



**THE UNIVERSITY OF NORTH CAROLINA
AT CHAPEL HILL**

STRATEGIC ENERGY AND WATER PLAN—2014

Table of Contents

Executive Summary	1
Energy Demand	2
Energy Conservation Measure (ECM) Program.....	2
Dedicated Energy Projects	3
Capital Projects	3
Energy Generation and Distribution	5
Cogeneration Facility.....	5
Chilled Water Department.....	5
Electric Distribution Systems	6
Education and Outreach	7
Education.....	7
Outreach.....	8
Student Involvement	9
Water Resources Management	10
Summary	10
Potable Water – Summary of Activities.....	11
Non Potable Water – Summary of Activities.....	11
UNC-Chapel Hill Successes	12
Appendix	13
Energy Projects at UNC-Chapel Hill.....	13
Energy Mandate	19
Staff	20

List of Tables

Table 1: Energy Consumption Summary.....	1
Table 2: Potable Water Usage Summary.....	10

List of Figures

Figure 1: UNC Annual Energy Intensity FY2003–2014.....	2
Figure 2: Chilled Water Performance	6
Figure 3: UNC Annual Water Intensity FY2003-2014	10
Figure 4: All Campus Water Consumption.....	11



EXECUTIVE SUMMARY

This year, UNC-Chapel Hill reports a 31% overall reduction in energy usage and a 48% reduction in potable water usage since the base year, FY2002-03. This reduction represents \$223M in avoided energy costs and \$23.8M in avoided water costs over that time period.

This year, the university focused on traditional energy projects by taking advantage of available funding from unspent utility appropriations. In total, \$5.4M in energy and water conservation projects were identified and funded. These projects included lighting upgrade projects, primarily LED upgrades, and laboratory airflow reduction, re-commissioning and HVAC controls upgrades.

In late March, UNC-Chapel Hill opened Marsico Hall, a new nine-story, 340,000 square foot research lab. Since only two months of energy usage is represented in Marsico this fiscal year, the university did not include it in this report. Marsico Hall, though designed for energy efficiency, represents one of the most energy intensive footprints on campus due to its programming.

Further analysis of the results indicates weather did not play a significant role in reduced energy performance as it was statistically identical to the base year. The campus research laboratories increased in energy usage as did the receipt supported buildings. Natural gas usage in campus buildings reached a high of 951,000 therms.

Energy Consumption Summary

Year	Energy Cost Avoided	Square Foot Cost (\$ / GSF)	Energy Cost (\$ / MMBtu)	Energy Intensity (Btu / GSF)	Energy Intensity Change
2002-03	-	\$3.53	\$18.22	193,502	-
2003-04	\$2,574,607	\$3.45	\$18.83	183,400	-5%
2004-05	\$4,652,644	\$3.56	\$20.18	176,581	-9%
2005-06	\$11,248,512	\$3.62	\$22.41	161,495	-17%
2006-07	\$8,125,957	\$4.00	\$23.28	171,648	-11%
2007-08	\$15,061,496	\$4.16	\$26.06	159,694	-17%
2008-09	\$12,889,637	\$4.72	\$28.21	167,358	-14%
2009-10	\$20,287,078	\$4.84	\$30.97	156,406	-19%
2010-11	\$27,017,595	\$4.78	\$32.50	147,037	-24%
2011-12	\$38,152,581	\$4.75	\$35.37	134,144	-31%
2012-13	\$43,465,689	\$4.68	\$36.27	129,085	-33%
2013-14	\$39,520,282	\$4.72	\$35.36	133,465	-31%

Table 1: \$223M in cost avoidance since FY2002-03 and 31% reduction in energy intensity. Energy Services buildings, leased facilities and UNC Hospital facilities are excluded.

ENERGY DEMAND

FY2013-14 Activities

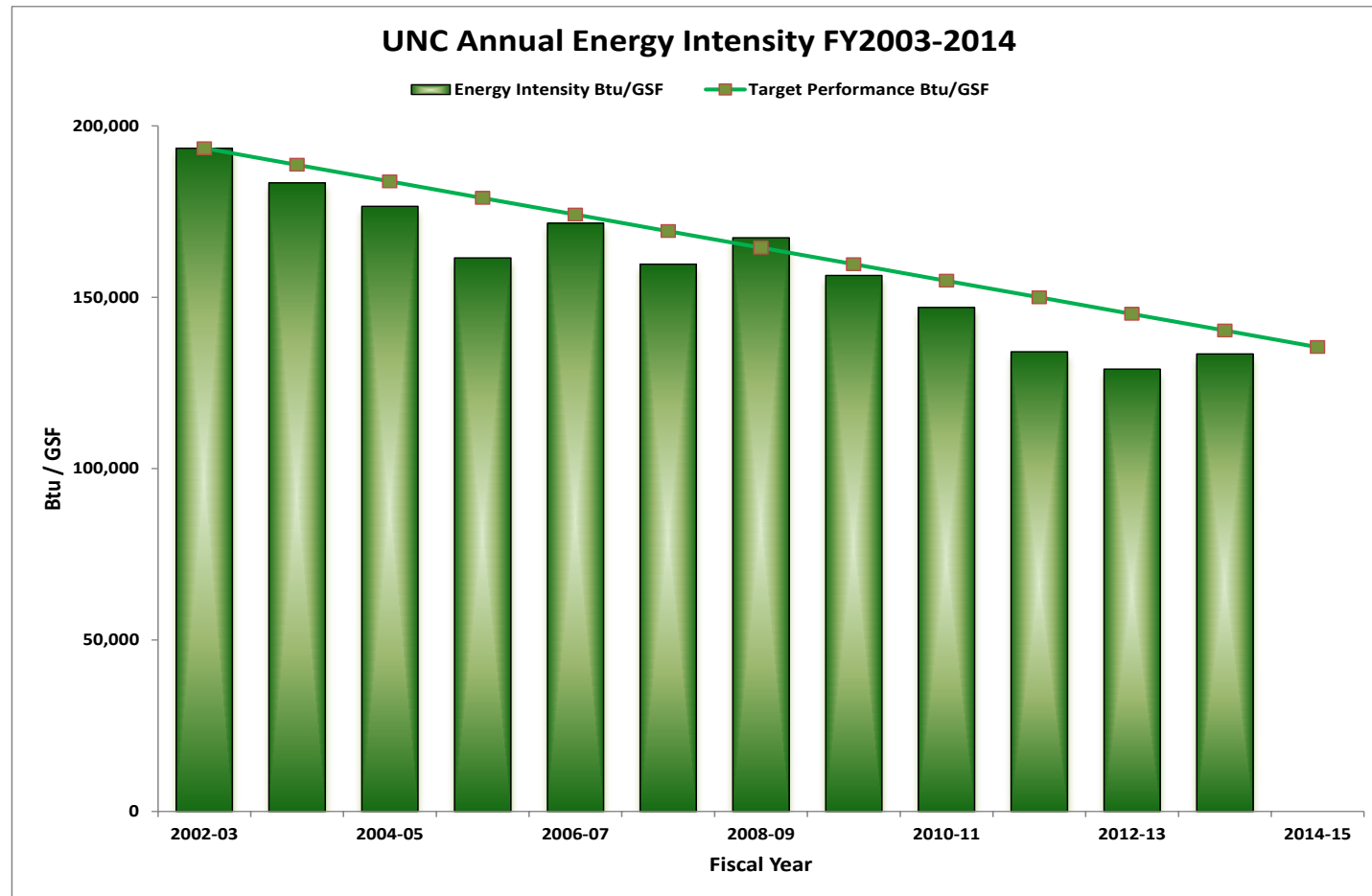


Figure 1: Annual Energy Consumption reduced by 31% to 140 kBtu/GSF exceeding the 30% target established by NC Senate Bill 668.

Energy Conservation Measure (ECM) Program

The ECM program continued through this fiscal year. This program is a continuous commissioning program led by in house resources. The building area in the program did not increase and remains at approximately 10M square feet, or approximately 54% of central campus. The focus this fiscal year was monitoring performance of buildings and correcting deficiencies. The program savings are approaching \$28M with additional benefits of 230,000 metric tons of CO2 equivalent reduction and 160M gallons of water saving. The university is piloting a utility analysis and fault detection software for possible expansion across campus to aid in measurement and verification as well as building performance monitoring.

“MONEY ISN’T ALL YOU’RE SAVING.”

-EPA

Dedicated Energy Projects

This year, UNC-Chapel Hill identified, scoped and funded approximately \$5.4M towards energy conservation projects. In aggregate, the expected simple payback is less than 5 years. These projects are funded in a variety of manners including \$1.6M in funding through NC House Bill 1292, which allows use of unspent utility allocations. Additionally, \$3.8M in funding is provided by the university. These projects include \$3.4M of scope developed in the performance contract, \$1M for lighting, primarily LED upgrades, and the remainder building automation controls projects.

Capital Projects

Several capital projects that are underway will have significant impacts on energy consumption on campus.

Craige Parking Deck expansion is installing additional levels on an existing deck and installing LED lighting, which should reduce the overall energy consumption. Currently under construction, the project is expected to be completed in June 2015.

Parking Deck Lighting - The project will provide for the design and installation of energy efficient LED lighting in various campus parking decks to reduce energy consumption and provide better lighting for security. The project will evaluate independent lighting systems in nine parking decks for consideration to upgrade to high efficiency LED lighting.

Marsico Hall – This 340,000 square foot building was dedicated in late March 2014. This research laboratory is the second largest on campus and is expected to increase the energy usage per square foot for campus due to installed energy intensive imaging equipment. This building does have the university’s first water source heat recovery chiller which will cool the campus chilled water and reject the heat to the building heating water system.

New chiller plant – This project is in the early design phase and will replace five existing steam absorption chillers with two 5000 ton steam driven chillers. The benefits are two fold: to increase the chiller efficiencies and to provide base steam load for the cogeneration facility in the summer time. This project will be complete in the fall of 2017.

Project Spotlight

Lighting Upgrades

UNC-Chapel Hill has completed installation of LED lighting in 34 buildings, 2 parking decks, and a large portion of site lighting on University properties. The interior LED retrofit lamps and fixtures were installed in chandeliers, track lighting, pendant lighting, downlights and troffers. Interior spaces include classrooms, offices, labs, corridors, elevators, lobbies, dining areas and retail. New exterior LED pole and building wall lighting were installed across the main campus and other buildings off campus. LEDs have replaced incandescent, metal halide, high pressure sodium and obsolete fluorescent lighting and have 50% or greater energy and maintenance savings. UNC-Chapel Hill is continuing to identify spaces where LED upgrades will be provided with similar savings and maintenance benefit. Currently, there are an additional 18 buildings with areas that are being designed or in construction for LED upgrades.

Upper Quad Residence Halls - The project will plan the replacement of the existing HVAC and window systems in Mangum, Ruffin, Manly and Grimes Residence Halls. These building systems were replaced in 1989 and this proposed update is expected to significantly improve the energy efficiency and indoor air quality in these 1920's era residence halls. Project completion is fall 2015.



Wilson Library's chandeliers incandescent lamps replaced with LED lamps

ENERGY GENERATION AND DISTRIBUTION

Cogeneration Facility

The landfill gas generation system at Carolina North continued commercial operation in FY2014. During the year, the generator produced 7.9M kilowatt hours of electricity and consumed 131.8M cubic feet of landfill gas. During the same time the system collected and flared an additional 89.3 million cubic feet of landfill gas. This gas was approximately 58% methane equating to the destruction of 128.2 million cubic feet of methane. At 21 times the global warming potential of CO₂, this is equivalent to removing approximately 85 million pounds of CO₂ from the atmosphere. The on-site electrical generation also prevented another 6.2 million pounds of CO₂ from being released by the public utility.

The Cogeneration Facility continues to replace aged thermal piping systems in the distribution network to improve safety, reliability, and thermal efficiency. A 3,000 foot section of walkable steam tunnel is currently under renovation. The insulating capacity of the system will double with this project, which is expected to complete construction in FY2014-15. Over the next five years, the Cogeneration Facility expects to do similar projects on six additional piping runs.

Chilled Water Department

In FY2013-14, the Chilled Water department continued to work on optimization and efficiencies. The maintenance staff has performed inspections to determine physical and operational conditions of chillers and support equipment. Planning has begun for replacement of five steam absorption chillers. The project is scheduled to be complete by FY 2017.

The Chilled Water department commissioned the heat recover chiller installed in the District Energy Plant during the construction of Marsico Hall. The chiller will be placed in operation during the fall and winter months. Technicians continue to work on the four year project to replace programmable logic controllers (PLCs) for bridge controls in all buildings. To date, 93 controllers (58% of total) were replaced.

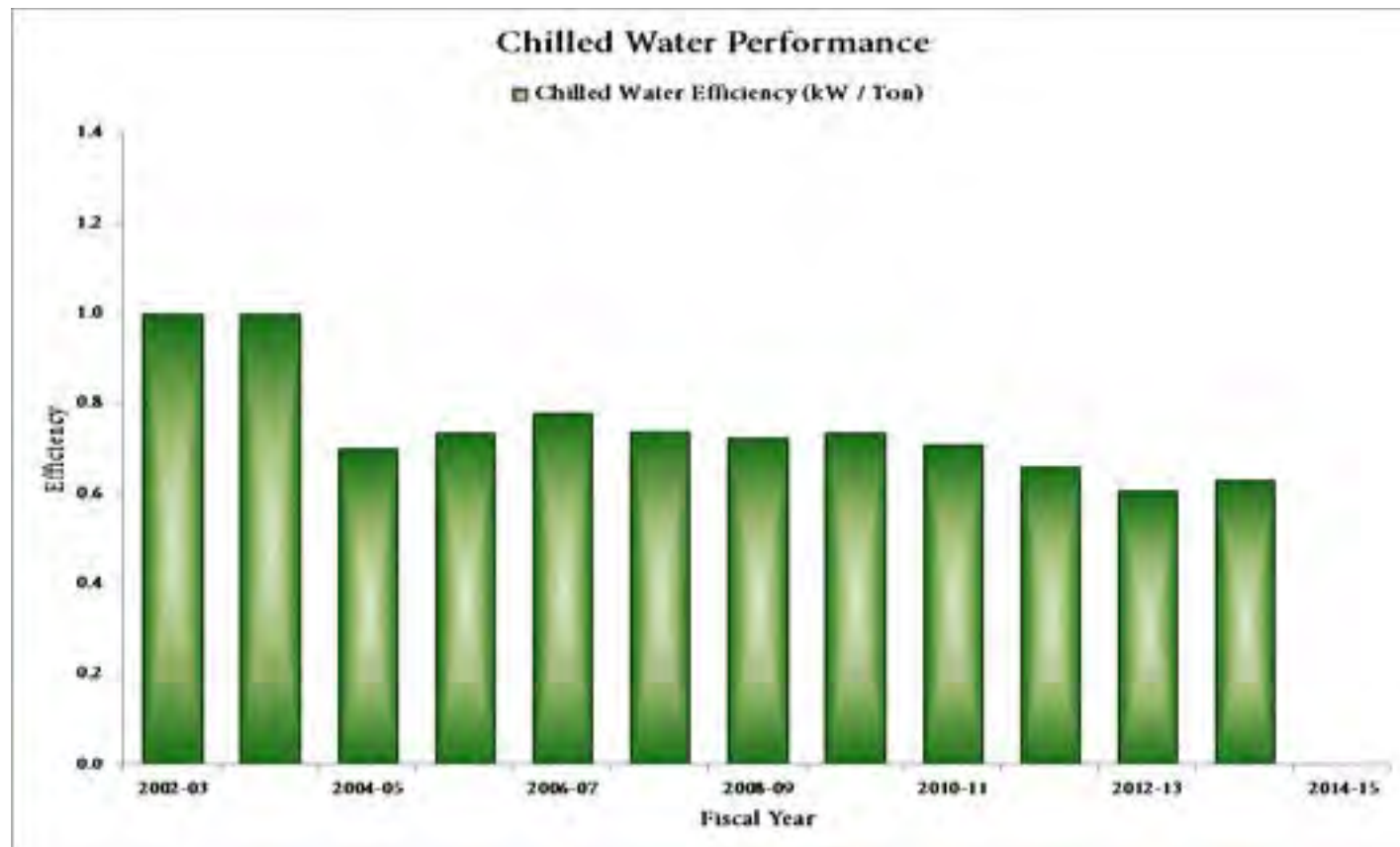


Figure 2: Chilled Water Generation Efficiency improved by 37% over the last ten years.

Electric Distribution Systems

UNC-Chapel Hill's Electric Distribution Systems (EDS) replaced 43 high pressure sodium lights with LEDs, which resulted in an annual savings of approximately \$1,830. The longer life of the LED lights will also result in an annual maintenance savings of \$386, for a total annual savings of \$2,216. EDS will continue to look for financially prudent opportunities to replace lighting with efficient LED lighting.

EDS is investigating the possibility of utilizing high-efficiency transformers to reduce system losses. With rising electric costs, the opportunity to upgrade to more efficient equipment might now be economically viable.

EDS employs 332 "smart" meters out of a total of 494 meters installed. Of these 332 "smart" meters, 251 are connected to the SCADA network by fiber. These meters not only provide all electrical billing information, but they also capture important power quality information to help diagnose problems on the electric system.

EDUCATION AND OUTREACH

Education

Understanding where energy comes from, how it is used, and the environmental, economic, and social impacts associated with its use are integral to understanding current and future policy-making. Fossil fuel extraction and use are changing the climate. Finding solutions to today's energy challenges is a large and growing field. In response to student demand, the number of energy-related courses available at UNC-Chapel Hill is growing. A new Energy and Climate course is taught by faculty from environmental studies, marine sciences and physics.

Energy is a new focus area for students pursuing an MBA at the Kenan-Flagler Business School. The focus prepares students for various roles in the energy sector and provides students with exposure to the energy value chain as well as the design and management of energy markets. Popular elective courses include Alternative Energy, Energy Project Finance, and Renewable Energy.

In February 2014, the UNC-Chapel Hill Institute for the Environment hosted the first-annual N.C. Clean Tech Summit in partnership with the UNC-Chapel Hill Kenan-Flagler Business School Center for Sustainable Enterprise, the Research Triangle Clean Tech Cluster, and Strata Solar. More than 300 people from industry, academia, and state government discussed clean technology in North Carolina, an emerging industry involving solar power, biofuels, alternative transportation, electric grid modernization, water conservation, improving energy efficiency, waste reduction, and more.

Senior campus administrators, students, faculty and staff from across higher education in North Carolina including 17 public institutions and six private university partners convened at the

annual Appalachian Energy Summit to share best practices. System-wide, long-term objectives set forth by UNC General Administration include:

- Educating students to be leaders of tomorrow
- Reducing and stabilizing the university system's average annual energy expenditures
- Transforming and stimulating the North Carolina economy
- Positioning the UNC system and private university colleagues as national leaders
- Creating a culture of environmental and economic sustainability

Integration

For the first time, UNC-Chapel Hill has a three-year campus theme: Water in Our World. Faculty from across the university are incorporating water themes into their teaching, writing, and assigned projects. A tour of Carolina's water infrastructure —past, present, and future— was offered to participants at the international Water and Health conference in Fall 2012.

"THE CHEAPEST ENERGY IS THE ENERGY YOU DON'T USE IN THE FIRST PLACE."

-SHERYL CROW

Outreach

Conserving Carolina Recognition Program

The Energy Management energy conservation recognition program recognizes faculty, staff, and students for their energy conservation efforts on campus. The recognition program rewards measurable energy savings efforts for individuals or teams.

Energy Use Dashboard

The online Energy Dashboard developed by UNC-Chapel Hill's Energy Services department now includes data on more than 200 buildings. The display provides the ability to monitor interval, monthly and annual utility consumption for steam, electricity, chilled water, domestic water, and reclaimed water.

Making the data visible to the Carolina community is the first step in occupant behavioral modification. Positive action is enabled through education and information. Current and historical data reveals weather impacts and the result of behavioral and operational changes. This information helps occupants, maintenance staff and engineers better understand how to make positive changes.

In Morrison Residence Hall, occupants can view and compare the energy consumption with the LUCID energy dashboard. Students use the dashboard to collect and measure data during the Campus Conservation Nationals.

In the new Dental Sciences building, large touch screen displays profile the high performance building features incorporated in the project and the resulting energy use.

Other Education and Outreach Efforts

X-treme Energy Teams: A packet of energy conservation information created by student interns is distributed to building managers for their use in educating and reminding occupants of their contribution to conservation.

EcoReps: Carolina's trained peer-to-peer student sustainability outreach team. EcoReps expand awareness of sustainability initiatives on campus and motivate sustainable behaviors, including energy and water conservation.

Carolina Green Pledge: UNC-Chapel Hill offers members of the campus community an opportunity to make an online pledge to reduce their energy, water, and carbon footprint.

EPA National Building Competition: UNC-Chapel Hill continues to compete and receive national recognition in the Energy Star National Building Competition. The Bioinformatics building was recognized Top In Category, Top Performer #4 Overall, and 20% OR Better Improvement against over 3,000 competitors for energy use reductions this year.

Campus Conservation Nationals: UNC-Chapel Hill joined the Campus Conservation Nationals competition to compete against other universities once again.

Green Labs: Efforts to reduce energy in labs focused on an energy efficient ultra-low freezer replacement program, shut the sash and installation of water-saving vacuum pumps.

Campus Events: Employees from Energy Management staffed event booths throughout the year on campus and off. Some of the campus events were Sustainability Day, Employee Appreciation Day, Tarheel Bike Launch Event, and new students' orientation.

Student Involvement

RESPC

The Renewable Energy Special Projects Committee (RESPC) is a student-created and led committee of student government. The committee consists of seven student committee members (five undergraduates, two graduates), an open student group, and ex-officio members who provide advisory and oversight assistance.

The committee was formed as a result of a 2003 campaign to promote renewable energy on campus. Via referendum that same year, 74.5% of voting students agreed to tax themselves \$4 per student per semester funds totaling approximately \$200,000 a year— to fund renewable energy projects. A fee renewal in 2009 resulted in an expanded mandate that includes energy efficiency, energy education, and maintenance. A student body referendum in 2013 with 83% approval made the fee permanent.

Projects for FY2013-14 were mostly energy efficiency and education projects with one renewable energy project. RESPC funded marketing materials for education to be used by the Green



labs Committee of the Office of Waste Reduction & Recycling. Additional efficiency projects

were funding design fees for the Friday Center LED retrofit, LED wall packs for Health Affairs department buildings, sterilizer retrofits for four labs on campus, and occupancy sensors for the School of Public Health. RESPC also funded a passive solar greenhouse for the Carolina Community Gardens that will also include photovoltaic cells to power lights and equipment.

In total, RESPC allocated approximately \$229,500 of which \$84,000 is already spent. This coming year, RESPC expects to fund a number of renewable energy projects in order to better meet the mandate along with several other efficiency and education projects. RESPC funded projects lower the cost of attending UNC-Chapel Hill which is always an important endeavor.



Kenan-Flagler Energy Club

The Kenan-Flagler Energy Club provides MBA students with the skills, knowledge, and connections necessary to compete for top energy industry jobs and internships and enhance their value in the workplace. The Energy Club hosts a range of events including the Energy 101 series and career treks to industry hubs and offers opportunities to participate in global competitions.

WATER RESOURCES MANAGEMENT

Summary

UNC-Chapel Hill's water resources management includes the use of non-potable water and potable water to meet the water needs of the university.

The potable water usage has dropped to nearly half against the baseline year, FY2002-03. This reflects UNC-Chapel Hill's strong commitment to reducing negative environmental impacts and avoiding unnecessary utility costs.

Potable Water Consumption Summary

Year	Water Cost Avoided	Square Foot Cost (\$ / mGal)	Water/Sewer Cost Change	Water Intensity (Gal/GSF)	Water Intensity Change
2002-03	0	\$3.95	0%	49	0%
2003-04	\$41,353	\$3.99	1%	49	-2%
2004-05	\$185,084	\$4.50	14%	46	-6%
2005-06	\$315,440	\$3.34	-15%	43	-12%
2006-07	\$606,268	\$5.04	28%	42	-15%
2007-08	\$932,129	\$5.48	39%	40	-20%
2008-09	\$1,459,331	\$6.26	59%	36	-27%
2009-10	\$2,613,194	\$8.56	117%	32	-35%
2010-11	\$3,467,671	\$9.94	152%	30	-40%
2011-12	\$4,171,910	\$10.85	175%	28	-43%
2012-13	\$4,790,987	\$11.13	182%	26	-47%
2013-14	\$5,242,279	\$11.91	202%	26	-48%

Table 2: \$23.8M in cost avoidance since FY2002-03 and 48% reduction in water intensity. Leased facilities and UNC Hospital facilities are excluded.

"ALL THE WATER THAT WILL EVER BE IS, RIGHT NOW."

-NATIONAL GEOGRAPHIC, OCTOBER 1993

UNC Annual Water Intensity FY2003-2014

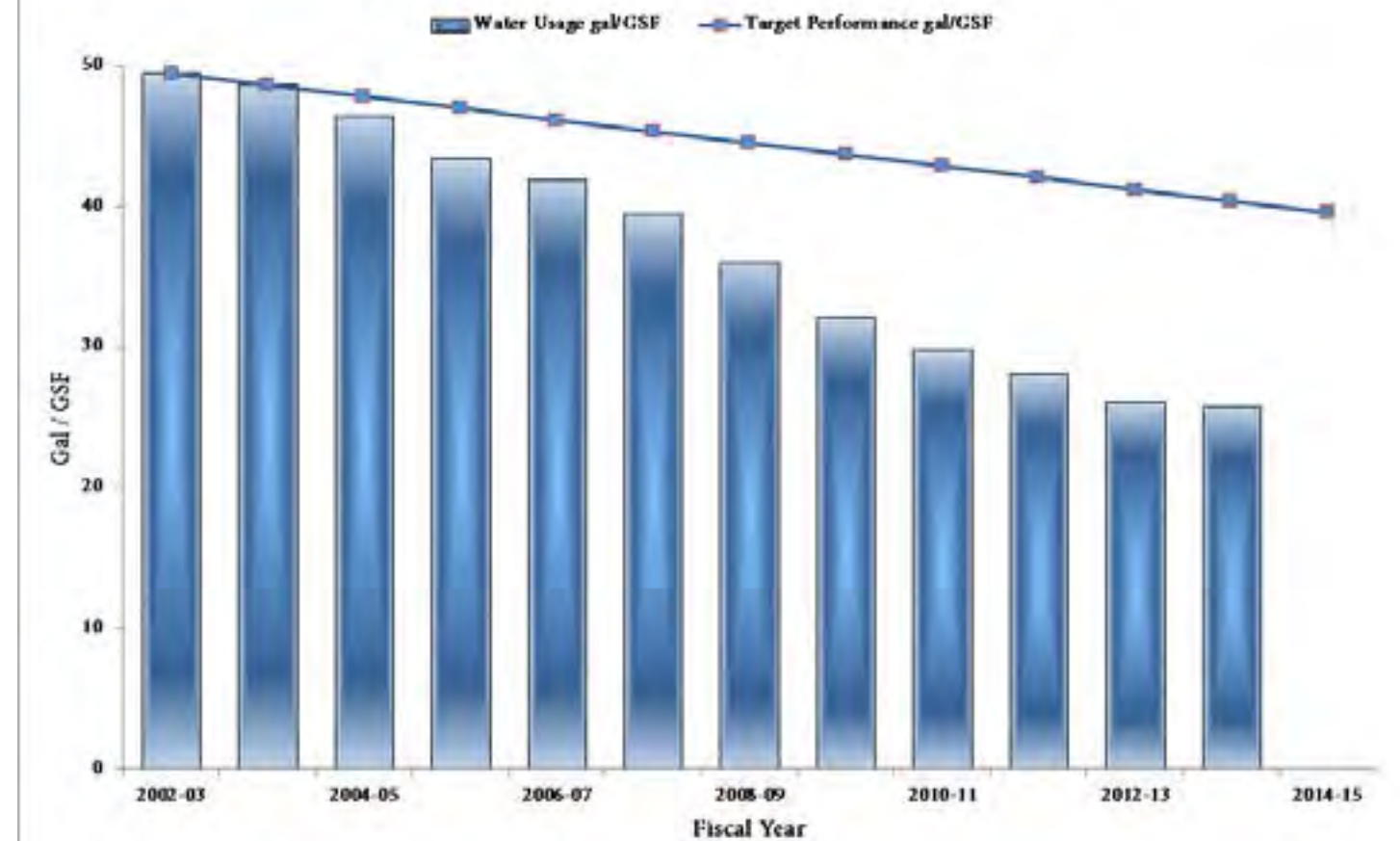


Figure 3: Annual potable water consumption reduced by 48% to 26 gallons/GSF exceeding the 20% reduction target established by NC Senate Bill 668

Potable Water – Summary of Activities

Supply side reductions occur by encouragement and change-over of potable water use to non-potable water use where available and feasible. See non-potable water summary and explanation for more information.

Non Potable Water – Summary of Activities

UNC-Chapel Hill operates an integrated non-potable water system that supplies non-drinking water for approved uses and thereby reduces the use of potable water. Sources of non-potable water used at UNC-Chapel Hill are reclaimed water, storm-water/rainwater, and condensate.

In FY 2013-14, the university used 180,357,000 gallons of non-potable water for cooling tower

make-up water, toilet flushing, and irrigation. Additionally, in FY 2013-14, five sites were irrigated with rainwater stored in unmetered cisterns.

In FY2013-14, non-potable use began at the following sites: Landscape irrigation at the Tomkins Chilled Water Plant was switched to reclaimed water from potable water.

Future non-potable water use: Marsico Hall will include a cistern for irrigation and toilet flushing. Initially, the building will use potable water for these uses, until the cistern is brought on line. The cistern is part of the second phase of construction and was not started in FY2013-14.

UNC-CHAPEL HILL SUCCESSES

EPA Energy Star National Building Competitions



Morrison Residence Hall
2010 Winner



NC Area Health Education Center
2012 Winner



Kenan Residence Hall
2011 Winner



Bioinformatics Building
2013 Winner

2013 LEED Certified Buildings



Genome Sciences Building



Koury Oral Health Sciences Building

APPENDIX

Energy Projects at UNC-Chapel Hill

Project	Building	Probable Cost	Simple Payback (Years)	Status
FY2013-2014				
AX Server Software	Academic Affairs Buildings	\$12,660	NA	Complete
Central weather feed for economizer control	Academic Affairs Buildings	\$10,000	<0.5	In construction
Preliminary design to identify switched incandescent and T12	Academic Affairs Buildings	\$20,000	NA	In design
Replace leaking steam traps	Academic Affairs Buildings	\$65,000	0.8	In construction
Replace Wall Pack Lighting with LED-192	Academic Affairs Buildings	\$68,760	7.0	Complete
Replace Wall Pack Lighting with LED- 72	Academic Affairs Buildings	\$24,336	7.0	Complete
Replace incandescent with LED	Ackland Art Museum	\$18,000	11.9	Complete
Energy Conservation Measure (ECM) Program	All Campus	\$75,000	1.0	Complete
Green Labs energy education materials	All Campus	\$3,500	NA	In design
Heating water flushing and treatment	All Campus	\$50,000	TBD	Complete
Steam tunnel rehab	All Campus	\$12,000,000	TBD	In construction
Annual upgrade - BAS Standards	All Campus	\$5,000	NA	Complete
Upgrade sterilizers for water and energy conservation - per ESPC	All Campus	\$77,000	0.4	In construction
Install dedicated OA Unit	Battle Vance Pettigrew	\$389,999	TBD	Complete
4th and 5th floor – Replace 4-lamp T12 troffers with new LED fixtures	Berryhill Hall	\$81,984	7.4	In construction
Upgrade BAS controls-6th floor	Brinkhous-Bullitt Bldg	\$50,000	TBD	Complete
Alternative Energy Project	Carolina North	\$7,500,000	NA	Complete
Utilities/Site Infrastructure Design	Carolina North	\$5,000,000	TBD	Complete
Replace dimmed incandescent lighting with LED	Chapman Hall	TBD	5.0	Complete
North Chiller Plant	Chiller Plant Upgrades	\$4,500,000	TBD	In design
Deck Expansion and Lighting Upgrades	Craige Parking Deck	\$32,000,000	TBD	In construction
Replace discontinued fluorescent fixtures with LED	Craige Residence Hall	TBD	15.0	Complete
Lighting and electrical upgrades	Dogwood Parking Deck	\$2,907,514	TBD	In design
Retrofit Dramatic Art mercury vapor with LED	Dramatic Art, Center For	\$8,970	4.5	Complete
Provide Jace AX integration with Circon	Environment, Health And Safety Bldg	\$32,100	9.4	In construction
Provide Jace AX integration with Circon	Facilities Construction Shops	\$32,100	5.7	In construction
Upgrade wall packs to LED	Facilities Construction Shops	TBD	7.0	Complete
Re-roofing	Fetzer Hall	\$3,589,650	TBD	In construction
Upgrade Metal Halide to LED in Atrium	Fetzer Hall	\$70,980	6.8	In construction
Corridor LED Lighting upgrades	Fordham Hall	\$43,884	8.7	Complete
Design to replace/retrofit Incandescent and MH lighting with LED lighting	Friday Center, William & Ida	\$25,000	NA	In design
Corridor LED Lighting upgrades	Gardner Hall	\$17,760	7.5	In construction

<i>Project</i>	<i>Building</i>	<i>Probable Cost</i>	<i>Simple Payback (Years)</i>	<i>Status</i>
Re-roofing	General Storeroom	\$879,800	TBD	Complete
Perform ESPC SOW	Genetic Medicine Research Bldg	\$550,000	4.0	In design
Submetering Genomics Greenhouse	Genome Sciences Building	\$16,080	NA	In design
Corridor LED Lighting upgrades	Giles Horney Building	\$20,640	12.0	Complete
Hanes Hall DDC upgrade 2nd floor only	Hanes Hall	\$74,055	19.0	In design
Corridor LED Lighting upgrades	Hanes Art Center	\$40,800	9.8	Complete
Replace AHU	Hill Hall	\$250,000	TBD	Complete
Submetering hot water loops	Hill Hall HW Vault	\$12,675	NA	In design
Upgrade BAS controls	Hooker Research Center	\$459,400	TBD	Complete
Upgrade Metal Halide to LED in Atrium	Hooker Research Center	\$5,360	5.7	On hold
Replace incandescent with LED	Hyde Hall	\$1,200	1.0	Complete
Commissioning	Imaging Research Building	\$871,189	NA	In construction
Corridor LED Lighting upgrades	Knapp-Sanders Bldg	\$52,800	10.8	Complete
Upgrade BAS controls	MBRB DLAM	\$26,250	TBD	In design
Upgrade BAS controls	McGavran-Greenberg Hall	\$378,974	TBD	In design
Upgrade HRU Controls and recommission	McGavran-Greenberg Hall	\$125,000	18.8	In design
AHU Commissioning	Medical Biomolecular Research Bldg	\$200,000	1.9	In design
DLAM Ventilation Reduction per ESPC	Medical Biomolecular Research Bldg	\$20,426	0.8	In design
DDC to VAV boxes	Medical Biomolecular Research Bldg	\$1,500,000	3.4	In design
Memorial Hall retrofit incandescent with LED	Memorial Hall	\$6,400	NA	Awaiting funding
DDC controls upgrade	Mitchell Hall	\$200,655	3.2	In design
Upgrade T12 and track lights and chandeliers to LED	Morehead Planetarium	\$46,500	8.0	Complete
Replace MR16 with LED	NC Botanical Garden Education Center	\$2,500	3.3	In construction
Submetering hot water loops	New West HW Vault	\$21,125	NA	In design
Corridor LED Lighting upgrades	Peabody Hall	\$33,600	10.7	Complete
Provide Jace AX integration with Circon	Saunders Hall	\$36,900	2.6	In construction
Replace dimmed incandescent lighting with LED	Sitterson Hall	TBD	5.0	In construction
Corridor LED Lighting upgrades	Smith Hall	\$9,360	7.7	Complete
Existing Building Commissioning	South Building	In House	NA	Complete
Submetering hot water loops	South HW Vault	\$20,800	NA	In design
Vacancy sensor pilot for HVAC	Steele Bldg	\$48,000	18.8	In design
Upgrade Metal Halide to LED	Storage Facility - DEHS	\$11,000	10.0	Complete
Retrofit metal halide in SRC with LED	Student Recreation Center	\$36,608	8.7	In construction
Upgrade Swain to DDC AHU only	Swain Hall	\$140,595	7.5	In design
Upgrade BAS controls	Taylor Hall	\$465,000	TBD	In design
Upgrade T12 to LED	Totten Garden Center	\$17,284	11.7	Complete
HVAC and window replacement	Upper Quad Residence Halls	\$650,000	TBD	In construction

<i>Project</i>	<i>Building</i>	<i>Probable Cost</i>	<i>Simple Payback (Years)</i>	<i>Status</i>
Retrofit Study Van Hecke library with LED-split Funded FY14 w/dept	Van Hecke-Wettach Hall	\$76,760	15.4	Awaiting funding
Upgrade Metal Halide to LED in Atrium	Woollen Gym	\$43,680	6.9	In construction
Existing Building Commissioning	YMCA Building	\$15,000	NA	In construction
FY2014-2015				
Central weather feed for economizer control	Academic Affairs Buildings	\$10,000	<0.5	In construction
Replace leaking steam traps	Academic Affairs Buildings	\$65,000	0.8	In construction
Provide VFD on chilled water pumps	Ackland Art Museum	\$12,400	10.0	Awaiting funding
Energy Conservation Program	All Campus	\$75,000	1.0	In construction
Green Labs energy education materials	All Campus	\$3,500	NA	In design
Install campus fixtures with daylight harvesting control where appropriate	All Campus	\$30,000	NA	Awaiting funding
Measurement and Verification Software targeted to ESPC buildings	All Campus	\$60,000	NA	Awaiting funding
Steam tunnel rehab	All Campus	\$12,000,000	TBD	In construction
Annual upgrade - BAS Standards	All Campus	\$5,000	NA	In design
Upgrade sterilizers for water and energy conservation - per ESPC	All Campus	\$77,000	0.4	In construction
Provide VFD on chilled water pumps	Ambulatory Care Center	\$18,180	6.0	Awaiting funding
4th and 5th floor – Replace 4-lamp T12 troffers with new LED fixtures	Berryhill Hall	\$81,984	7.4	In construction
Lighting Upgrade	Boathouse Storage Shed	\$6,120	38.0	Awaiting funding
Upgrade control of CW heat exchanger	Brinkhous-Bullitt Bldg	\$30,000	NA	Awaiting funding
Lighting Upgrade	Carmichael Arena	\$186,360	36.0	Awaiting funding
Provide VFD on chilled water pumps	Carrington Hall	\$12,400	10.0	Awaiting funding
ECMs identified in ESPC	Chapman Hall	\$400,000	1.7	Awaiting funding
Synchronous Drive Belts per ESPC IGA	Chapman Hall	\$18,150	9.9	Awaiting funding
Install touch screen energy dashboard	Chase Dining Hall (Rams Head)	\$10,000	NA	Awaiting funding
North Chiller Plant	Chiller plant upgrades	\$4,500,000	TBD	In design
Lighting Upgrade	Coker Hall	\$37,950	18.7	Awaiting funding
Commissioning	Collaborative Science Building	\$44,860	NA	On hold
Lighting Upgrade	Cone Kenfield Tennis Center	\$242,710	30.5	Awaiting funding
Deck Expansion and Lighting Upgrades	Craige Parking Deck	\$32,000,000	TBD	In construction
High output T8 Lighting upgrade	Davis Library	\$33,696	15.0	Awaiting funding
Lighting controls to stacks	Davis Library	\$50,000	TBD	In design
Provide VFD on chilled water pumps	Davis Library	\$18,180	6.0	Awaiting funding
Light Upgrade- Court	Dean Smith Student Center	\$591,700	25.2	Awaiting funding
Provide VFD on chilled water pumps	Dey Hall	\$12,400	10.0	Awaiting funding
Lighting and electrical upgrades	Dogwood Parking Deck	\$2,907,514	TBD	In construction
Provide Jace AX integration with Circon	Environment, Health And Safety Bldg	\$32,100	9.4	In construction
Replace discontinued fluorescent fixtures with LED	Ehringhaus, Hinton James	\$175,000	15.0	Awaiting funding
Provide Jace AX integration with Circon	Facilities Construction Shops	\$32,100	5.7	In construction

<i>Project</i>	<i>Building</i>	<i>Probable Cost</i>	<i>Simple Payback (Years)</i>	<i>Status</i>
FY2014-2015				
Re-roofing	Fetzer Hall	\$3,589,650	TBD	In construction
Upgrade Metal Halide to LED in Atrium	Fetzer Hall	\$70,980	6.8	In construction
Lighting Upgrade	Finley Golf Course Road, 212	\$22,860	13.5	Awaiting funding
Design to replace/retrofit Incandescent and MH lighting with LED lighting	Friday Center, William & Ida	\$25,000	NA	In design
Lighting Upgrade	Friday Center, William & Ida	\$250,000	9.1	Awaiting funding
Corridor LED Lighting upgrades	Gardner Hall	\$17,760	7.5	In construction
Install synchronous drive belts per ESPC	Genetic Medicine Research Bldg	\$70,000	3.3	Awaiting funding
Perform ESPC SOW	Genetic Medicine Research Bldg	\$550,000	4.0	In design
Water retrofit per ESPC	Genetic Medicine Research Bldg	\$55,419	14.2	Awaiting funding
Submetering Genomics Greenhouse	Genome Sciences Building	\$16,080	NA	In design
Lighting Upgrade	Graham Student Union	\$97,390	9.2	Awaiting funding
Install dedicated gateway for EMCS connectivity	Greenlaw Hall	\$25,000	10.0	Awaiting funding
Replace MH with LED	HA Bookstore	\$4,571	10.0	Awaiting funding
Install dedicated gateway for EMCS connectivity	Hamilton Hall	\$25,000	10.0	Awaiting funding
Hanes Hall DDC upgrade 2nd floor only	Hanes	\$74,055	19.0	In design
Upgrade Halogen and Incandescent to LED - Auditorium	Hanes Art Center	\$57,782	14.0	Awaiting funding
Upgrade Wall Packs to LED-70	Health Affairs Buildings	\$28,600	7.2	Awaiting funding
Lighting Upgrade	Health Sciences Library	\$472,800	40.1	Awaiting funding
Submetering hot water loops	Hill Hall HW Vault	\$12,675	NA	In design
Lighting Upgrade	Homestead Operations Center	\$16,300	13.5	Awaiting funding
Commissioning	Imaging Research Building	\$871,189	NA	In construction
Liebert optimization and window film for machine room	ITS Manning	\$375,000	10.2	Awaiting funding
Design - upgrade incandescent lighting with LED and dimming system	Kenan Center	\$25,000	NA	Awaiting funding
Provide VFD on chilled water pumps	Kenan Center	\$12,400	10.0	Awaiting funding
Repair mechanical insulation per ESPC	Kenan Labs	\$35,750	7.5	Awaiting funding
Water retrofit per ESPC	Kenan Labs	\$23,496	11.0	Awaiting funding
Improve controls on heat recovery	Kenan Music Bldg	\$15,000	7.5	Awaiting funding
Add VFD's on preheat	Kerr Hall	\$20,000	10.0	Awaiting funding
Add exhaust fan control to enable occupancy scheduling	Knapp-Sanders Bldg	TBD	NA	Awaiting funding
Lighting upgrade - Atrium	Knapp-Sanders Bldg	\$45,000	11.0	Awaiting funding
Address building envelope issues per ESPC	Lineberger Cancer Research Center	\$11,129	7.9	Awaiting funding
Install dedicated gateway for EMCS connectivity	Manning Hall	\$25,000	10.0	Awaiting funding
Upgrade BAS Controls	MBRB DLAM	\$26,250	TBD	In design
HVAC controls upgrade	McColl Bldg	\$1,722,168	NA	Awaiting funding
Corridor LED lighting upgrade	McColl Bldg	\$160,860	32.5	Awaiting funding

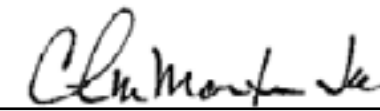
<i>Project</i>	<i>Building</i>	<i>Probable Cost</i>	<i>Simple Payback (Years)</i>	<i>Status</i>
FY2014-2015				
Replace dimmed incandescent lighting with LED	McColl Bldg	\$4,070	7.6	On hold
Lighting Upgrade	McGavran-Greenberg Hall	\$66,564	31.0	Awaiting funding
Replace/retrofit Incandescent and obsolete dimming system with LED	McGavran-Greenberg Hall	\$70,000	NA	On hold
Upgrade BAS Controls	McGavran-Greenberg Hall	\$378,974	TBD	In design
Upgrade HRU Controls and recommission	McGavran-Greenberg Hall	\$125,000	18.8	In design
AHU Commissioning	Medical Biomolecular Research Bldg	\$200,000	1.9	In design
Auditorium and Lobby Systems Energy Reduction per ESPC	Medical Biomolecular Research Bldg	\$108,510	6.4	Awaiting funding
DLAM Ventilation Reduction per ESPC	Medical Biomolecular Research Bldg	\$20,426	0.8	In design
Lighting Upgrade - Auditoriums	Medical Biomolecular Research Bldg	\$9,940	14.1	Awaiting funding
DDC to VAV boxes	Medical Biomolecular Research Bldg	\$1,500,000	3.4	In design
DDC controls upgrade	Mitchell Hall	\$200,655	3.2	In design
Provide VFD on chilled water pumps	Mitchell Hall	\$15,200	12.3	Awaiting funding
Address building envelope issues per ESPC	Molecular Biology Research Lab/Glaxo	\$9,500	6.9	Awaiting funding
Glaxo Install Synchronous Drive Belts per ESPC	Molecular Biology Research Lab/Glaxo	\$4,103	16.5	Awaiting funding
MBRB Install Synchronous Drive Belts per ESPC	Molecular Biology Research Lab/Glaxo	\$3,571	12.6	Awaiting funding
MBRB Ventilation Reduction per ESCO	Molecular Biology Research Lab/Glaxo	\$580,000	7.2	Awaiting funding
Repair mechanical insulation per ESPC	Molecular Biology Research Lab/Glaxo	\$25,692	6.5	Awaiting funding
Provide VFD on chilled water pumps	Morehead Planetarium	\$15,200	12.3	Awaiting funding
Upgrade incandescent and MH lighting in health affairs buildings	NC Area Health Education Center Bldg	\$40,000	10.0	Awaiting funding
Replace MR16 with LED	NC Botanical Garden Education Center	\$2,500	3.3	In construction
Replace MH with LED	Neurosciences Research Bldg	\$13,110	10.0	Awaiting funding
Submetering hot water loops	New West HW Vault	\$21,125	NA	In design
Provide VFD on chilled water pumps	Paul Green Theatre	\$12,400	10.0	Awaiting funding
Replace flood lamps with LED	Person Hall	\$864	3.4	On hold
Provide VFD on chilled water pumps	Phillips Hall	\$30,580	7.0	Awaiting funding
Provide VFD on chilled water pumps	Phillips Hall	\$15,200	10.0	Awaiting funding
Lighting Upgrade	Rosenau Hall	\$1,560	12.5	Awaiting funding
Provide Jace AX integration with Circon	Saunders Hall	\$36,900	2.6	In construction
Replace dimmed incandescent lighting with LED	Sitterson Hall	TBD	5.0	In construction
Lighting Upgrade	Smith Eddie Field House	\$210,659	33.4	Awaiting funding

<i>Project</i>	<i>Building</i>	<i>Probable Cost</i>	<i>Simple Payback (Years)</i>	<i>Status</i>
FY2014-2015				
Lighting Upgrade-Wall Pack	Smith Student Activities Center	\$9,800	7.1	Complete
Submetering hot water loops	South HW Vault	\$20,800	NA	In design
Vacancy sensor pilot for HVAC	Steele Bldg	\$48,000	18.8	In design
Retrofit metal halide in SRC with LED	Student Recreation Center	\$36,608	8.7	In construction
Upgrade Swain to DDC AHU only	Swain Hall	\$140,595	7.5	In design
Install exhaust fan control to enable occupant scheduling	Tarrson Hall	\$75,000	15.0	Awaiting funding
Replace MH with LED	Tarrson Hall	\$9,833	7.0	Awaiting funding
Add VFDs to hot water system	Tate-Turner-Kuralt Bldg	\$7,500	NA	Awaiting funding
Provide VFD on chilled water pumps	Tate-Turner-Kuralt Bldg	\$12,400	10.0	Awaiting funding
Upgrade BAS Controls	Taylor Hall	\$465,000	TBD	In design
HVAC and window replacement	Upper Quad Residence Halls	\$650,000	TBD	Complete
Dedicated OA Units	Wilson Hall Annex	TBD	TBD	Awaiting funding
Upgrade incandescent to LED	Wilson Library	\$10,000	3.0	Complete
Improve controls on ERU.	Woollen Gym	\$15,000	7.5	Awaiting funding
Upgrade Metal Halide to LED in Atrium	Woollen Gym	\$43,680	6.9	In construction
Existing Building Commissioning	YMCA Building	\$15,000	NA	In construction

ENERGY MANDATE

I have read the strategic Energy and Water Plan for my organization. The plan, as presented, supports the reductions required in Session Law 546.

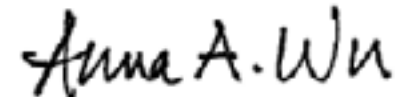
Implemented this 1st day of October, 2014



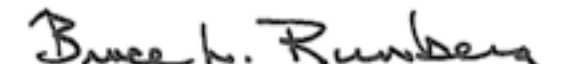
Chris Martin, PE
Director of Energy Management



Phil Barner
Director of Energy Services



Anna Wu, FAIA
Assistant Vice Chancellor &
University Architect



Bruce Runberg, PE
Associate Vice Chancellor for
Facilities Services



STAFF

Energy Management

Martin Jr, Chris
O'Hara, Jessica
Rabold, Rod
Freeman, Todd
Jacobs, George

Energy Management Controls System

Adams, Lane
Long, Dion
Crowder, Jeffery
Day, Matthew
Bodeen, Steven
Marbury, Vivian

Energy Management Interns

Parker, Daniel
Parker, Meredith

UNC-CHAPEL HILL ENERGY MAN-
AGEMENT
Facilities Services
103 Airport Drive
Chapel Hill, NC 27599-1800
Email: save-energy@unc.edu
Website: save-energy.unc.edu

