

**Strategic**

**Energy Plan**

**2014 UPDATE**

September, 2014

Contents

**Executive Summary**

**Campus Energy Overview**

**Energy Conservation Accomplishments and Goals**

**Water Conservation Accomplishments and Goals**

**Energy Plan**

**Energy Data Management**

**Energy Supply Management**

**Energy Use in Facilities**

**Equipment Efficiency**

**Organization Integration & Awareness Training**

**Water Plan**

**Water Management**

**Water Supply**

**APPENDICES**

1. G.S. 143‑64.12(a) Declaration
2. SEO Annual Report Form FY ’13 (Attachment)

**Executive Summary**

**Campus Energy Overview**

**Size and Growth**

UNC Charlotte is an urban research-intensive university, located on a 1,000 acre campus in the state’s largest metropolitan city. In the fall of 2014, the University had a campus community (students and faculty) of approximately 30,000 with more than nine (9) million gross square feet (GSF) of built space, including parking decks. Approximately 750,000 GSF of space was added in fiscal year 2013-14. 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 grow to support the campus population growth.

Since 2002, the full time equivalent (FTE) campus population has grown by almost 50% and built space has more than doubled. In that same period, energy consumption has grown by 55%, and energy costs have grown by 89%; however, energy consumption per GSF has fallen by 27%.

**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 27% per building GSF provided an avoided cost of approximately $3.8 million this year alone and $10 million over the life of the program, as defined by the NC DENR (formerly SEO). New buildings continue to have energy recovery and high efficiency equipment and systems installed.

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

Web based monitoring is provided on all new buildingsand 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 reducing the speed of the supply fans when the campus electric demand is projected to exceed a certain value. Electric load shedding 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 has obtained Green Globes certification in our two newest dorms Hunt Hall and Martin Hall. UNCC is the first State Agency to seek Green Globes certification. UNCC intends to seek three Green Globe Certification in all future construction projects, where feasible.

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 56% 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 considers rainwater harvesting systems in all new buildings to displace some of the irrigation demand on the domestic water system. Consideration is also given to collecting 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.

**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. UNCC is beginning to compare energy usage in similar building types by usage, i.e. library, classroom building, research building, etc***.***

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| **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 2014-2015** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| New sub-metering. Electric, water, & gas meters tied to BAS. Phase 2 | Monthly | N/A | $100k | Utilities Cary 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 |

*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.

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| **Past Year Accomplishments** | **Measurement** | **Savings Actual or Calculated** | **Cost** | **Funding Source** |
| 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 incentives from Duke Energy as applicable | $ | $400K | N/A | N/A |
| Substation: Use electrical load shedding to reduce peak demand. Phase 2 | KW | $70K | $50k | FM Budget |
| **Planned Activities 2014 - 2015** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| 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 | $ | $30K | N/A | N/A |

*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.

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| **Past Year Accomplishments** | **Measurement** | **Savings Actual or Calculated** | **Cost** | **Funding Source** |
| Controls Modifications for Energy – Scheduling, Resets, Tuning, etc.. | KWH & KW,BTU’s | $80k | $50k | R&R |
| Retro Commission Foundation Bldg |  | $10K | $100K | R&R |
| Replace Pneumatic controls with digital in 6 bldgs | BTU’s | $60K | $600k | Performance Contract |
| **Planned Activities 2014 - 2015** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| Controls Modifications for Energy – SAT Resets, Tuning, etc., Phase 2 | BTU’s | $50K | $100K | 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 |
| Retrofit energy efficient lights, and equipment. | KWH | $100K | $500K | R&R |
| Retro Commission McEniry | KWH | $10K | $150K | R&R |
| Renovate Holshouser Hall | KWH |  |  | HRL Bonds |
| Renovate Oak Hall | KWH |  |  | HRL Bonds |

*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.

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| **Past Year Accomplishments** | **Measurement** | **Savings Actual or Calculated** | **Cost** | **Funding Source** |
| 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 Cooling Tower | KWH | $15K | $250 K | R&R |
| **Planned Activities 2014 - 2015** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| 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 | R&R |
| Replace SAC chillers with efficient models | KWH | $70k | $700K | R&R |
| Replace Grigg Hall Clean Room Chiller | BTU | $20K | $250K | R&R |

*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.

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| **Past Year Accomplishments** | **Measurement** | **Savings Actual or Calculated** | **Cost** | **Funding Source** |
| Sustainability Newsletter issued Quarterly | N/A | N/A | N/A | FM Budget |
| Additional Sustainability Meetings | N/A | N/A | N/A | FM Budget |
| **Planned Activities 2014 - 2015** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| Support Campus Sustainability Efforts | N/A | TBD | N/A | General Fund |

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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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| **Past Year Accomplishments** | **Measurement** | **Savings Actual or Calculated** | **Cost** | **Funding Source** |
| 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 |
| **Planned Activities 2013-2014** | **Measurement** | **Savings Estimated** | **Cost** | **Funding Source** |
| 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 |
| Integrated Rain Water Harvesting in EPIC | Gallons | $7K | $140K | Capitol |
| Consider Rain Water Harvesting for irrigation in New Bldgs | Gallons | $5K | $150K | Capitol |

**Appendices**

1. G.S. 143‑64.12(a) Declaration
2. SCO Annual Report Form FY ‘13 (Attachment)

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**Appendix A**

**I have read the Strategic Energy & Water Plan for my Organization. The plan, as presented, supports the reductions required in G.S. 143‑64.12(a).**

**Implemented this 12th day of September, 2014.**

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