

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



STRATEGIC ENERGY AND WATER PLAN—2013

Table of Contents

Executive Summary	1
Energy Demand	2
Energy Savings Performance Contracting.....	2
Capital Projects.....	3
Energy Conservation Measure (ECM) Program	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
Appendix	13
Energy Projects at UNC, Chapel Hill	13
Energy Mandate	17
Staff	18

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 FY 2003–2012.....	2
Figure 2: Chilled Water Performance	5
Figure 3: Historical Water Consumption	11
Figure 4: All Campus Water Consumption.....	12

EXECUTIVE SUMMARY

UNC Chapel Hill continues its downward trend with energy consumption. Over the last four years the energy consumption has dropped each year. Currently the energy intensity is 33% less than the baseline year. This is an additional reduction of 2% over last year. Weather had some impact as it was more extreme than the previous year, or 11% higher degree days. Degree days are a simplified measure of outside temperature used to compare weather changes from year to year. The university also added two new buildings totaling 451,085 square feet to add to the campus. The building use for both is laboratory, which is a more energy intensive facility. These buildings were designed for minimum energy intensity. Genome Science Building includes the university's first installation of chilled beams for cooling and both facilities utilize lower airflow rates in laboratory spaces. They rank among our most efficient facilities of this type.

Efforts continued on the Energy Conservation Measure (ECM) program, an internal commissioning program for existing buildings. Though no new square footage was brought into the program, a modification to the occupancy schedules now allows full energy benefits from reducing the cooling and heating systems over the weekends and university holidays. The previous logic recognized only time of day opportunities and did not recognize weekends and holidays as additional opportunities.

If the energy and water usage per square foot remain unchanged since the base year then the university would have realized more than \$183M in additional energy costs and \$19M in additional potable water costs (excluding costs associated with non-potable water).

Year	Energy Cost Avoided	Energy Cost / GSF	Cost / MMBtu	Btu / GSF	Btu / GSF % 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%

Table 1: Energy Consumption Summary; Energy services buildings, Leased buildings, and UNC Hospitals excluded

ENERGY DEMAND

FY2012-13 Activities

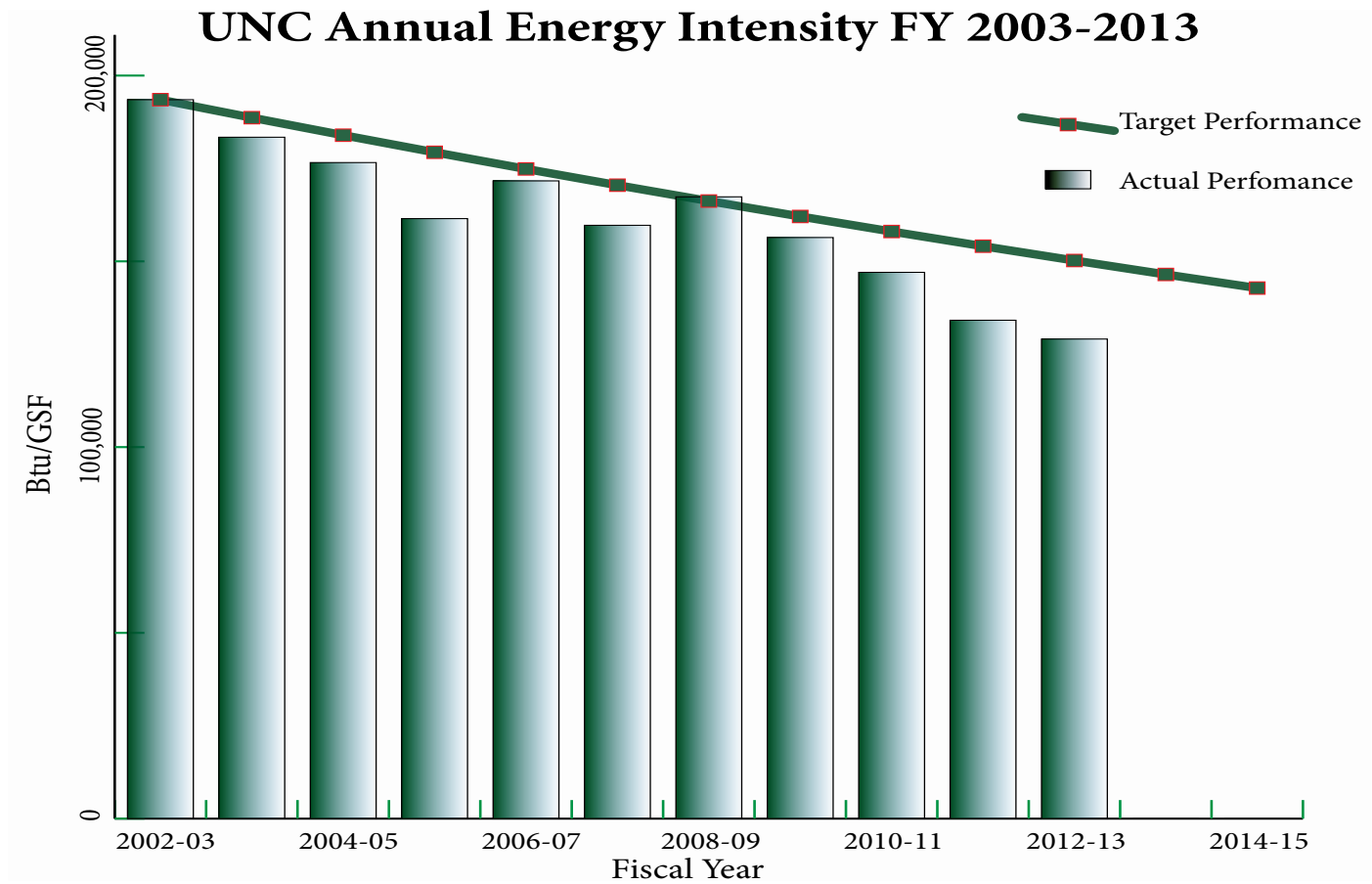


Figure 1: Annual Energy Consumption reduced by 33% to 129 kBtu/gsf meeting the 30% target established by NC Senate Bill 668

Energy Savings Performance Contracting

The main objective during this fiscal year was the completion of the Energy Savings Performance Contract (ESPC) Investment Grade Audit (IGA). The IGA is the discovery phase of the project when the contractor completes detailed energy audits, energy models and selects value added measures to both conserve energy and water and address deferred maintenance issues. The IGA identified several broad categories of ECMs. Some examples include the following:

“MONEY ISN’T ALL YOU’RE SAVING.”

-EPA

Building automation upgrades and subsequent commissioning allows the use of advanced control strategies, laboratory airflow reduction, and correction of outstanding operational issues. This contributes to a significant energy reduction. Another major savings opportunity was identified with the university's 5mW data center, integration of Computer Room Air Conditioning (CRAC) units. The data center employs over a dozen individual units to cool the servers. These CRAC units do not currently communicate with each other causing simultaneous and unnecessary humidifying and dehumidifying. Another short payback ECM is to program laboratory autoclaves to shut down during unoccupied times. Autoclaves are steam heated 'dishwashers' for decontamination of laboratory equipment.

The buildings analyzed in the IGA have dedicated steam, chilled water, and electric metering with data intervals of 15 minutes. This facilitates early identification and resolution of problems which could lead to occupant comfort issues and poor energy performance. Additionally this data can be used to quantify the energy savings post installation, a contractual requirement for an ESPC. Lastly, more traditional ECMs were identified such as replacement of leaking steam traps, building envelope improvements, and installation of low flow fixtures for sinks, toilets, and urinals.

Capital Projects

After a full year of performance the newest laboratory buildings (Koury Oral Health and Genome Science Building) are among the most efficient laboratories on campus using less than 200,000 Btu/ gsf each. Imaging Research Building is under construction this fiscal year. The building is 343,000 square feet and will be another laboratory. Expected completion is January, 2014.

Energy Conservation Measure (ECM) Program

The ECM program continued through the 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. One additional modification was applied broadly, utilization of a more sophisticated occupancy schedule. Previously a daily schedule was employed and did not extend unoccupied hours during weekends or university holidays.

Commissioning is a vital part of ensuring renovations and new buildings operate effectively and efficiently from the beginning. The university commissions all projects and this fiscal year included

Project Spotlight

Bioinformatics HVAC controls upgrade

The university upgraded the digital controls for the HVAC system in Bioinformatics building, completing in December 2012. The building is mixed use but is primarily office space with two energy intensive computer server rooms. The project re-programmed the existing HVAC control system and extended the system to the occupied areas which provides the opportunity to monitor the temperatures throughout the building. Through a joint effort with outside contractors and university engineers and technicians an overall reduction of approximately 58% was achieved. This highlights the significant savings achievable through HVAC system improvements. The simple payback for this effort is less than one year.

opposite seasonal testing and warranty verification on the Koury Oral Health Sciences Building (Dental Sciences Project), completing building commissioning, opposite seasonal testing and warranty verification on the new Genome Sciences project. Construction phase commissioning continues on the new Imaging Research Building and design phase commissioning continued on the Collaborative Sciences Building.

In house commissioning efforts included the Thurston Bowles bone lab renovation, Davis Library HVAC controls upgrade, the South Building renovations, the YMCA building retro commissioning and the new BSL3 lab at the Kannapolis campus.



*UNC
Genome Science
Building won the
USGBC North
Carolina Chapter
2013 Thomas
Edison award for
Sustainability*

ENERGY GENERATION AND DISTRIBUTION

Cogeneration Facility

Cogeneration Systems continues its mission of owning and operating a best-in-class system. The plants operate with over 70% efficient production of both thermal heating and electrical generation. Over the last 15 years we have cut our underground thermal losses by nearly 50%, going from 16% losses to approximately 9%, and continue in that family of projects with the design of a full renovation of nearly 3,000 feet of walkable tunnel with multiple steam piping runs. This piping is approximately 70 years old and is insulated with a thin layer of asbestos insulation. This insulation will be replaced with a modern product that will more than double the insulative capacity of the system, and greatly improve operator safety.

Our landfill gas generation system began commercial operation in April and through August it has generated over 2.5 million kilowatt hours of power and consumed over 42 million cubic feet of landfill gas. During that same time we also flared over 43 million cubic feet of landfill gas. With this gas being approximately 54% methane this system contributed to the destruction of 46 million cubic feet of methane that would have otherwise been released into the atmosphere. At 21 times the global warming potential as CO₂, that is equivalent to removing approximately 60 million pounds of CO₂ from our atmosphere.

Chilled Water Department

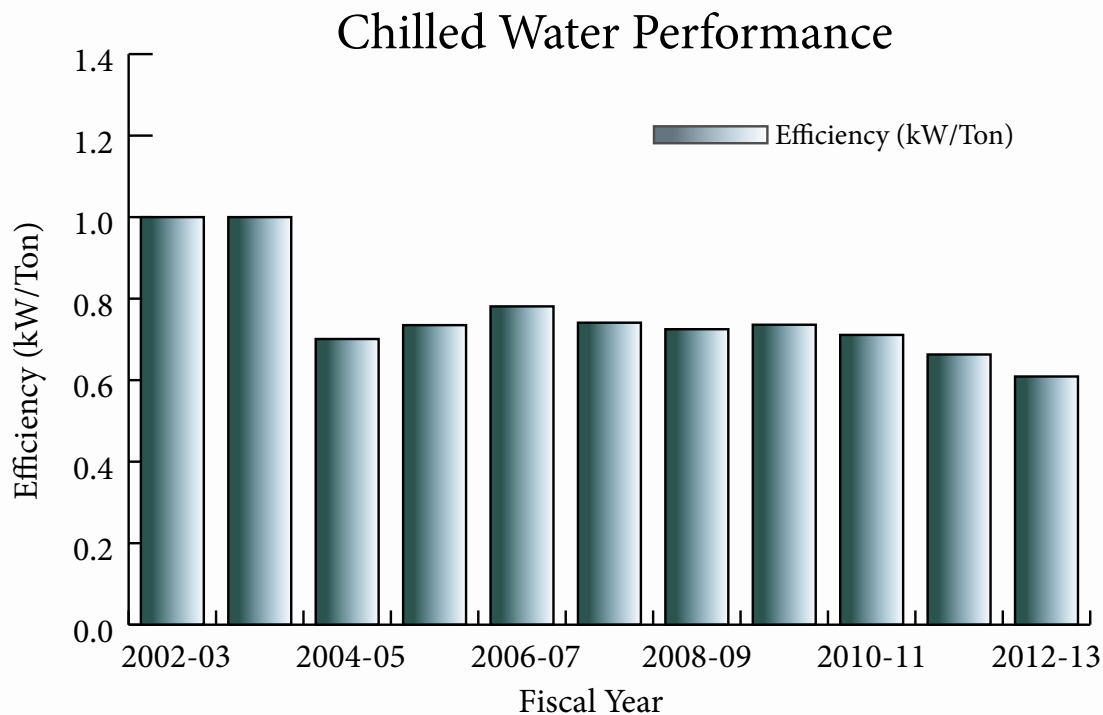


Figure 2: Chilled Water Generation Efficiency improved by 40% over the last 10 years

In FY2012 – 2013, operations staff, programmers and technicians worked on the optimization and operation of the chilled water system. The chiller operation plant master was reconfigured from 16 steps to 23 steps; the plant master is the matrix that operators use to set up operation sequence of the electric chillers in the main plants. This increase was made to setup for the installation of two more variable speed chillers, which will be completed during FY 2014-2015.

Technicians are working through the first year of four year project to replace the Programmable Logic Controllers (PLCs) for the bridge controls in all buildings. The new bridge control PLCs will give chilled water better interface and control of building chilled water pumps, VFDs and valves. Plant performance optimization changes during FY2013 resulted in annual efficiency of 0.609 kW/ton, 1.5 percent above goal.

Electric Distribution Systems

UNC-Electric Distribution Systems (EDS) replaced 90 high pressure sodium lights with LEDs, resulting in an annual savings of approximately \$1,830. The longer life of the LED lights will also result in an annual maintenance savings of \$807, for a total annual savings of \$2,637. 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. These transformers have been around for years, but it is time to review them from a financial perspective to see if they make sense for the university.

Electric metering provides the basis for determining electric energy improvements on the UNC campus. We have improved the metering reliability and data gathering capability through a meter replacement program for the 327 ION power quality meters used for more than 96% of the energy consumed on campus. The ION meters provided 15 minute interval data for the Energy Savings Performance Contract for nine buildings. We have reduced the number of meters read and improved reading accuracy at Odum Village by eliminating individual unit meters and reading a single ION meter for the area. There are now 222 ION meters reporting continuously on the network. Additional metering will be connected in the upcoming year along with other improvements such as better outage detection and reporting using updated software.

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 is 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 is growing. The following is a sample of energy related coursework at UNC.

- Energy in a Sustainable Environment
- Energy and Material Flows in the Environment and Society
- Energy Resources for a Hungry Planet
- Energy Law
- Physics of Energy
- Energy, Transportation, and Land Use
- Renewable Energy: Project Development and Finance

Integration

For the first time, UNC has a two-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—is under development. The tour was offered first to participants at the international Water and Health conference in Fall 2012.

Carolina Students Produce NC Energy and Politics Multimedia Stories

Students taking an energy reporting class in fall 2012 wrote and produced interactive multimedia stories covering the intersection of energy and politics in North Carolina. Story topics included: smart grid education, Progress Energy's use of stimulus money, the state legislature's shift on environmental policy, the future of offshore wind energy, the rapid growth of solar, the changing nature of food, and how climate change is affecting the state's sweet potato industry.

"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'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. Access to this data will be used for the Conserving Carolina Energy Recognition Award Program, to monitor residence halls for building competitions, and for monitoring and analyzing data.

Making the data visible to the Carolina community is the first step in occupant behavioral modification. Positive action is enabled through education and information. Real time electricity consumption data is available for a smaller subset of buildings. Current and historical data reveals trends, weather impacts, and the result of behavioral and operational changes.

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

Other Education and Outreach Efforts

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

EcoReps: Student representatives are trained on energy and water conservation, recycling efforts, and sustainability initiatives at the university. The representatives, called EcoReps, will conduct training and campus tours for their peers.

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

EPA National Building Competition: UNC continues to compete and receive recognition in the EPA National Building Competition. NC Area Health Education Center placed 11th overall among 3,000 competitors for energy use reductions this year.

Campus Conservation Nationals: UNC joined the Campus Conservation Nationals competition this year and was awarded top reducer for Morrison Residence Hall with an 18% reduction in energy for a total of 5,772 KWh.

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 that 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 totalling approximately \$200,000 a year – to fund renewable energy projects. A recent fee renewal in 2009 resulted in an expanded mandate that includes energy efficiency, energy education, and maintenance while the 2013 fee renewal amended the mandate so that it is a permanent fee.

FY2012-13 focused on preparing for a major fee renewal in February of 2013. Unlike previous years, the campaign for the fee included an addendum that created permanence for the fee. The fee renewal and mandate change was resoundingly successful with a 83% success rate. RESPC will now focus on identification and funding of projects and campaigns in line with the charter.



Projects for FY2012-13 were all energy efficiency and education projects. RESPC first funded marketing materials for education to be used by Energy Management in the EPA Building

Contest. Additional efficiency projects were the purchase of LEDs for Stadium and South Roads, Davie Hall air handler freezestats, wallpacks for North Campus, and LED lighting for Craig Residence Hall balconies. UNC Housing partnered with the RESPC for the final project.

In total, RESPC spent approximately \$230,000 in FY2012-13. This coming year, RESPC expects to fund a renewable energy project in order to better meet the mandate along with several other common efficiency projects. It has never been more important to support students than now in the effort to lower the cost of attending UNC-Chapel Hill. 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.

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's water resources management includes the use of non-potable water in addition to potable water to meet the water needs of UNC.

The table below, Eleven Year Record of Progress in Potable Water Usage Reduction, under "All Campus Water Usage" includes campus water consumption and the water consumption for Energy Services. Energy Services' water consumption is for the production of chilled water and co-generation of steam and electricity serving the campus community. This table reflects the potable water usage reduction for the campus.

Fiscal Year	Water & Sewer Cost Avoided	Water & Sewer Cost / mGal	Water & Sewer Cost / mGal % Change	Water Gal / GSF	Water Gal / GSF % Change
2002-03	-	\$3.95	-	49.48	-
2003-04	\$41,353	\$3.99	1%	48.71	-2%
2004-05	\$185,084	\$4.50	14%	46.46	-6%
2005-06	\$315,440	\$3.34	-15%	43.45	-12%
2006-07	\$606,268	\$5.04	28%	41.95	-15%
2007-08	\$932,129	\$5.48	39%	39.52	-20%
2008-09	\$1,459,331	\$6.26	59%	36.13	-27%
2009-10	\$2,613,194	\$8.56	117%	32.19	-35%
2010-11	\$3,467,671	\$9.94	152%	29.82	-40%
2011-12	\$4,171,910	\$10.85	175%	28.10	-43%
2012-13	\$4,790,987	\$11.13	182%	26.11	-47%

Table 2: Potable Water Usage Summary

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

-NATIONAL GEOGRAPHIC, OCTOBER 1993

Historical Water Consumption

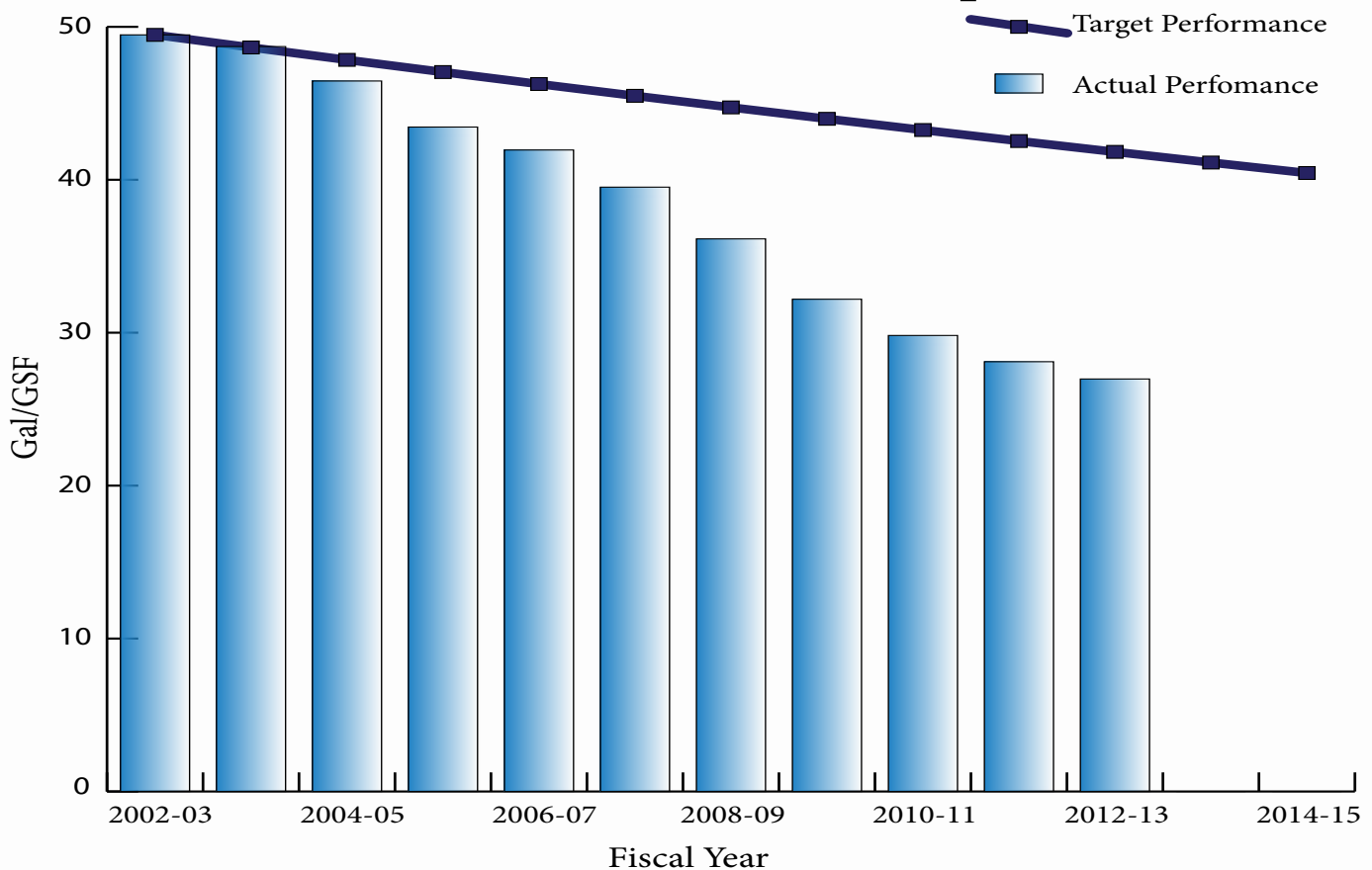


Figure 3: Historical Water Consumption, Comparison of Water Consumption Intensity to Target Consumption

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 2012-13, the university used 175,229,000 gallons of non-potable water for cooling tower make-up water, toilet flushing, and irrigation.

(The reduction in use from FY 2011-12 is due to increased building efficiencies and milder spring and summer weather.) Additionally in FY 2012-13, five sites were irrigated with rainwater stored in cisterns that were not metered.

In FY 2012-13, non-potable use began at the following sites: The New Genome Sciences Building began beneficial occupancy on June 28, 2013. This building uses non-potable water for toilet flushing and irrigation.

Future non-potable water use: Landscape irrigation at the Tomkins Chilled Water Plant will be switched to reclaimed water from potable water. This work has not been completed.

The future Biomedical Imaging Research Building, anticipated for completion Spring 2014, 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 FY 2012-13.

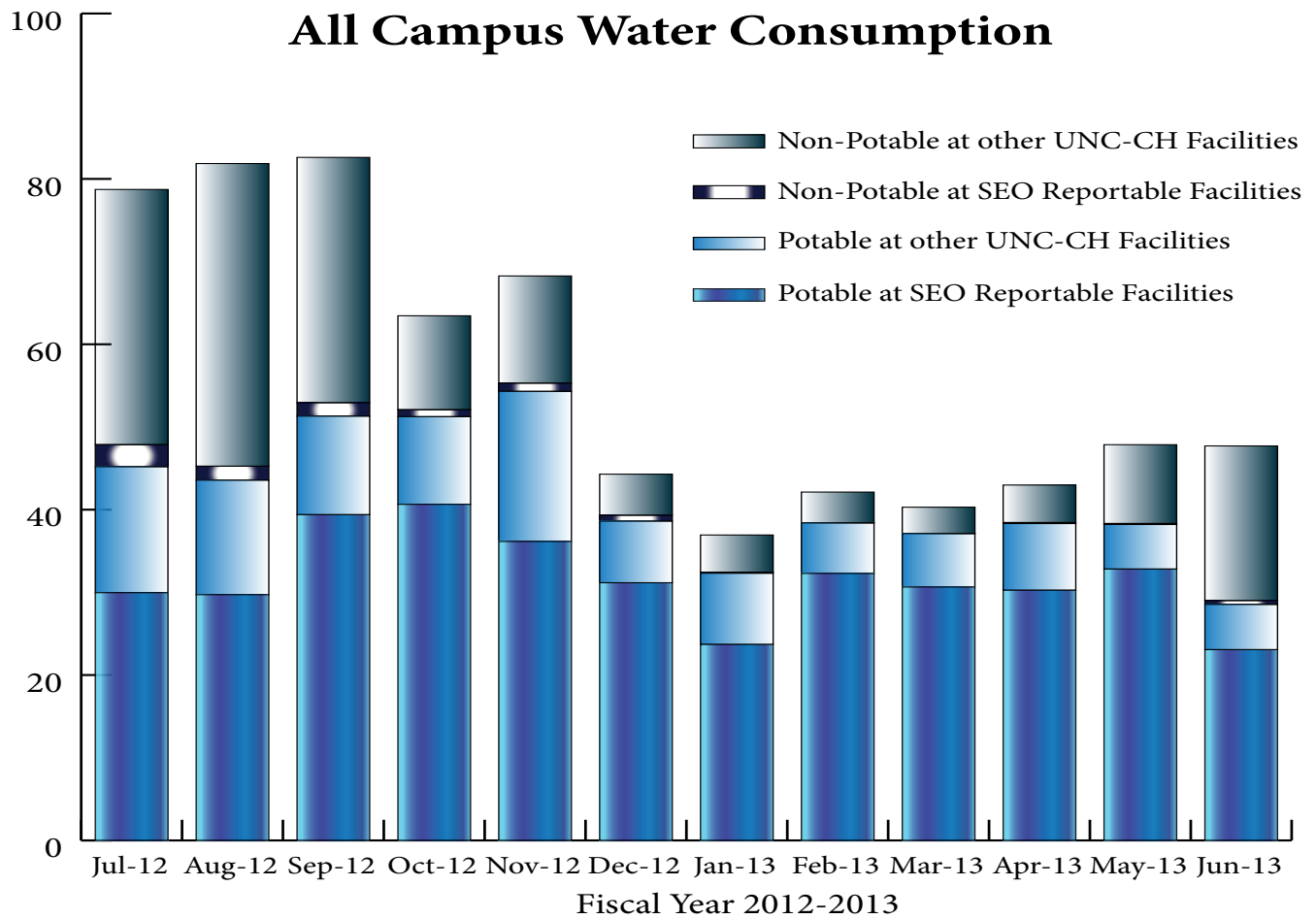


Figure 4: All water consumption – showing potable, non-potable, and other UNC-CH facilities

APPENDIX

Energy Projects at UNC, Chapel Hill

<i>Project</i>	<i>Building</i>	<i>Cost (\$)</i>	<i>Simple Payback (yr)</i>	<i>Status</i>
FY2012-2013				
Energy conservation program	All Campus	\$75,000	1	In progress
Update BAS standards	All Campus	\$5,000	NA	In progress
Heating water flushing and treatment	All Campus	\$50,000	TBD	In construction
Install dedicated OA Unit	Battle Vance Pettigrew	\$389,999	TBD	In construction
Replace chilled water valves	Berryhill	\$25,213	TBD	Complete
Provide VFD on chilled water pump	Berryhill	\$24,389	TBD	Complete
Upgrade BAS controls	Bioinformatics	\$738,000	1	Complete
Upgrade BAS controls-6th floor	Brinkhous Bullitt	\$50,000	TBD	In design
Alternative energy project	Carolina North	\$7,500,000	NA	In construction
Utilities/Site infrastructure	Carolina North	\$5,000,000	TBD	In design
Landfill gas recovery project-pipeline	Carolina North	\$641,000	NA	Complete
Commissioning	Collaborative Science Building	\$44,860	NA	On hold
Deck expansion and lighting upgrades	Craig Parking Deck	\$32,000,000	TBD	In construction
Upgrade BAS controls	Davis Library	\$457,900	TBD	Complete
Commissioning	Dental Sciences Building	\$490,000	NA	Complete
LED lighting upgrades	Dogwood Parking Deck	\$2,800,000	TBD	In design
Lighting and electrical upgrades	Dogwood Parking Deck	\$2,907,514	TBD	In design
Re-roofing	Fetzer Gym	\$3,589,650	TBD	In design
Chiller plant upgrades	Friday Center	\$2,316,450	TBD	Complete
Re-roofing	General Storeroom	\$879,800	TBD	In design
Commissioning	Genome Science Building	\$644,570	NA	Complete
Replace AHU	Hill Hall	\$250,000	TBD	In construction
Upgrade BAS controls	Hooker	\$459,400	TBD	In design
Commissioning	Imaging Research Building	\$871,189	NA	In progress
Upgrade BAS controls	Kerr	\$483,000	TBD	Complete
Makeup air unit	MacNider	\$343,400	NA	Complete
Steam tunnel rehab	Main Campus	\$12,000,000	TBD	In design
Replace chilled water valve	Mary Ellen Jones	\$15,275	TBD	Complete
Upgrade BAS controls	MBRB DLAM	\$26,250	TBD	In design
Upgrade BAS controls	McGavran Greenberg	\$378,974	TBD	In design
ESPC - IGA	Multiple	\$450,000	NA	Complete
Chiller plant upgrades	North Chiller Plant	\$4,500,000	TBD	In design
Existing building commissioning	South Building	In House	NA	In progress
Install sub metering	Student Union	\$6,511	NA	Complete
Upgrade BAS controls	Taylor Hall	\$465,000	TBD	In design
HVAC and window replacement	Upper Quad Residence Halls	\$650,000	TBD	In design
Dedicated OA units	Wilson Hall Annex	TBD	TBD	In design
Existing building commissioning	YMCA	\$15,000	NA	In progress

<i>Project</i>	<i>Building</i>	<i>Cost (\$)</i>	<i>Simple Payback (yr)</i>	<i>Status</i>
FY2013-2014				
Central weather feed for economizer control	Academic Affairs	\$10,000	1	In construction
Preliminary design to identify switched incandescent and T12	Academic Affairs	\$20,000	NA	In design
Replace wall pack lighting with LED-192	Academic Affairs	\$68,760	7	In construction
Replace leaking steam traps	Academic Affairs	\$60,000	2	In construction
AX server software	Academic Affairs	\$12,660	NA	In construction
Provide VFD on chilled water pumps	ACC	\$18,180	6	Awaiting funding
Provide VFD on chilled water pumps	Ackland Art Museum	\$12,400	10	Awaiting funding
Energy conservation program	All Campus	\$75,000	1	In progress
Update BAS standards	All Campus	\$5,000	NA	In progress
Heating water flushing and treatment	All Campus	\$50,000	TBD	In construction
Install dedicated OA unit	Battle Vance Pettigrew	\$389,999	TBD	In construction
Provide VFD on chilled water pumps	Berryhill Hall	\$18,180	NA	Awaiting funding
Upgrade BAS controls-6th floor	Brinkhous Bullitt	\$50,000	TBD	In design
Alternative energy project	Carolina North	\$7,500,000	NA	In construction
Utilities/Site infrastructure	Carolina North	\$5,000,000	TBD	In design
Provide VFD on chilled water pumps	Carrington Hall	\$12,400	10	Awaiting funding
Synchronous drive belts per ESPC IGA	Chapman	\$18,150	10	In construction
Ventilation reduction per ESPC IGA	Chapman	\$225,367	1	Awaiting funding
Auditorium systems energy reduction per ESPC IGA	Chapman	\$129,944	25	Awaiting funding
Building envelope per ESPC IGA	Chapman	\$1,999	18	Awaiting funding
Mechanical insulation per ESPC IGA	Chapman	\$50,657	16	Awaiting funding
Water retrofit including china replacements per ESPC IGA	Chapman	\$11,134	23	Awaiting funding
Deck expansion and lighting upgrades	Craig Parking Deck	\$32,000,000	TBD	In construction
Replace discontinued fluorescent fixtures with LED	Craige/Eringhouse, Hinton James	\$175,000	15	Awaiting funding
Davis Library retrofit discontinued fluorescent light fixtures	Davis Library	\$33,696	15	In construction
Provide VFD on chilled water pumps	Davis Library	\$18,180	6	Awaiting funding
Lighting controls to stacks	Davis library	\$40,000	10	Awaiting funding
Provide VFD on chilled water pumps	Dey Hall	\$12,400	10	Awaiting funding
LED lighting upgrades	Dogwood Parking Deck	\$2,800,000	TBD	In design
Lighting and electrical upgrades	Dogwood Parking Deck	\$2,907,514	TBD	In design
Retrofit Dramatic Art mercury vapor with LED	Dramatic Art	\$8,970	5	In construction
Provide VFD on chilled water pumps	Eddie Smith Field House	\$12,400	10	Awaiting funding
Provide Jace AX integration with Circon	EHS	\$32,100	9	In construction
Provide Jace AX integration with Circon	Facilities Construction	\$32,100	6	In construction
Re-roofing	Fetzer Gym	\$3,589,650	TBD	In design
Corridor lighting upgrades	Fordham Hall	\$43,884	9	In construction
Corridor lighting upgrades	Gardner	\$17,760	7	In construction
Re-roofing	General Storeroom	\$879,800	TBD	In design

<i>Project</i>	<i>Building</i>	<i>Cost (\$)</i>	<i>Simple Payback (yr)</i>	<i>Status</i>
FY2013-2014				
Sub-metering Genomics Greenhouse	Genomics	\$16,080	NA	In construction
Corridor lighting upgrades	Giles Horney	\$20,640	12	In construction
Replace MH with LED	HA Bookstore	\$4,571	10	Awaiting funding
Hanes Hall DDC upgrade 2nd floor only	Hanes	\$74,055	19	In design
Corridor lighting upgrades	Hanes Art	\$40,800	10	In construction
Upgrade wall packs to LED-81	Health Affairs	\$28,600	7	Awaiting funding
Replace AHU	Hill Hall	\$250,000	TBD	In construction
Sub-metering hot water loops	Hill Hall HW Vault	\$12,675	NA	In construction
Upgrade BAS controls	Hooker	\$459,400	TBD	In design
Upgrade metal halide to LED in atrium	Hooker Research Lab	\$5,360	6	In construction
Commissioning	Imaging Research Building	\$871,189	NA	In progress
Liebert system optimization per ESPC IGA	ITS Manning	\$361,064	11	Awaiting funding
Provide VFD on chilled water pumps	Kenan Center	\$12,400	10	Awaiting funding
Synchronous drive belts per ESPC IGA	Kenan Labs	\$14,488	5	In construction
Sterilizer retrofit	Kenan Labs	\$10,219	3	In construction
AHU controls upgrades (AHUs 2,4,5) per ESPC IGA	Kenan Labs	\$283,079	6	Awaiting funding
Mechanical insulation per ESPC IGA	Kenan Labs	\$39,185	10	Awaiting funding
Water retrofit excluding china replacements per ESPC IGA	Kenan Labs	\$23,771	11	Awaiting funding
Corridor lighting upgrades	Knapp Sanders	\$52,800	11	In construction
Steam tunnel rehab	Main Campus	\$12,000,000	TBD	In design
Upgrade BAS controls	MBRB DLAM	\$26,250	TBD	In design
Existing building commission	McColl	\$53,040	TBD	Awaiting funding
Replace dimmed incandescent lighting with LED	McColl, Chapman, Caudill, Sitterson	TBD	5	Awaiting funding
Upgrade BAS controls	McGavran Greenberg	\$378,974	TBD	In design
Upgrade HRU controls and recommission	McGavran Greenburg	\$123,339	19	Awaiting funding
Memorial Hall retrofit incandescent with LED	Memorial Hall	TBD	NA	Awaiting funding
Mitchell Hall - DDC controls upgrade	Mitchell	\$200,655	3	In design
Provide VFD on chilled water pumps	Mitchell Hall	\$15,200	12	Awaiting funding
Provide VFD on chilled water pumps	Morehead Planetarium	\$15,200	12	Awaiting funding
Replace MH with LED	Neurosciences	\$13,110	10	Awaiting funding
Sub-metering hot water loops	New West HW Vault	\$21,125	NA	In construction
Chiller plant upgrades	North Chiller Plant	\$4,500,000	TBD	In design
Provide VFD on chilled water pumps	Paul Green Theatre	\$12,400	10	Awaiting funding
Corridor Lighting upgrades	Peabody	\$33,600	11	In construction
Provide VFD on chilled water pumps	Phillips Hall	\$30,580	7	Awaiting funding
Provide VFD on chilled water pumps	Phillips Hall	\$15,200	10	Awaiting funding
Install touch screen energy dashboard	Rams Head Dining	\$10,000	NA	Awaiting funding
Provide Jace AX integration with Circon	Saunders	\$36,900	3	In construction
Corridor lighting upgrades	Smith Hall	\$9,360	8	In construction
Existing building commissioning	South Building	In House	NA	In progress

<i>Project</i>	<i>Building</i>	<i>Cost (\$)</i>	<i>Simple Payback (yr)</i>	<i>Status</i>
FY2013-2014				
Sub-metering hot water loops	South HW Vault	\$20,800	NA	In construction
Steele Building - vacancy sensor pilot to try controlling both lights and HVAC with one sensor	Steele	\$48,000	19	In design
Retrofit metal halide in SRC with LED	Student Recreation Center	\$36,608	7	In design
Upgrade Swain to DDC AHU only	Swain	\$140,595	7	In design
Replace MH with LED	Tarrson Hall	\$9,833	7	Awaiting funding
Provide VFD on chilled water pumps	Tate Turner Kurault	\$12,400	10	Awaiting funding
Add VFDs to hot water system	Tate Turner Kurault	\$7,500	NA	Awaiting funding
Upgrade BAS controls	Taylor Hall	\$465,000	TBD	In design
HVAC and window replacement	Upper Quad Residence Halls	\$650,000	TBD	In design
Retrofit study Van Hecke library with LED-split funded w/dept	Van Hecke	\$76,760	15	In design
Provide Jace AX integration with Circon	Wilson Hall	\$42,900	2	In construction
Dedicated OA units	Wilson Hall Annex	TBD	TBD	In design
Wilson Library - upgrade incandescent to LED	Wilson Library	\$10,560	1	In construction
Existing building commissioning	YMCA	\$15,000	NA	In progress

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 22th day of October, 2013



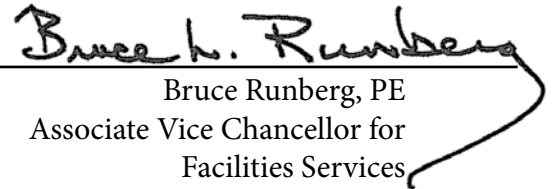
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Cover Photographs by Dan Sears