Rate Optimization	Switched one account to SGS-TOU, monitored 14 other accounts	\$ 112,000	\$ -	N/A
Supplier Choice	Evaluate purchase of tariff, transport, and strip natural gas versus fuel oil monthly	\$ 970,000	Staff Labor	N/A
Supply Optimization	Inspect steam traps quarterly and replace as needed	N/E	Staff labor + parts	Operating
Supply Optimization/ Accessibility	Purchase master INET 7 software license and survey	N/A	\$ 7,330	COP
Supply Optimization	Assessment of existing boiler plant operational requirements and cost, preliminary layout and boiler configuration development	N/A	\$ 96,439	COP
Supply Optimization	Reviewed six capital projects to downsize transformers and minimize transformer energy losses	N/E	Staff Labor	N/A

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Demand-Supply Optimization	Chilled Water master plan report will be reviewed and adopted for CBC campus	N/A	\$ 45,000	Operating
Rate Optimization	Switched Sullivan to LGS TOU	\$ 70,000	\$ -	NA
Supplier Choice	Evaluate purchase of tariff, transport, strip natural gas, and fuel oil monthly	\$ 1,000,000	Staff Labor	N/A
Supply Optimization	Inspect steam traps quarterly and replace as needed	N/E	Staff labor + parts	Operating
Supply Optimization/ Accessibility	Purchase Supervisory Control and Data Acquisition (SCADA) system for utility distribution and building controls	N/E	\$ 250,000	COP
Supply Optimization/ Accessibility	Purchase TAC, Yamas and JCI modbus to access central plant and building controls from web	N/A	\$ 70,000	COP
Supply Optimization	Finalize recommendations and do preliminary design for boiler study	N/A	\$ 54,000	COP

\*Glossary of Funding terms is provided at the end of the report

## Activities in Our Focus Areas

### Energy in Facilities

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Comprehensive Audits	Selection of vendor for Performance Contracting study	N/A	N/A	N/A
Commissioning	Nine buildings were under commissioning	N/E	N/A	N/A
Facility Walk Through - Lighting	Audited 2 buildings (Carmichael, Student Health)	N/A	\$ 1,200	Operating/NCDOA
HVAC Controls Tune Up	Tuned up four buildings (Toxicology, Language and Computer Labs, Student Health Center, Clark Hall)	\$ 80,000	\$ 12,284	Operating/NCDOA
Operating Procedures	Setback 100 buildings over Holiday break	\$ 185,000	Staff Labor	N/A

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Comprehensive Audits	Comprehensive survey of 12 sample buildings to be complete for Performance Contracting Study	N/A	\$ 75,000	R&R
HVAC Audit	HVAC Audit for one building (Carmichael)	N/A	\$ -	IES/NCDOA
HVAC Controls Tune-Up	Tune Up four buildings: (COE I, Cox Hall, David Clark Labs, Fox Lab)	\$ 187,000	\$ 16,000	Operating/NCDOA
HVAC Tune-Up	Tune up one building - Yarbrough	N/E	\$ 5,000	R&R
Comprehensive Audits	Audit 8 buildings (Caldwell, Winston, Tompkins, CBC 301, and 4 more to be determined )	N/A	\$ 4,800	Operating/NCDOA
Operating Procedures	Setback 100 buildings over Holiday break	\$ 150,000	Staff Labor	N/A

\*Glossary of Funding terms is provided at the end of the report

## Activities in Our Focus Areas

### Equipment Efficiencies

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Lighting Upgrades	Install fluorescent lighting in 11 Squash Courts	\$ 11,000	\$ 46,480	R&R
Lighting Upgrades	Install occupancy sensors in classrooms, restrooms, hallway (Tompkins, Research IV)	\$ 2,300	\$ 20,360	R&R
Lighting Upgrades	Install T8/25 Watt lighting in Dabney Hallways, Mann Hall, Research I, and Research II	\$ 35,900	\$ 170,824	COP/ R&R
Lighting Upgrades	LED Exit signs installed campus wide	\$ 7,000	\$ 24,687	R&R
Plumbing Upgrades	500 faucet aerators (0.5 GPM) installed campus wide	\$ 5,200	\$ 6,896	R&R
System Upgrades	Surveyed and identified motors for replacement with NEMA premium efficient motors	N/A	Staff Labor	Operating
Plumbing Upgrades	Replace 110 Showerheads at Carmichael (Men's)	\$ 12,000	\$ 20,000	R&R
Irrigation Upgrades	Installed six systems (North Gateway, South Gateway, Visitors Center, Upper Miller Field, LSB Courtyard, MAFTL)	\$ 11,600	\$ 34,903	R&R
Plumbing Upgrades	Install new timers on pig barn flushers	\$ 20,000	\$ 100	Operating
HVAC System Upgrades	Convert controls to Sitenet in two buildings (Ricks and Broughton Halls)	\$ 13,500	\$ 23,400	R&R

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
HVAC System Upgrades	MERC Metasys Extended Architecture upgrade	\$ 20,000	\$ 59,000	Operating
HVAC System Upgrades	Ricks Hall Sitenet conversion	\$ 12,000	\$ 16,000	R&R
HVAC System Upgrades	Convert Pneumatic to DDC (Scott, Poe, Kamphoefner)	\$ 191,000	\$ 720,000	COP/ R&R
HVAC System Upgrades	Outdated DDC to Web based DDC (College of Textiles, Mann Hall, Burlington, Partners III)	\$ 78,300	\$ 525,000	R&R
Irrigation Upgrades	Remove irrigation system from city water at CBC	N/E	\$ 1,500	Operating
Lighting Upgrades	Install T8/25 Watt lighting in (Mann Hall, Dabney)	\$ 15,000	\$ 56,000	COP/ R&R
Lighting Upgrades	Continue lighting upgrades at Carmichael (Weight rms, locker rooms, mech rms, Squash cts, racquetball cts, running track, classrooms)	\$ 7,600	\$ 29,000	R&R
Lighting Upgrades	Add occupancy control in rest rooms, classrooms, break areas (Main Campus and CBC)	\$ 5,800	\$ 29,000	R&R
Lighting Upgrades	Electronic Ballasts for Yarbrough HID Lamps	N/E	\$ 5,000	R&R
System Upgrades - HVAC	Stand Alone HVAC Unit for Yarbrough Control Room	N/E	\$ 15,000	R&R
System Upgrades - Motors	Replace 48 motors using premium efficient style	\$ 16,700	\$ 100,000	COP

\*Glossary of Funding terms is provided at the end of the report

## Activities in Our Focus Areas

### Campus Integration

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Awareness and Participation	Displayed energy awareness stickers at campus building entrances	N/A	Staff Labor	Operating
Awareness and Participation	Promoted Million Dollar Challenge at freshmen orientation fair and other events	N/A	Staff Labor	Operating
Awareness and Participation	Organized and sponsored the NCSU Earth Day	N/A	\$ 579	Operating
Awareness and Participation	Held four CAT team meetings	N/A	Staff Labor	N/A
Awareness and Participation	Ran weekly Technician advertisement	N/A	\$ 900	Operating
Awareness and Participation	Redesigned website <a href="http://www.ncsu.edu/energy">www.ncsu.edu/energy</a>	N/A	\$ 1,000	Operating
Performance and Training	Three employees completed the State Energy Office Diploma Series	N/A	Staff Labor	N/A
Performance and Training	Attend national conferences and job related training for energy management (eDNA, AEE, TAC)	N/A	\$ 10,400	Operating

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Awareness and Participation	Run Technician ad daily	N/A	\$ 3,500	Operating
Awareness and Participation	Design, print, and distribute 5000 tri-fold brochures on energy and water conservation and print 35 educational bulletin boards	N/A	\$ 2,730	Operating
Awareness and Participation	Light switch and building/vending machine sticker design and placement	N/A	\$ 2,000	Operating
Awareness and Participation	Energy awareness displays at Talley	N/A	Staff Labor	Operating
Awareness and Participation	Pilot GREEN program for Residence Halls with Univ. Housing and OWRR	N/A	Staff Labor	Operating
Awareness and Participation	Hold bi-monthly CAT meetings	N/A	Staff Labor	Operating
Awareness and Participation	Launch new website and keep updated	N/A	Staff Labor	Operating
Awareness and Participation	Awareness events (Energy Awareness Month, Movies, Organization fairs)	N/A	TBD	Operating
Awareness and Participation	Awareness events (Earth Day)	N/A	\$ 600	Operating
Performance and Training	EBS Training	N/A	Staff Labor	Operating
Performance and Training	Attend national conferences and job related training for energy management (AASHE, eDNA, ASHRAE, TAC)	N/A	\$ 13,600	Operating

\*Glossary of Funding terms is provided at the end of the report

## Introduction

North Carolina State University, located in Raleigh, North Carolina, is a land grant University with approximately 35,000 students, faculty and staff. NC State is a leader in the areas of teaching, research and public service. Facilities Operations through the Office of Energy Management has been charged with the responsibility to manage the energy and water resources purchased and consumed by NCSU in the most cost efficient manner and to promote energy and water conservation and awareness throughout the campus community. Our activities must support a superior academic environment and continued growth while simultaneously accomplishing our primary conservation responsibilities.

**Our Mission:** The *Office of Energy Management* recognizes that by being good stewards of our energy and water resources we will maintain a quality environment while reducing consumption and controlling costs. This will be accomplished by creating a culture that is dedicated to achieving environmental sustainability by supporting conservation objectives and recognizing and eliminating waste.

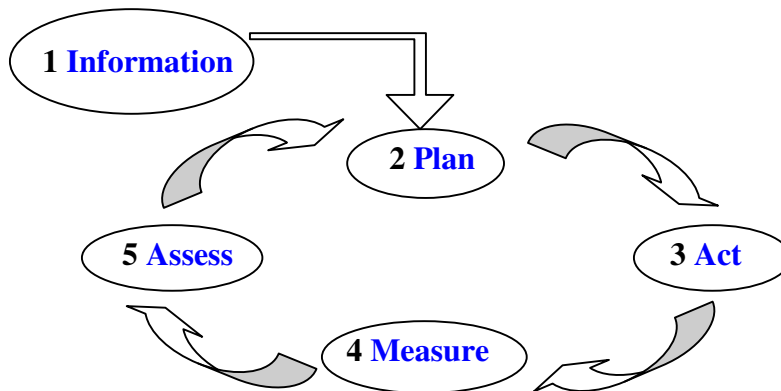
**Our Vision:** The vision of this office will be to sustain a long-term reduction of 20% in unit consumption of energy that is purchased by NCSU. In the Strategic Energy and Water Plan Commitment for NC State University, we have established the goal of reducing the Aggregate Annual Energy Consumption per Gross Square Foot, adjusted for weather, by a minimum of 4% over a ten year period. We will reduce the Annual Water Consumption Per Gross Square Foot by a minimum of 10% over 2001-02.

**Our Staff:** Fiscal year 2003-2004 was the inaugural year for the *Office of Energy Management* at NC State. There are now seven full time employees including an Energy Management Engineer, Energy Conservation Coordinator, four Electronic Technicians, and a dedicated Meter Reader.

**Our Implementation Strategy:** Energy management in a complex ever-changing environment is as much a journey as a destination. Growth, new technologies, environmental concerns, availability of fuels and new regulations and codes are a few of the challenges we must navigate. The Energy Management Plan is the roadmap we use to establish our objectives and guide our activities. A matrix, based on our Energy Management Plan, was created to track the progress of our activities. The Plan's five focus areas, Energy Data Management, Energy Supply Management, Energy Use in Facilities, Equipment Efficiency, and Campus Integration are being implemented using a five-step approach.

1. Information Gathering – The first step in the execution of any project or activity is to identify the sources of information available, gather that information and present it in a meaningful and understandable form.
2. Plan – Based on the information gathered in step one an action plan should be developed. This will include procedures for execution of the project, the goals for the project and the indicators that will be used to measure the success of the project.
3. Act – The actual execution of the plan.
4. Measure – Monitor and report on the key indicators as outlined in the plan.
5. Assess – Review and evaluate the findings and continue with the plan or revise as required.

This is an ongoing process as most activities and projects in the realm of energy management are dynamic, hence the depiction of the implementation strategy as a circle.

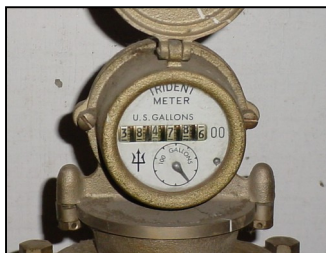


## Activities and Accomplishments 2005-06

As stated earlier, the Energy Management Office plan includes five focus areas: Energy Data Management, Energy Supply Management, Energy Use in Facilities, Equipment Efficiency, and Organizational Integration. Highlights from the accomplishments for FY 2005-06 in each of these focus areas is described below. More details about these projects are available in the tables on pages 11 and 12.

### *Highlights from the accomplishments for FY 2005-06*

#### Data Management



- The eDNA billing software is now used for internal utility billing along with a handheld Datamatic meter recording device. A total of 475 utility meters on buildings are read monthly by NCSU to help track utility consumption (54 more than last year).
- The new billing software helps review monthly utility usage variances at the building level to identify problems with utility metering or mechanical systems. This procedure ensures customers receive accurate utility invoices.
- This was the inaugural year that Facilities Operations had historical information digitally available on submetering data.

#### Supply Management

- The cost effectiveness of rate schedules for electric accounts was monitored.
- Purchase of tariff, transport, and strip natural gas versus fuel oil was evaluated monthly.
- Chilled water for main campus is now served through Yarbrough and Cates central plants, eight buildings were added to the central chilled water loop in 2005-06

## Energy Use in Facilities

- Facilities Operations coordinated building temperature setbacks during the holiday break with estimated savings of \$185,000.
- HVAC tune-ups were performed on four buildings with partial funding from the State Energy Office.
- Lighting audits were conducted by the Industrial Extension Service on 2 buildings.

## Equipment Efficiencies

- Lighting replacement project was continued in 11 Squash Courts at Carmichael and upgrades were done at Dabney, Mann, Research I, and Research II.
- Occupancy sensors were installed at Tompkins Hall in 11 classrooms, hallway, and restrooms.
- LED EXIT signs and faucet aerators (0.5 gpm) continued to be installed campus wide.
- Existing motors were surveyed and identified for replacement with NEMA premium efficient motors.
- Energy saving opportunities were explored in the operation of variable air volume fume hoods in laboratory areas.



## Campus Integration

- Energy awareness stickers were displayed at the entrances to campus buildings.
- The Million Dollar Challenge was promoted during freshmen orientation fair and events such as Energy Awareness Month.
- OEM helped organize and sponsor the NCSU's largest Earth Day event in the brickyard with over 40 exhibitors including the NC State Energy Office, the NC Solar Center, Students for Sustainable Energy, and NC Green Power.
- Three employees completed the *State Energy Office Diploma Series*.
- The OEM began running a weekly technician advertisement about energy or water conservation.

The tables on the following pages provide more details about the projects that were started or completed in the last year. Included are projects reported by the Office of Energy Management, Utilities Services, HVAC Control Shop, Building Maintenance, and Grounds Irrigation.

**Table of Activities in Five Focus Areas 2005-06**

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
<b>Energy Data Management</b>				
KPI-Benchmarking	Review KPI Quarterly	N/A	Labor	N/A
Monthly Bills (Internal)	Review meter variances monthly	N/A	Labor	Operating
Monthly Bills (Internal)/ Accessibility	New EBS software for internal billing into production	Labor - N/A	\$ 174,000	Operating
Sub-metered data	Handheld computer internal meter reading (Datamatic), tracking 54 more meters (475 total)	Labor - N/A	\$ 25,000	Operating
<b>Energy Supply Management</b>				
Demand-Supply Optimization	Converted eight buildings on main campus to chilled water central loop	N/E	N/E	N/E
Demand-Supply Optimization	Report for Chilled Water Master Plan was delivered, reviewed, and adopted for main campus (Ref. RMF Study)	N/A	\$ 24,000	Operating
Rate Optimization	Switched one account to SGS-TOU, monitored 14 other accounts	\$ 112,000	\$ -	N/A
Supplier Choice	Evaluate purchase of tariff, transport, and strip natural gas versus fuel oil monthly	\$ 970,000	Staff Labor	N/A
Supply Optimization	Inspect steam traps quarterly and replace as needed	N/E	Staff labor + parts	Operating
Supply Optimization/ Accessibility	Purchase master INET 7 software license and survey	N/A	\$ 7,330	COP
Supply Optimization	Assessment of existing boiler plant operational requirements and cost, preliminary layout and boiler configuration development	N/A	\$ 96,439	COP
Supply Optimization	Reviewed six capital projects to downsize transformers and minimize transformer energy losses	N/E	Staff Labor	N/A
<b>Energy in Facilities</b>				
Comprehensive Audits	Selection of vendor for Performance Contracting study	N/A	N/A	N/A
Commissioning	Nine buildings were under commissioning	N/E	N/A	N/A
Facility Walk Through - Lighting	Audited 2 buildings (Carmichael, Student Health)	N/A	\$ 1,200	Operating/ NCDOA
HVAC Controls Tune Up	Tuned up four buildings (Toxicology, Language and Computer Labs, Student Health Center, Clark Hall)	\$ 80,000	\$ 12,284	Operating/ NCDOA
Operating Procedures	Setback 100 buildings over Holiday break	\$ 185,000	Staff Labor	N/A

\*Glossary of Funding terms is provided at the end of the report

**Table of Activities in Five Focus Areas 2005-06**

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
<b>Equipment Efficiencies</b>				
Lighting Upgrades	Install fluorescent lighting in 11 Squash Courts	\$ 11,000	\$ 46,480	R&R
Lighting Upgrades	Install occupancy sensors in classrooms, restrooms, hallway (Tompkins, Research IV)	\$ 2,300	\$ 20,360	R&R
Lighting Upgrades	Install T8/25 Watt lighting in Dabney Hallways, Mann Hall, Research I, and Research II	\$ 35,900	\$ 170,824	COP/R&R
Lighting Upgrades	LED Exit signs installed campus wide	\$ 7,000	\$ 24,687	R&R
Plumbing Upgrades	500 faucet aerators (0.5 GPM) installed campus wide	\$ 5,200	\$ 6,896	R&R
System Upgrades	Surveyed and identified motors for replacement with NEMA premium efficient motors	N/A	Staff Labor	Operating
Plumbing Upgrades	Replace 110 Showerheads at Carmichael (Men's)	\$ 12,000	\$ 20,000	R&R
Irrigation Upgrades	Installed six systems (North Gateway, South Gateway, Visitors Center, Upper Miller Field, LSB Courtyard, MAFTL)	\$ 11,600	\$ 34,903	R&R
Plumbing Upgrades	Install new timers on pig barn flushers	\$ 20,000	\$ 100	Operating
HVAC System Upgrades	Convert controls to Sitenet in two buildings (Ricks and Broughton Halls)	\$ 13,500	\$ 23,400	R&R
<b>Campus Integration</b>				
Awareness and Participation	Displayed energy awareness stickers at campus building entrances	N/A	Staff Labor	Operating
Awareness and Participation	Promoted Million Dollar Challenge at freshmen orientation fair and other events	N/A	Staff Labor	Operating
Awareness and Participation	Organized and sponsored the NCSU Earth Day	N/A	\$ 579	Operating
Awareness and Participation	Held four CAT team meetings	N/A	Staff Labor	N/A
Awareness and Participation	Ran weekly Technician advertisement	N/A	\$ 900	Operating
Awareness and Participation	Redesigned website <a href="http://www.ncsu.edu/energy">www.ncsu.edu/energy</a>	N/A	\$ 1,000	Operating
Performance and Training	Three employees completed the State Energy Office Diploma Series	N/A	Staff Labor	N/A
Performance and Training	Attend national conferences and job related training for energy management (eDNA, AEE, TAC)	N/A	\$ 10,400	Operating

\*Glossary of Funding terms is provided at the end of the report

## Charting NC State's Utility Consumption

The OEM is currently responsible for managing purchased utilities for most buildings on main campus and several research facilities. The OEM reports on both utilities purchased from vendors (such as Progress Energy and PSNC Energy) and demand side utilities provided to individual campus facilities (from substations and thermal plants).

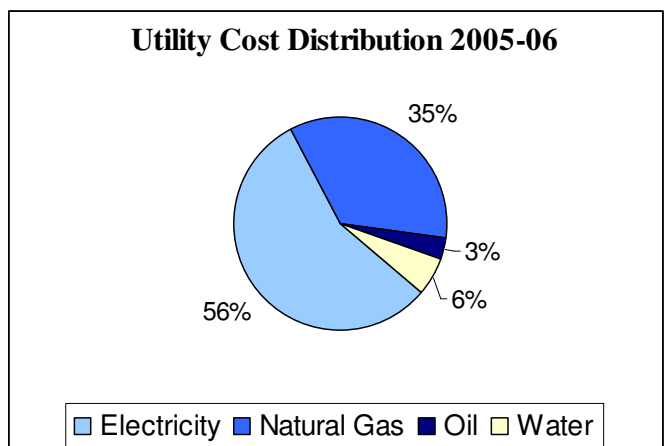
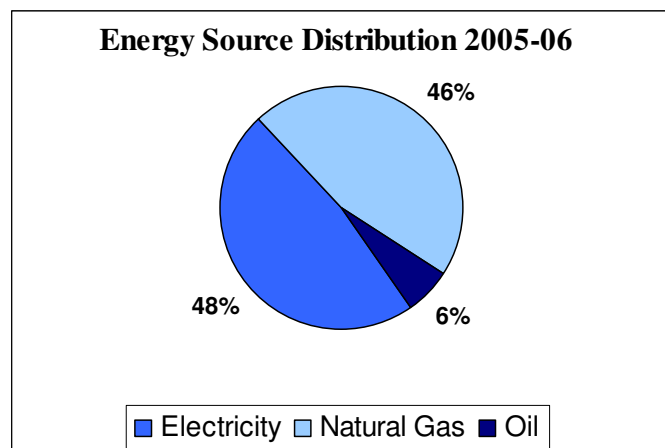
- Purchased Utility Accounts: 120 electric, 89 natural gas, 80 domestic water/irrigation
- Demand Utility Meters: 202 electric, 64 steam/condensate, 148 cold water, 37 domestic and heating hot water, 24 chilled water

The purchased utilities are paid through the Peoplesoft financial system and tracked in Excel and Access databases. The demand side utility meters are read each month with a hand held device and entered into EBS, a utility billing software system. Historical information on demand side utilities is now tracked through an Oracle database. Currently, the demand side data is used to primarily to monitor consumption by receipt-funded entities such as University Housing and Dining. We are also beginning to use this information to benchmark utility consumption for different building types (Classroom, Office, Laboratory) where metering information is available.

The data presented below is based mainly on the supply side data, or utilities purchased by the NC State. Data from submetering on the demand side is presented when available.

### ***Facts about Energy and Water Consumption at NCSU in 2005-06***

- Total amount spent on utilities in FY 2005-06 was over \$29 million
- Electricity accounts for 48% of total energy consumed, but 56% of our utility cost.
- About 38% is spent on heating buildings and for providing hot water.
- Electrical account rate schedule changes have saved \$357,000 to date, over \$112,000 in FY 2005-06
- Natural gas rate negotiations avoided about \$1 million in charges in FY 2005-06.
- About 6% of the total utility cost is spent on purchasing water which is used for irrigation, personal hygiene, make-up water, and in research laboratories. Submetering shows that about 12% of the total water consumed is in the residence halls and 4% is used in the central thermal plants for boiler make up water.



**Total Energy and Water Consumption 2005-06**

The total energy and water consumption as reported to the State of North Carolina is presented below.

Utility	Consumption	Units	Consumption	Units	Cost
Electricity	268,968,522	kWh	917,990	Million BTU	\$16,492,029
Natural Gas	8,863,683	therms	886,368	Million BTU	\$10,260,034
Fuel Oil #6	769,791	Gal	115,469	Million BTU	\$ 935,527
Fuel Oil #2	0	Gal	0	Million BTU	\$ -
<b>Total Energy</b>			<b>1,919,827</b>	<b>Million BTU</b>	<b>\$27,687,589</b>
Water	457,624,904	Gal	611,798	CCF	\$ 1,670,460
Stormwater					\$ 8,780
<b>Total Energy and Water (excluding Stormwater)</b>					<b>\$29,358,049</b>

The university made a settlement with the City of Raleigh for Stormwater fees. The settlement totaled \$288,915.20 and included all fees from February 2004. We began to pay stormwater fees in June 2006 and the cost listed is fees for that month only.

**Key Performance Indicators 2005-06**

As stated in the Energy and Water Mandate, NCSU has established a goal to reduce the:

- Aggregate Annual Energy Consumption per Gross Square Foot, adjusted for weather, by a minimum of 4% over a 10 year period
- Annual Water Consumption Per Gross Square Foot by a minimum of 10% over the baseline year 2001-2002.

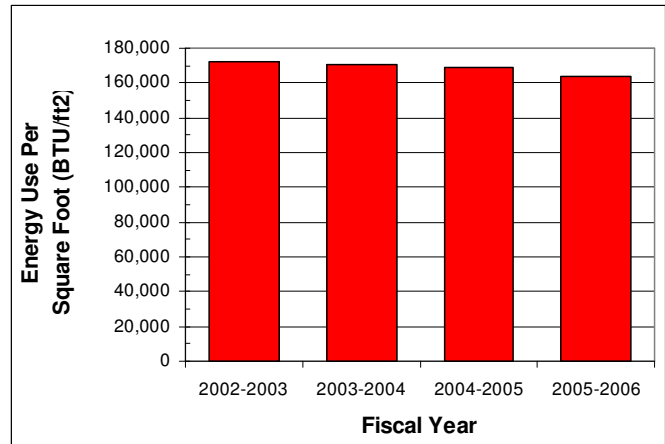
NCSU uses the following Key Performance Indicators to evaluate our progress towards our goal.

Fiscal Year	2001-2002	2002-2003	2003-2004 <sup>2</sup>	2004-2005 <sup>3</sup>	2005-06	% Change 1 Year	% Change from Baseline <sup>1</sup>
Utility Cost per GSF		\$ 1.98	\$ 2.10	\$ 2.18	\$ 2.50	15%	26%
Energy Cost per Thousand GSF per DD		\$ 0.357	\$ 0.386	\$ 0.438	\$ 0.474	8.2%	33%
Energy (BTU) Consumption per GSF		171,888	170,406	168,685	163,756	-2.9%	-4.7%
Energy (BTU) Consumption per GSF per DD		32.8	33.6	36.1	32.9	-8.9%	0.4%
Water Cost per GSF	\$ 0.119	\$ 0.106	\$ 0.137	\$ 0.135	\$ 0.142	5.2%	20%
Water Consumption (CCF) per GSF	0.066	0.054	0.058	0.054	0.052	-3.1%	-21%
Heating and Cooling Degree Days (DD)		5,248	5,078	4,670	4,978	6.6%	-5.1%
Campus Area, Gross Square Feet (GSF)	9,796,638	9,910,619	9,986,663	11,056,592	11,723,681	6.0%	20%
Sponsored Award Activity (Million \$)		\$ 169.5	\$ 208.6	\$ 199.5	\$ 207.0	3.8%	22%
Utility Cost per Student (\$/FTE)		\$ 701	\$ 743	\$ 857	\$ 1,043	22%	49%
<p>Note 1: Baseline year for Water Cost per GSF and Water Consumption per GSF is 2001-02 because of Governor Easley's Executive Order Number 26. For all other Key Performance Indicators, the Baseline Year is 2002-03.</p> <p>Note 2: A correction was made to reported Degree Days for 2003-04</p> <p>Note 3: A correction was made to reported total gas usage for 2004-05 for error in March 2005.</p>							

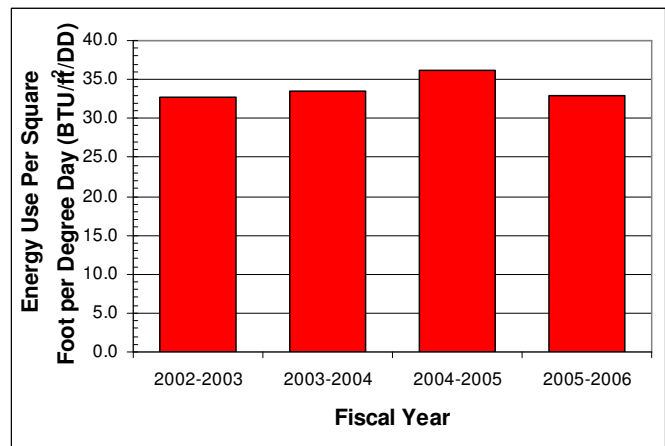
## Trends in Energy and Water Consumption at NCSU

Energy and water use and cost depend on weather and campus growth (people and building square feet). The trends in energy and water consumption and progress on our commitment to the state to reduce are shown below.

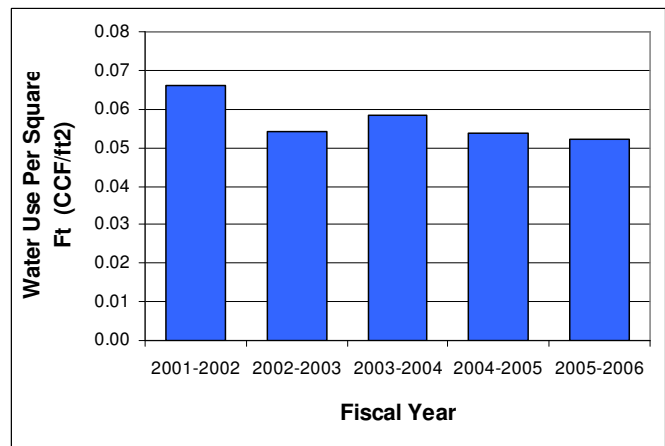
The energy use per square foot has steadily trended down from 2002-03 as shown in the chart on the right. Overall, based on total million BTUs per square foot, energy usage per square foot has **reduced 4.7%** since 2002-03. A significant reduction is shown for the 2005-06 year. This energy use per square foot does not take into account the effect of weather on energy use.



NCSU committed to the State of NC to reduce its energy consumption per gross square foot, adjusted for weather. This is measured in BTU per square foot per total heating and cooling degree days (BTU/ft<sup>2</sup>/DD). The trend of energy adjusted for weather has also begun to decrease as shown in the second graph. Since 2002-03, NCSU has **increased by 0.4%** in BTU/ft<sup>2</sup>/DD overall. It is believed that there was a large increase in BTU/ft<sup>2</sup>/DD in 2004-05 due to a mild weather year. Also, there was a significant number of buildings brought online in that year and building HVAC systems may not have been optimized yet.

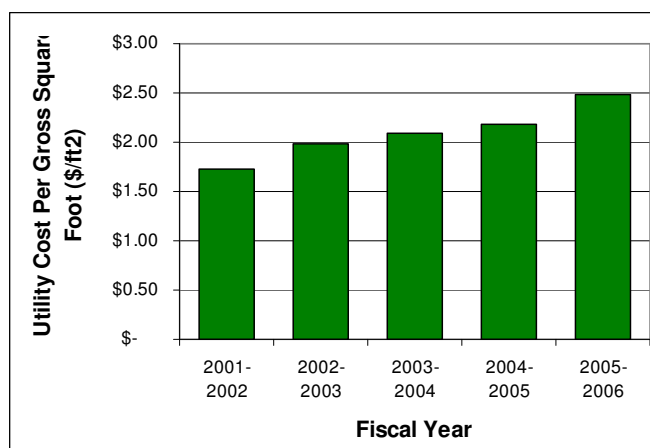


NC State met the goal to reduce water consumption by 10 % over the baseline year 2001-2002 by 2002-03. Water conservation practices were implemented in response to the drought of 2002-03 and have been maintained and expanded. By 2005-06, we have now doubled that goal and are **down by 20%** over 2001-02. This is due to several factors: Improved irrigation control through Grounds Management, operation of central chilled water plants, and installation of water-saving fixtures including showers, faucets, and laundry machines.

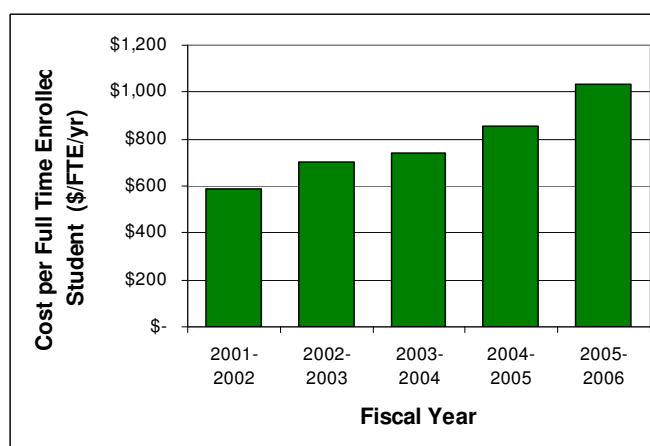


## Trends in Energy and Water Costs at NCSU

There has been a significant increase in fossil fuel prices this year, which directly impacts the prices of natural gas and electricity for the university. The cost of water has also increased. Therefore, while conservation measures are implemented to reduce the overall consumption, the cost per square foot will likely continue to increase. The cost per square foot is now about \$2.50. This cost is **up by 26%** over 2002-03.



Another key performance indicator that NCSU is tracking is the cost per full-time enrolled (FTE) student. The FTE reported only includes on campus students (not distance education students). While the campus has been expanding rapidly due to the 2000 Bonds for Higher Education, there has not yet been a significant increase in student enrollment. The cost per student is **up 49%** over 2002-03.



## Avoided Costs: Rate Negotiations

The Office of Energy Management focuses on both saving money (and avoiding cost) and energy. The following table summarizes monetary savings to date realized through the rate schedule changes for electricity and gas/oil negotiations. Natural gas prices fluctuated drastically in the first half of 2005-06 due to damage from Hurricanes Katrina and Rita. The price did stabilize after a mild winter.

Description of Activity	Recorded Avoided Costs Fiscal 02-03 to Fiscal 04-05	Avoided Costs Fiscal 04-05	Total Avoided Costs Recorded to Date
Progress Energy – 15 accounts changed from standard service to Time Of Use	\$247,285	\$112,021	<b>\$359,306</b>
Natural gas negotiations – Strip/Transport Vs. PSNC Tariff rate	\$552,943	(\$16,097)	<b>\$536,846</b>
Natural gas negotiations – Alternate Fuels (Oil/NG) Vs Transport rate	\$1,470,298	\$989,181	<b>\$2,459,479</b>

\*Strip gas in addition to transport gas was used this fiscal year

## Highlights of Future Plans for 2006-07

Our first three years was spent collecting data, identifying opportunities, implementing pilot solutions, quantifying the results, and then identifying larger scale projects. From this we developed the basis for guidelines and procedures that will provide the foundation for the conservation measures that will allow us to meet our long-term goal. Our projected activities will continue implementing conservation practices and assessing their results as outlined below:

- For fiscal year 2006-07, the Office of Energy Management will continue to provide technical expertise for optimizing the Central Thermal Plants as more metering data is available
- We will complete the transition to the new software for the functions of energy management, vendor utility bill reconciliation and internal utility billing on to a single system. By the end of next fiscal year, this will be the sole system for managing energy data.
- We will continue to upgrade and add meters to campus buildings to begin to benchmark and classify buildings on campus. As we add meters and buildings, they will be monitored in the new utility software system and the real time eDNA monitoring system.
- The office intends to expand its campus activities and will work with entities that exist already including the Students for Sustainable Energy, Student Activities, and pilot the GREEN residence hall program with University Housing.
- NCSU will be purchasing a Supervisory Control and Data Acquisition System for utility distribution and building controls.
- Building lighting projects will be continued. These projects will make use of occupancy sensors, re-lamping, de-lamping, and light replacement as appropriate for the area.
- The Conservation Awareness Team will meet as required to track progress on existing projects and identify new opportunities.

### ***Fiscal 2006-07 Estimated Activities and Expenditures***

A detailed list of planned projects for 2006-07 is shown in the table below and on the following pages.

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
<b>Energy Data Management</b>				
Monthly Bills	Purchase invoicing upgrade for accounts receivables and contractors	Labor and improved collections	\$ 18,000	Operating
Monthly Bills (Payable) / Accessibility	Pay utilities through billing system and make all utility information web accessible	Labor - N/A	\$ 19,000	Operating
Sub-metered Data	Purchase Modbus Interface for eDNA and Cutler Hammer electric meters in Yarbrough plant - connect 50 Meters total for real-time	Labor - N/A	\$ 40,000	COP
Sub-Metered Data	Purchase and install 60 electric and wet meters for buildings and wet meters on central plant. (Ref-Kling Projects)	N/A	\$ 470,000	COP

\*Glossary of Funding terms is provided at the end of the report

**2006-07 Estimated Activities and Expenditures (Cont'd)**

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
<b>Energy Supply Management</b>				
Demand-Supply Optimization	Chilled Water master plan report will be reviewed and adopted for CBC campus	N/A	\$ 45,000	0
Rate Optimization	Switched Sullivan to LGS TOU	\$ 70,000	\$ -	NA
Supplier Choice	Evaluate purchase of tariff, transport, strip natural gas, and fuel oil monthly	\$ 1,000,000	Staff Labor	N/A
Supply Optimization	Inspect steam traps quarterly and replace as needed	N/E	Staff labor + parts	Operating
Supply Optimization/ Accessibility	Purchase Supervisory Control and Data Acquisition (SCADA) system for utility distribution and building controls	N/E	\$ 250,000	COP
Supply Optimization/ Accessibility	Purchase TAC, Yamas and JCI modbus to access central plant and building controls from web	N/A	\$ 70,000	COP
Supply Optimization	Finalize recommendations and do preliminary design for boiler study	N/A	\$ 54,000	COP
<b>Energy in Facilities</b>				
Comprehensive Audits	Comprehensive survey of 12 sample buildings to be complete for Performance Contracting Study	N/A	\$ 75,000	R&R
HVAC Audit	HVAC Audit for one building (Carmichael)	N/A	\$ -	IES/ NCDOA
HVAC Controls Tune-Up	Tune Up four buildings: (COE I, Cox Hall, David Clark Labs, Fox Lab)	\$ 187,000	\$ 16,000	Operating/ NCDOA
HVAC Tune-Up	Tune up one building - Yarbrough	N/E	\$ 5,000	R&R
Comprehensive Audits	Audit 8 buildings (Caldwell, Winston, Tompkins, CBC 301, and 4 more to be determined )	N/A	\$ 4,800	Operating/ NCDOA
Operating Procedures	Setback 100 buildings over Holiday break	\$ 150,000	Staff Labor	N/A
<b>Equipment Efficiencies</b>				
HVAC System Upgrades	MERC Metasys Extended Architecture upgrade	\$ 20,000	\$ 59,000	Operating
HVAC System Upgrades	Ricks Hall Sitenet conversion	\$ 12,000	\$ 16,000	R&R
HVAC System Upgrades	Convert Pneumatic to DDC (Scott, Poe, Kamphoefner)	\$ 191,000	\$ 720,000	COP/R&R
HVAC System Upgrades	Outdated DDC to Web based DDC (College of Textiles, Mann Hall, Burlington, Partners III)	\$ 78,300	\$ 525,000	R&R

\*Glossary of Funding terms is provided at the end of the report

**2006-07 Estimated Activities and Expenditures (Cont'd)**

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
<b>Equipment Efficiencies (Cont'd)</b>				
Irrigation Upgrades	Remove irrigation system from city water at CBC	N/E	\$ 1,500	Operating
Lighting Upgrades	Install T8/25 Watt lighting in (Mann Hall, Dabney)	\$ 15,000	\$ 56,000	COP/ R&R
Lighting Upgrades	Continue lighting upgrades at Carmichael (Weight rms, locker rooms, mech rms, Squash cts, racquetball cts, running track, classrooms)	\$ 7,600	\$ 29,000	R&R
Lighting Upgrades	Add occupancy control in rest rooms, classrooms, break areas (Main Campus and CBC)	\$ 5,800	\$ 29,000	R&R
Lighting Upgrades	Electronic Ballasts for Yarbrough HID Lamps	N/E	\$ 5,000	R&R
System Upgrades - HVAC	Stand Alone HVAC Unit for Yarbrough Control Room	N/E	\$ 15,000	R&R
System Upgrades - Motors	Replace 48 motors using premium efficient style	\$ 16,700	\$ 100,000	COP
<b>Campus Integration</b>				
Awareness and Participation	Run Technician ad daily	N/A	\$ 3,500	Operating
Awareness and Participation	Design, print, and distribute 5000 tri-fold brochures on energy and water conservation and print 35 educational bulletin boards	N/A	\$ 2,730	Operating
Awareness and Participation	Light switch and building/vending machine sticker design and placement	N/A	\$ 2,000	Operating
Awareness and Participation	Energy awareness displays at Talley	N/A	Staff Labor	Operating
Awareness and Participation	Pilot GREEN program for Residence Halls with Univ. Housing and OWRR	N/A	Staff Labor	Operating
Awareness and Participation	Hold bi-monthly CAT meetings	N/A	Staff Labor	Operating
Awareness and Participation	Launch new website and keep updated	N/A	Staff Labor	Operating
Awareness and Participation	Awareness events (Energy Awareness Month, Movies, Organization fairs)	N/A	TBD	Operating
Awareness and Participation	Awareness events (Earth Day)	N/A	\$ 600	Operating
Performance and Training	EBS Training	N/A	Staff Labor	Operating
Performance and Training	Attend national conferences and job related training for energy management (AASHE, eDNA, ASHRAE, TAC)	N/A	\$ 13,600	Operating

\*Glossary of Funding terms is provided at the end of the report

# The Strategic Energy and Water Plan

The Office of Energy Management worked with the NC State Energy Office to develop a strategic plan to achieve the goal of reducing long-term reduction of 20% in unit consumption of energy that is purchased by NCSU. The Strategic Plan Matrix allows us to track the details of our activities in each of the five focus areas.

NCSU Energy Management Strategic Plan Matrix					
Focus Area	Phase I	Phase II	Phase III	Phase IV	Phase V
<b>ENERGY DATA MANAGEMENT</b>					
Supply Side Utility-Owned Meters (250)					
Determine information available/required #	■				
Create systems to capture/accumulate data #	■				
Establish Key Performance Indicators #		■			
Annual report for SEO #		■	■	■	■
Initiate reporting #	■				
Monthly report for detailed account analysis #		■	■	■	■
Procedures for account maintenance		■			
Demand Side NCSU-Owned Meters (350+)					
Create systems to capture existing data #	■				
Determine information available/required		■			
Determine meter type & location requirements		■			
Meter additions & repairs		■	■	■	■
Locate & map all existing meters	■	■			
Make Energy Data Accessible to All Users					
Select & purchase utility accounting software		■	■		
Transfer supply and demand accounts			■	■	■
Initiate reporting; format & content			■	■	■
Establish benchmarks / bldg rankings		■	■	■	■
Establish load profiles			■	■	■
<b>ENERGY SUPPLY MANAGEMENT</b>					
Price negotiations for deregulated utilities	■	■	■	■	■
Implement monthly transport NG purchases	■	■	■	■	■
Implement monthly PSNC rate 160 NG purchases	■	■	■	■	■
Central Thermal Plants	■	■	■		
Review data for utility accounts	■	■	■	■	■
Rate schedule optimization	■	■	■	■	■
Account & meter consolidation		■	■	■	■
Method to verify LGS & LGS-TOU rates #	■				

### Legend

- Major Development of Task
- Extension of Task
- Implementation
- # Denotes work complete

NCSU Energy Management Strategic Plan Matrix (Cont'd)					
Focus Area	Phase I	Phase II	Phase III	Phase IV	Phase V
<b>ENERGY USE IN FACILITIES</b>					
System condition assessments	Red	Red	Red	Red	Red
Audits by Energy Mgmt Dept	Red	Red	Red	Red	Red
Upgrade equipment & building control systems		Blue	Blue	Red	Red
Maintenance Preventive & remedial		Blue	Red	Red	Red
Repair/replace decisions		Blue	Red	Red	Red
Establish operating procedures/guidelines		Blue	Cyan	Cyan	Cyan
Lighting efficiency guidelines	Blue	Blue	Cyan	Cyan	Cyan
Motor efficiencies replacement guidelines	Blue	Blue	Cyan	Cyan	Cyan
Building operation guidelines (automation systems)		Blue	Cyan	Cyan	Cyan
Optimize settings on Building Automation Systems		Blue	Cyan	Cyan	Cyan
Audits and Tune-ups through SEO				Blue	Red
Boiler Study				Blue	Blue
Performance Contracting Study				Blue	Cyan
Evaluate alternative/renewable fuels for boilers				Blue	Blue
<b>EQUIPMENT EFFICIENCY</b>					
Pilot lighting programs #	Blue	Blue			
Test effectiveness of occupancy sensors #	Blue	Blue			
Reduced flow shower heads and sink aerators		Blue	Cyan	Cyan	Cyan
Carmicahel Gym Squash Court Lighting			Blue	Blue	Blue
Occupancy Sensors in Appropriated Buildings				Blue	Red
LED Exit Lights in Appropriated Buildings			Blue	Red	Red
Lighting Upgrades at Building Level				Red	Red
Replace Inefficient Motors Campus Wide			Blue	Cyan	Red
Evaluate Pilot Solar Hot Water Project				Blue	Blue
Evaluate Energy Savings Opprotunites in Laboratories				Blue	Blue
<b>CAMPUS INTEGRATION</b>					
"Turn It Off" sticker campaign	Red	Red	Red	Red	Red
Web site	Blue	Blue	Red	Red	Red
Presentations	Blue	Blue	Red	Red	Red
Campus publications	Blue	Blue	Red	Red	Red
Liaisons	Blue	Blue	Blue	Blue	Blue
Student Groups	Blue	Blue	Red	Red	Red
Logo #		Blue	Blue		
Controls Systems, Meters, eDNA Training			Blue	Blue	Red
Energy Management Diploma program #	Blue	Blue	Red	Red	Red
SEO workshops	Blue	Blue	Blue	Blue	Blue

- Legend
- Major Development of Task
  - Extension of Task
  - Implementation
  - # Denotes work complete

# Glossary of Terms

## **Abbreviations in Activities Table**

**COP** – Certificate of Participation funds

**N/A** – Not Applicable, direct savings from these tasks not quantifiable

**N/E** – Not Estimated, direct savings from these tasks is quantifiable, but is not estimated due insufficient supporting data

**NCDOA** – NC Department of Administration helped fund through State Energy Office

**Operating** –Operating funds from department responsible for task

**R&R** – Repair and Renovation funds, may be either CI (Capital Improvement) or Recurring

## **Definitions**

**BTU** – Measure of Energy, British Thermal Units, 3413 BTU=1 kWh

**CCF** – Measure of Volume, 100 Cubic feet, 1CCF= 748 gallons

**DD** – Degree Days, a unit of measurement equal to a difference of one degree between the mean outdoor temperature on a certain day and a reference temperature (65°F). Used to estimate the energy for heating or cooling a building. Use Raleigh RDU Airport Data from Weather Underground

**FTE** – Full Time Enrolled Students, On campus Total Headcount Enrollment: Includes all on-campus students enrolled for one or more course in regular fall term with each person counted only once. Excludes audit only and extension students. Obtained from Item # 10 at <http://www2.acs.ncsu.edu/UPA/fastfacts/quick.htm>. Official Source: Student Data File as submitted to UNC-General Administration

**Gal** – Measure of Volume, Gallons

**GSF** – Gross Square Feet, total building square footage that we provide utilities, includes parking decks. Source: Facilities Operations Budget Office

**kWh** – Measure of Energy, usually in reference to electricity, 1 kWh = 3413 BTU

**MMBTU** – Measure of Energy, 1 Million BTU, 1MMBTU= 10<sup>6</sup>BTU

**Sponsored Award Activities** - Amount of Grants Proposals Awarded: Total dollar amount of grants awarded for organized research, extension, public service and instruction activities funded through sources external to the University. Obtained from Item # 29 at <http://www2.acs.ncsu.edu/UPA/fastfacts/quick.htm>.

**Therm** – Measure of Energy, usually in reference to natural gas, 1 Therm = 10<sup>5</sup>BTU

# Strategic Energy and Water Plan Commitment for North Carolina State University

We recognize energy and water as controllable expenses wherein savings result in reducing overall operating cost. Energy and water management is a responsibility of the staff, faculty and students at each facility, guided and supported by the Energy Manager.

- North Carolina State University will develop a Strategic Energy and Water Plan. The Assistant Director for Utilities Services is responsible for the success of the Program at the campus facilities.
- The Energy Management Engineer is responsible for implementation of North Carolina State University's Strategic Energy and Water Plan.
- The Assistant Vice Chancellor for Facilities Operations will review progress and results quarterly.

## **Strategic Energy and Water Plan Commitment- Goals**

Recognizing that North Carolina State University is experiencing significant growth in facilities and utilization rates, we will establish a goal to reduce the Aggregate Annual Energy Consumption per Gross Square Foot, adjusted for weather, by a minimum of 4% over a 10 year period based on the Key Performance Indicators listed below, using Fiscal Year 2002/2003 as a baseline. We will reduce Annual Water Consumption Per Gross Square Foot by a minimum of 10% over the baseline year 2001-2002.

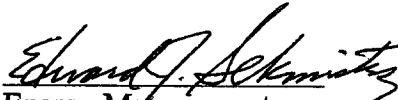
## **Strategic Energy and Water Plan Commitment- Measures**

Our tracking measures will be the following State Key Performance Indicators (KPI)

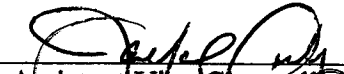
- *Total Utilities Cost per Gross Square Feet*
- *Total Energy Cost per Thousand Gross Square Feet per Degree Day*
- *Total Energy Consumption in BTU's per Gross Square Feet*
- *Total Energy Consumption in BTU's per Gross Square Feet per Degree Day*
- *Total Water Cost per Gross Square Foot*
- *Water Consumption in Hundred Cubic Feet (CCF) per Gross Square Foot*
- *Total heating and cooling Degree Days*
- *Campus Area (GSF)*
- *Growth in Research Programs(\$)*
- *Utility Cost per Student (\$/FTE)*


## **Strategic Energy and Water Plan - Commitment**

Implemented this 29<sup>th</sup> day of September, 2006.

  
\_\_\_\_\_  
Energy Management  
Engineer

  
\_\_\_\_\_  
Assistant Director of  
Utilities Services

  
\_\_\_\_\_  
Assistant Vice-Chancellor  
for Facilities Operations

  
\_\_\_\_\_  
Associate Vice-Chancellor  
for Facilities

This Energy and Water Commitment serves as a Memorandum of Agreement to support Strategic Energy and Water Plans for the state Utility Savings Initiative.

\_\_\_\_\_  
Director State Energy Office

\_\_\_\_\_  
Date