



# **Strategic Energy Plan**

**2013 UPDATE**

September, 2013

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**Executive Summary**

**Campus Energy Overview**

**Size and Growth**

UNC Charlotte is an urban research-intensive university, sitting on a 1,000 acre campus the state's largest metropolitan city. In the fall of 2012, the University had a campus community (students and faculty) of approximately 29,000, with more than eight (8) million gross square feet (GSF) of built space, including parking decks. About one (1) million GSF of space was added just in fiscal year 2012-13. Plans continue for an enrollment increase to approximately 35,000 students by 2020, with an additional one million gross square feet of academic space built during this time. Auxiliary Services and Residence Life spaces are also planned to support campus population growth.

Since 2002, the full time equivalent (FTE) campus population has grown by over 46%, with built space growth of 95%. In that same period, energy consumption has grown by 48%, and energy costs have grown by 85%; however, energy *consumption* per GSF has fallen by 24%.

**Energy Systems**

Building heating and cooling requirements are provided by a combination of Regional Utility Plants (RUP) and systems dedicated to specific buildings. Regional Utility Plants are designed and constructed to provide energy efficient distribution of chilled water and hot water to multiple buildings. The Main Steam Plant provides steam for campus central core buildings and is included in the first phase of the University guaranteed energy savings performance contract.

**Energy Conservation Challenges, Accomplishments and Goals**

**Challenge**

New academic buildings are predominately research intensive and inherently more energy intensive due to wet labs, cleanrooms and occupancy requirements which translates into significantly higher energy use than traditional classroom buildings.

**Accomplishments and Goals**

UNC Charlotte's energy use reduction of 24% per building GSF provided an avoided cost of over \$3 million this year alone. Additionally, the University spent \$100,000 less on utilities this year than the year before. New buildings continue to receive installments of energy recovery and high efficiency equipment and systems.

Funded through a combination of Performance Contracting, Operational, and Repair and Renovation funds, significant energy reduction will continue through:

- intensive retro-commissioning
- tuning of building to actual requirements versus design assumptions
- system retrofit modifications such as high efficiency motors and lighting
- HVAC scheduling for occupancy
- awareness training

The University has entered into the construction phase of a "Guaranteed Energy Savings Performance Contract", often referred to as a "Performance Contract",

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providing energy savings and energy related capital improvements to eight (8) facilities. The ESCO is on track complete the construction in August of 2014.

Web based monitoring is provided on all new buildings and on existing buildings undergoing major renovations. State-of-the-art DDC Control Systems with utility monitoring and trending are also used. Load shedding software is installed on our Building Automation System (BAS), raising air handler supply air temperature and reduces the speed of the supply fans when the campus electric demand is projected to exceed a certain value. Additionally, phase one has been implemented on selected HVAC systems.

Retro Commissioning and building energy audits continue to be a high priority as funding is available.

North Carolina G.S. 143-64.12 and LEED principles for sustainability, particularly relating to energy and water use, are included in the design guidelines for UNC Charlotte new buildings and major renovations.

The University continues to add utility monitoring to existing buildings that do not have active water, electric, and/or steam or hot water meters. Older meters are being replaced with new meters that have the capability to communicate to the existing Building Automation System (BAS), which allows trending and archiving of energy usage data.

**Water Conservation Challenges, Accomplishments and Goals**

**Challenge**

The State Energy Office mandates a 20% reduction per gross square foot of buildings, plus parking decks, with FY03 as the base year.

**Accomplishments and Goals**

UNC Charlotte's 42% reduction of campus potable water use is significantly better than the mandate. A large part of this reduction is due to adding rain water sensors to the irrigation systems. Additionally, the University includes rainwater harvesting systems in all new buildings to displace some of the irrigation demand on the domestic water system. These buildings also collect water condensed in the major air handlers for use as flushing water, where practical. The University is exploring the feasibility of contracting with Charlotte Mecklenburg Utilities for Reclaimed Water to serve irrigation, cooling tower makeup, and flushing in the buildings with dedicated piping to the toilets.

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**Energy Plan**

Energy Data Management – UNC Charlotte has a program for collecting and analyzing monthly utility billing information using spreadsheets. The main campus electrical substation is trended real-time to document load shedding opportunities and high consumption periods. Benchmarking is beginning for typical facility usage, i.e. library, classroom building, research building, etc.

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Posting of Energy Usage on Utility Spreadsheet updated monthly.	Monthly	N/A	N/A	FM Budget
Update KPI Quarterly for Quarterly Strategic Planning Meeting for Facilities Management.	Quarterly	N/A	N/A	FM Budget
New sub-metering in 4 bldgs. Electric, water, and steam meters tied to BAS.	Monthly	N/A	\$60k	Central Funds
Planned Activities 2013-2014	Measurement	Savings Estimated	Cost	Funding Source
New sub-metering. Electric, water, & Steam /gas meters tied to BAS. Phase 2	Monthly	N/A	\$100k	Utilities Carry forward
Update KPI Quarterly for Quarterly Strategic Planning Meeting for Facilities Management.	Quarterly	N/A	N/A	FM Budget
Main Boiler Plant: Integration of gas, steam, electric, and make-up water to BAS.	Monthly	N/A	\$30k	Performance Contract
Install Chiller plant Optimization software on RUP2	Monthly	\$60K	\$500K	PC
Automate energy consumption reporting for 20 buildings	Monthly	N/A	\$80K	Utilities carry forward

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**Energy Supply Management** – UNC Charlotte is proactive in selection of electrical rates, and cost effective fuels for the Main Boiler Plant. Facilities Management thoroughly reviews utility invoices for deviations indicating billing errors. UNC Charlotte will aggressively pursue available rebates available through Duke Energy.

<b>Past Year Accomplishments</b>	<b>Measurement</b>	<b>Savings Actual or Calculated</b>	<b>Cost</b>	<b>Funding Source</b>
Monitoring all utility bills for billing errors and miscalculations by major utilities.	\$ per month	N/A	N/A	FM Budget
Locked in 50% of natural gas wholesale pricing (well head) for Main Steam Plant, RUP-1 and RUP-2	\$	\$300k	N/A	FM Budget
Apply for rebates from Duke Energy as applicable	\$	\$60K	N/A	N/A
Substation: Use electrical load shedding to reduce peak demand. Phase 2	KW	\$70K	\$50k	FM Budget
<b>Planned Activities 2012 - 2013</b>	<b>Measurement</b>	<b>Savings Estimated</b>	<b>Cost</b>	<b>Funding Source</b>
Monitoring all utility bills for billing errors and miscalculations by major utilities.	\$ per month	N/A	N/A	FM Budget
Natural gas wholesale pricing (well head) for 50% of Main Steam Plant, RUP-1 and RUP-2 purchased at spot pricing.	\$	\$100K	N/A	FM Budget
Apply for rebates from Duke Energy as applicable	\$	\$10K	N/A	N/A

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*Energy Use in Facilities* – Building HVAC and lighting controls are updated as renovations occur. New buildings have state-of-the-art Building Automation System (BAS) controls. New and existing building control systems will be evaluated and adjusted for optimum energy usage.

<b>Past Year Accomplishments</b>	<b>Measurement</b>	<b>Savings Actual or Calculated</b>	<b>Cost</b>	<b>Funding Source</b>
Controls Modifications for Energy – Scheduling, Resets, Tuning, etc..	KWH & KW,BTU's	\$80k	\$50k	R&R
Performance contracting: Performed IGA	Energy	N/A	N/A	N/A
Performance contracting: begin construction	Energy	\$50K	NA	Loan
<b>Planned Activities 2012 - 2013</b>	<b>Measurement</b>	<b>Savings Estimated</b>	<b>Cost</b>	<b>Funding Source</b>
Replace Pneumatic controls with digital in 6 bldgs	BTU's	\$60K	\$600k	Performance Contract
Controls Modifications for Energy – Resets, Tuning, etc., Phase 2	BTU's	\$50K	\$100K	R&R
Repair Dual Temp system in Burson Hall	BTU's	\$40k	\$400K	R&R
Reconfigure Cameron Chill water Piping	KWh	\$5K	\$125K	R&R
Retro Commission Grigg Hall	KWH	\$10K	\$100K	R&R
Retro Commission Woodward Hall	KWH	\$8K	\$75k	R&R
Performance Contacting – complete Construction	BTU's	\$200k	\$8.5 Million	Loan
Retro Commission Foundation Bldg	BTU	\$10K	\$100K	R&R
Retrofit energy efficient lights, and equipment, and expand HVAC controls	KWH	\$100K	\$500K	R&R

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*Equipment Efficiency* – The UNC Charlotte requires all equipment replacements to meet or exceed code requirements. Preventive Maintenance is in effect. Major energy consuming equipment will be identified and evaluated for cost-effective modification or replacement. All chillers were selected on Life Cycle Cost Analysis.

<b>Past Year Accomplishments</b>	<b>Measurement</b>	<b>Savings Actual or Calculated</b>	<b>Cost</b>	<b>Funding Source</b>
Annual main steam boiler tune-ups.	\$/Therm	\$1k	\$6k	M&O
Replaced failed T12 ballasts with T8 Lamps and matching electronic ballast.	Energy	\$15k	\$30k	FM Budget
Replace Parking deck lights with induction lights	KWH	\$7k	\$100k	Operating
Replaced inefficient chiller In Storrs Bldg	KWH	\$15K	\$250 K	R&R
<b>Planned Activities 2012 - 2013</b>	<b>Measurement</b>	<b>Savings Estimated</b>	<b>Cost</b>	<b>Funding Source</b>
Continue to replace failed T12 ballasts with T8 Lamps and matching electronic ballast.	Energy	\$1k	\$8k	FM Budget
Use power save features on office equipment when available.	Energy	\$5k	N/A	N/A
Replace older, oversized inefficient air cooled chiller at Facilities Management/Police Building	Energy	\$10k	\$100k	R&R
Replace Remaining T-12's with LED's	KWH	\$100K	\$500K	Performance Contract
Replace Site lighting with LED Phase 1	KWH	\$50K	\$250K	Operating
Replace SAC chillers with efficient models	KWH	\$70k	\$700K	R&R
SAC/Halton Arena Energy Renovation	BTU	\$90K	\$900K	Loan



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*Organization Integration & Awareness Training* –The energy manager will form an energy conservation action team with representation from appropriate departments to help lead the University to meet and exceed the state of North Carolina mandated conservation goals.

<b>Past Year Accomplishments</b>	<b>Measurement</b>	<b>Savings Actual or Calculated</b>	<b>Cost</b>	<b>Funding Source</b>
Sustainability Newsletter issued Quarterly	N/A	N/A	N/A	FM Budget
Additional Sustainability Meetings	N/A	N/A	N/A	FM Budget
<b>Planned Activities 2012-2013</b>	<b>Measurement</b>	<b>Savings Estimated</b>	<b>Cost</b>	<b>Funding Source</b>
Energy Manager to reactivate Energy Action Teams	N/A	TBD	N/A	General Fund
Provide Campus Energy Dashboard	N/A	TBD	\$30k	Utility Rebates

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### Water Plan

Water Management – The final Session Law 2007- 546 decrees that all state agencies shall develop and implement a management program that is consistent with the State's comprehensive program. Below are the main requirements:

- *For new construction:, Water systems shall be designed and constructed to use a minimum of twenty percent (20%) less potable water than the indoor water use baseline calculated for the building after meeting the fixture performance requirements required by the 2006 North Carolina Plumbing Code. Outdoor potable water or harvested groundwater consumption shall be reduced by a minimum of fifty percent (50%) over that consumed by conventional means through water use efficient landscape materials and irrigation strategies, including water reuse and recycling.*
- *For existing buildings: Installation of aerators in sink faucets that reduce the flow of water to a rate of no more than five-tenths gallons per minute (0.5 g.p.m.); the installation of shower heads that reduce the flow of water to a rate of no more than one and five-tenths gallons per minute (1.5 g.p.m.); where appropriate, as determined by the Department of Administration, the resetting of hot water heaters to a water temperature of 120 degrees; the training of staff to monitor the use of irrigation systems and to base the use of the system on the moisture content of the soil, and either the elimination of potable water for irrigation or the reduction of water consumption in the building by twenty percent (20%) based on water consumption for the 2002-2003 fiscal year.*

Water Supply - Purchased water is supplied to the main campus through three (3) main water meters. These meters are read and maintained by Charlotte/Mecklenburg Utility Department. These meters are located on NC 49 (University City Blvd.), US 29N, and Mary Alexander Road. Water is then distributed throughout campus via the University owned and maintained underground distribution piping system. Invoices are received monthly from Charlotte Mecklenburg Utility Department and include charges for water usage, sewer and storm water drainage (based on square footage of impervious area). Facilities Management thoroughly reviews invoices for correctness, accuracy and billing errors.

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<b>Past Year Accomplishments</b>	<b>Measurement</b>	<b>Savings Actual or Calculated</b>	<b>Cost</b>	<b>Funding Source</b>
Conduct routine inspection on irrigation systems.	Gallons	N/A	N/A	M&O Budget
Conduct Routine Inspections for water leaks	Gallons	N/A	N/A	M&O Budget
Integrated Rain Water Harvesting in EPIC	Gal	\$7K	\$140K	Capitol
<b>Planned Activities 2012-2013</b>	<b>Measurement</b>	<b>Savings Estimated</b>	<b>Cost</b>	<b>Funding Source</b>
Conduct routine inspection on irrigation systems.	Gallons	N/A	N/A	M&O Budget
Conduct Routine Inspections for water leaks	Gallons	N/A	N/A	M&O Budget
Continue to develop reclaim water usage plan	Gallons	N/A	N/A	Capitol
Include Rain Water Harvesting for irrigation in New Bldgs	Gal	\$5K	\$150K	Capitol

**Appendices**

**A.** G.S. 143-64.12(a) Declaration

**B.** SCO Annual Report Form FY '13 (Attachment)