REVIEW OF UNIVERSITY POLICIES FOR SUSTAINABILITY AT UNC CHAPEL HILL

by

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Introduction
The goal of this paper is to investigate policies at the University of North Carolina at Chapel Hill in regards to long-term campus sustainability. The report will be presented in two parts.

The first part will be broad, focusing on incentives for U.S. institutions of higher education (hereto referred to as simply “universities” or “colleges”) that encourage sustainable practices on campus.

The second will an analysis of policies relating to building operations at the University of North Carolina at Chapel Hill (UNC) by looking at four buildings on UNC’s central campus to determine if they meet the prerequisites for the Leadership in Energy and Environmental Design (LEED®) Green Building Rating System, LEED for Existing Buildings: Operations and Maintenance, 2009 Edition, which is developed for existing commercial and institutional buildings.

These two pieces will help me to formulate constructive recommendations for University policy decision-making. Creating and implementing more sustainable and comprehensive policies for University operations would have numerous positive effects for the University: enhanced reputation as a campus sustainability leader, leading to a positive “green” image with potential impacts on student recruitment; reduced operating and maintenance costs, especially in the long-run; and simplified policies which will lessen confusion and ensure University departments and employees know how to operate. LEED Certified buildings would be a recognizable reward for such policies, giving the University something to show for its sustainable efforts. The first part will allow me to demonstrate incentives for the University to enact more sustainable policies beyond reduction of environmental impacts, and the second will provide an idea of where the University’s current policies and building operations stand by comparing them with the widely respected and rigorous standard of LEED.

Sustainability
Sustainability is a complex concept, often described as meeting the needs of the present without compromising the ability of future generations to meet their own needs (ISU, 2010). However, this is too often thought of in regards to environmental resources only. In reality, there are three dimensions of sustainability, or the “triple bottom line,” of environmental integrity, social equity and economic prosperity, a concept sometimes called “planet, people and profit” (ISU, 2010). Sustainability is where these three overlap, creating solutions that benefit society today without hindering society tomorrow, while accounting for the environmental and economic costs of human development.

The idea of sustainability is both a factual, scientific approach to examining actions, as well as a call to action for long-term responsible measures, which makes higher education an ideal place for sustainability to be implemented, innovated and advanced.
The Need for Sustainability in Higher Education

Universities in the U.S. have been centers for political discourse and catalysts for social action for decades. The 1960s saw student movements across the nation in response to a host of different issues: nuclear armament and war, segregation, women’s rights, and environmental deterioration. Student demonstrations were common in the 1970s as students marched, spoke-out, and sat-in for various causes (M’Gonigle & Starke, 2006).

The first Earth Day was celebrated on campuses from coast to coast on April 22, 1970. This is often cited as the kickoff of the modern environmental movement, and college and university campuses have continued to be focal points of concern and action through the following decades. Since the 1990s the national green campus movement has been steadily growing, with a recent boom since the turn of the 21st century, and have been several major events in the past few years. The Higher Education Associations Sustainability Consortium, a coalition of twelve of the most important professional associations in higher education, was formed in 2005. A year later in 2006 the Association for the Advancement of Sustainability in Higher Education (AASHE) was created, and attracted more than 350 members in its first year. The American College and University Presidents Climate Commitment, a pledge to achieve climate neutrality, was started in 2007 (Simpson, 2008).

Universities are unique because they are in the business of teaching, and are not normal industries; the products of universities are far more varied and diverse than a traditional industry, producing doctors, accountants and historians. However, the rule of the bottom line persists in universities as in all businesses. Corporate- and government-driven research is contracted out, creating departments and schools that are no longer primarily oriented to teaching, and government budget cuts add to the corporate agenda that universities must operate in (M’Gonigle & Starke, 2006).

Recently, universities have little choice but to heed the knowledge and advice gleamed from their own students and faculty regarding the need to act sustainably, which conflicts with the modern university’s need to operate as a business (M’Gonigle & Starke, 2006). This means that schools should function not under a business plan exclusively, but rather an action plan that sees the institution educating with all aspects of their operations in mind. This opens the door for business, educational and moral arguments for using best practices and sustainable measures on campuses. Cost-efficiency and return on investments are the name of the game for publications such as Eagan, Keniry, and Schott’s (2008) Higher Education in a Warming World: The Business Case for Climate Leadership on Campus and Putman and Philips’ (2006) The Business Case for Renewable Energy: A Guide for Colleges and Universities which advise how and why to finance sustainable action on campus. But many schools have been citing non financial reasons for why they enacted sustainable measures (Hsu, 2008).

Higher education has the ability to be a key player in humanity making a substantial shift to thinking, acting and living sustainability. Universities and colleges have tax-free status, the ability to receive both public and private funds, and vast academic freedom. Higher education must use these advantages and its influence on future generations of scientists, teachers, businessmen, and government leaders to take a leadership role in the effort to
achieving a sustainable society, as they did with the space race and the war on cancer (Cortese, 2008), and lead through education and research, as well as by example.

Certified green buildings are one way that campuses can lead in sustainability actions. They signal an ongoing commitment to considering the economical and environmental costs of operation. There are currently several green building evaluation systems in the United States. The Environments for Living Certified Green program ensures a home is designed and built with “building science features from the program, plus additional requirements in areas such as indoor water efficiency, lighting and appliance efficiency, and indoor environmental quality.” The program was started in 2001 and has since certified over 100,000 homes (Masco Home Services, 2008). BREEAM is an environmental assessment method for buildings that is based in the United Kingdom and has since been used across the world (BRE, 2009). The Green Building Initiative's Green Globes program certifies buildings in the United States using BREEAM guidelines, and claims to be “one of the leading green building rating systems in the U.S.” (GBI, 2010). Energy Star “qualified homes” must meet strict energy efficiency guidelines set by the U.S. Environmental Protection Agency; since 1995 more than one million Energy Star homes have been built (EPA, 2010). However, LEED has become the most widely accepted (and the most well known) standard for green building evaluation and certification system in the United States (Moltz, 2008).

**LEED**

As mentioned, LEED stands for Leadership in Energy and Environmental Design, and is an internationally recognized certification system for green building, overseen by the United States Green Building Council (USGBC). Certification verifies a building was designed and built to high performance across several different metrics. There are nine different LEED rating systems¹, but UNC buildings are most concerned with two: New Construction and Existing Buildings: Operations and Maintenance (LEED EBOM).

By committing to building and maintaining buildings in accordance with practices that result in LEED certifications, UNC establishes and shows an ongoing commitment to reducing the environmental impacts of its buildings, which can be huge. Buildings annually consume more than 30% of the total energy and over 60% of the electricity used in the United States, and can generate up to 1.6 pounds of solid waste per employee per day (USGBC, 2009b). The commercial building sector alone produced over 1 billion metric tons of carbon dioxide in 2006. LEED certified buildings are one way that UNC can help to curb these impacts and continue to be a leader in campus sustainability, but to achieve these prestigious certifications the University will need more sustainable policies for building and campus operations.

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¹ LEED for Core and Shell, LEED for New Construction, LEED for Schools, LEED for Neighborhood Development, LEED for Retail, LEED for Healthcare, LEED for Homes, LEED for Commercial Interiors, and LEED for Existing Buildings: Operations and Maintenance
Sustainability at UNC Chapel Hill

The University of North at Chapel Hill has been exploring ways of becoming a more sustainable university for over a decade. Pressure from students pushing for the university community to become more proactive on environmental issues, combined with Executive Order 156 from then-governor Jim Hunt, which called on all state agencies to adopt more sustainable practices, led to the first organized efforts to institutionalize sustainability at UNC in 1999, with the formation of the Sustainability Coalition (UNC Sustainability Office, 2008). In 2001 UNC became the first university in the state of North Carolina to hire a full-time Sustainability Coordinator. The University’s Sustainability Office was formed shortly thereafter and the University has been advancing sustainably ever since.

Most recently the University received an A– from the Sustainable Endowments Institute’s College Sustainability Report Card 2010, listing UNC as one of the top 26 campus sustainability leaders in the nation (Sustainable Endowments Institute, 2009). The University was also one of the first schools to register for the AASHE Sustainability Tracking, Assessment and Rating System (STARS) program, a transparent, self-reporting framework for colleges and universities to gauge relative sustainability progress. However, UNC has a lacking of one of the most widely known sustainable metrics: LEED certified buildings.

UNC has one LEED Certified building on campus, the addition to the School of Nursing’s Carrington Hall. Another, the new Education Center at the North Carolina Botanical Gardens, is nearing completion and hopes to be the University’s first LEED Platinum certified building. Since 2008, all new buildings entering design are required to be designed to achieve a minimum of a LEED Silver standard2 (UNC Sustainability Office, 2009).

These are encouraging developments, but they all are done for the LEED for New Construction certification system. The University has large potential for getting existing buildings LEED certified with the LEED EBOM program, ensuring buildings are operating in an environmentally friendly manner, saving money, streamlining operations and maintenance, as well as increasing UNC’s image as a green campus. One major obstacle for UNC buildings to achieve LEED EBOM certification is that many University policies for operations are not up to such high levels of sustainability. This report will use a gap-analysis of LEED prerequisites to establish recommendations for University policies to become more sustainable, which would fulfill the LEED EBOM prerequisites.

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2 However, being built to the standards of LEED Silver does not mean that the buildings will all go through the process to actually be certified, as this is a costly procedure in terms of both time and money.
Part I – Incentives for Sustainability in Higher Education

Incentives for campus sustainability can take many forms at the local, state and federal levels. They can be in place to simply recognize or reward using current practices, or to encourage innovation and spark competition, thereby facilitating the growth and advancement of sustainability at a high level.

Methodology

Two reviews of national incentivizing programs to promote sustainability on campuses were done at the national and state (North Carolina) levels, focusing on the two major different incentive types financial and rating systems.

Financial Incentives

Most incentives in place today tend to be financial. The North Carolina Solar Center out of N.C. State University maintains the Database of State Initiatives for Renewables and Efficiency (DSIRE, 2009), which lists many financial incentives for renewable energy and energy efficiency at the federal, state, utility, local, and non-profit levels for every state. Each state has energy incentives in place, almost always on multiple levels, in the form of tax incentives, rebates, grants, loans, industry support, bonds, and production incentives.

The recent American Recovery and Reinvestment Act of 2009 allocated historic levels of resources for higher education (Medlin, 2009), as well as a specific pot of money for campus infrastructure “modernization, renovation, and repairs that are consistent with a recognized green building rating system” (Alliance To Save Energy, 2009).

National Incentives

Federal Loan Programs

Clean Renewable Energy Bonds may be used by certain entities, principally in the public sector, to finance renewable energy projects including wind, biomass, geothermal and solar. These bonds are treated as taxable income for the bondholder, and are theoretically issued with a 0% interest rate, though, in practice, issuers have occasionally issued the bonds at a discount or made supplemental interest payments in order to find a buyer. The tax credit may be taken each year the bondholder has a tax liability, as long as the credit amount does not exceed the limits established by the federal Energy Policy Act of 2005 (IRS, 2007 and NC Solar Center, 2009).

Qualified Energy Conservation Bonds (QECBs) are similar to the above bonds and can be used by state (and local and tribal) governments to finance certain types of energy projects. The advantage of these is that they are issued (again, theoretically) at an interest rate of 0%, the borrower pays back only the principal of the bond, and the bondholder receives federal tax credits in lieu of the traditional bond interest. Qualified projects encompass a
broad array of initiatives and include renewable energy production, as well as things like public energy efficiency education campaigns (DSIRE, 2009).

The U.S. Department of Energy's Loan Guarantee Program was authorized by the federal Energy Policy Act of 2005 to offer more than $10 billion in loan guarantees for energy efficiency, renewable energy and advanced transmission and distribution projects. The terms require full repayment over a period not to exceed 30 years or 90% of the projected useful life of the physical asset to be financed, whichever is less. The program's initial due date for programs was in September of 2009, but it might open back up if the funding is not fully obligated (DSIRE, 2009).

National Production Incentive
The Renewable Energy Production Incentive provides incentive payments for electricity generated and sold by new qualifying renewable energy facilities. Qualifying systems are eligible for annual incentive payments of 2.1¢ per kilowatt-hour (kWh) in 1993 dollars indexed for inflation for the first 10-year period of their operation. Qualifying systems are those that sell electricity generated by electricity using solar, wind, geothermal, biomass (excluding municipal solid waste), landfill gas, or livestock methane to another entity (DSIRE, 2009).

North Carolina Incentives
Production Incentives
The NC GreenPower Production Incentive is a statewide green power production incentive program with the intent to encourage the use of renewable energy in North Carolina. The program offers production payments for grid-tied electricity generated by solar, wind, small hydro and biomass. The payments are from utility power-purchase agreements and are made on a per kWh basis dependent on the technology used. Solar electric systems receive $0.15 per kWh from the program plus approximately $0.04 per kWh from their utility under the power-purchase agreement, for a total production payment of about $0.19 per kWh. Wind-energy systems receive $0.09 per kWh from the program, plus approximately $0.04 per kWh from their utility, for a total production payment of about $0.10 per kWh (NC GreenPower, 2010).

Progress Energy has two production incentive programs under the SunSense solar initiatives. The SunSense Commercial PV Incentive Program will pay $0.18 per kWh for the electricity and renewable energy credits (RECs) generated by the photovoltaic system for a period of 20 years. Participants must sell all the electricity and RECs generated by the system, and purchase all the electricity their facilities consume. The SunSense Commercial Solar Water Heating Incentive Program is very similar, paying $20 for each renewable energy credit (RECs) generated by solar water heating systems for a period of 10 years (Progress Energy, 2010). The University has a history of receiving funding from Progress Energy for sustainable energy. In 2006 Progress Energy invested $150,000 to create the

State Grant Program
The North Carolina Green Business Fund was formed in 2007 to encourage the development and commercialization of “promising” technologies for both renewable energy and green building. Grants are awarded up to $100,000 for the development of innovations and applications in several sectors including sustainable building. Eligible renewable technologies include: passive solar, solar water, space and thermal process heat, photovoltaics, wind, and biomass (DSIRE, 2009).

American Recovery and Reinvestment Act of 2009
The massive American Recovery and Reinvestment Act of 2009 allocated $3.2 billion in formula grants available to U.S. states (and other local governments) under the Energy Efficiency and Conservation Block Grant (EECBG) Program (H.R. 1, 2009). This program provides funds to “develop and implement projects to improve energy efficiency and reduce energy use and fossil fuel emissions in their communities” (US Department of Energy, 2010).

EECBC funds can be used to carry out activities aimed at meeting the goals of the EECBG program, including: conducting residential and commercial building energy audits, developing and implementing energy-efficiency and energy-conservation programs and facilities; applying and implementing energy-distribution technologies to increase energy efficiency; purchasing and implementing technologies to reduce, capture and use methane and other greenhouse gases; and developing, implementing and installing renewable-energy technologies, including solar, wind, fuel cells, and biomass (Green for All, 2009).

The State Budget Factor
State governments are major driving forces directing the purchasing of state universities. State governments continue to be focused on reducing expenses, especially as the nation comes out of the recent recession. This desire to cut costs, though perhaps seemingly contradictory, goes hand-in-hand with governments’ desire for “green” purchasing, as environmentally-preferable purchasing makes financial sense for a school’s budget. Governments are increasingly seeing green purchasing as a way to save money, as well as help the environment. Lower product costs mean that buying green no longer has to cost more, but the real driver is the long-term cost savings. Many government purchasing policies are no longer required to focus solely on the initial purchase price; more are using total-cost pricing, which looks at the initial cost as well as operational and disposal expenses (Case, 2010). This means that budgets are made for products that might be slightly more expensive upfront, but that generate significant long-term financial savings.
Ranking and Rating Systems

The most notable non-financial incentives seem to be systems that rank, grade, or somehow assign a rating to schools. Americans like ranking things, and universities justly like promoting their recent laudable marks every chance they can find to. Peer and public reputations are important to universities, and rankings can facilitate competition and innovation (Orr, 2008).

Colleges and universities have been ranked for years by many different publications and organizations. Recently a new category of rating systems has emerged: the green rating.

When examining these tools, it is important to note the difference between the two types. Rankings (listings) on the other hand aim to inform prospective students (and their parents) of schools that have environmental issues as part of the core of their mission. These are typically published by for-profit college guides and magazines and have less scientific and more anecdotal methods. Rankings are criticized for arbitrarily publicizing some schools over others, potentially misleading readers.

Rating systems strive to be substantial assessment tools of a school’s commitment to the environment both in thought and practice. These are usually compiled by nonprofits and data is typically self-reported by the schools that choose to participate. Ratings are criticized for allowing low performers to “fly under the radar” by choosing to not participate, the voluntary and often unverified nature of the data submission, and any fees for participation. Rating systems can include lists too, which are usually unranked and used to highlight schools doing exceptionally well.

There are many different rating systems and ranking publications that aim to determine how green or sustainable universities are, or which ones are the greenest. A few of the most notable ranking and rating systems are:

- The Association for Advancement of Sustainability in Higher Education’s Sustainability Tracking, Assessment and Rating System (AASHE STARS) ³
- The Sustainable Endowments Institute’s College Sustainability Report Card ⁴
- The Princeton Review’s Green Rating and Green Honor Roll ⁵
- The National Wildlife Federation’s Campus Report Card⁶
- The Sierra Club’s Top Ten Cool Schools⁷

Several notable publications also list green schools, though without the rankings, these include, Forbes Magazine’s America’s Greenest Campuses and Kaplan’s Green Schools & Green Careers Guide as a part its comprehensive College Guide, featuring special coverage of

³ http://stars.aashe.org/
⁴ http://www.greenreportcard.org/
⁵ http://www.princetonreview.com/green.aspx
⁷ http://www.sierraclub.org/sierra/200909/coolschools/
environmentally responsible schools. These kinds of unranked lists do not assess the schools in any way, but details green aspects of selected institutions, often picked from high performers found through other systems.

The rating and certification system that is poised to become the standard for measuring campus sustainability, both across different schools but mainly over time for individual schools, is the AASHE STARS program. Commissioned by the Higher Education Associations Sustainability Consortium in 2006, it is hoped that STARS reaches the same level as an accepted standard that LEED certification has achieved with buildings. STARS uses a standardized methodology hinged on transparency from start to finish, which included making data and documentation provided by participating schools publicly available. The scoring rubric is objective with solid requirements for scoring points that are known from the beginning. Application to be certified by STARS is lengthy, detailed and comes with a fee, but the comprehensiveness and transparency makes STARS the likely standard for campus sustainability rating and tracking of the future (Moltz, 2008). Indeed, AASHE has stated the intent for STARS to become the primer campus sustainability assessment tool, alleviating the need for “so many sustainability surveys” (AASHE, 2010).

Problems arise when comparing the different assessment systems. Different methodologies rarely look at the same metrics and can disagree on which are the most important. Lists of schools that highlight sustainable initiatives are sometimes suspected of being based on schools’ public relations offices rather than their actual environmental efforts (Zernike, 2008). A study by Michael Shriberg (2002) found that the eleven campus sustainability assessment tools “vary[ed] greatly in purpose, scope, function and state of development.” Shriberg goes on to suggest that a “universal tool” would have great benefits in terms of standardizations and comparisons, but that developing it would be a “painstaking process” and questioned the feasibility of such a project.

AASHE seems to feel that the resulting STARS rating system will be worth the three-year development effort, stating that the program “provides a substantially more meaningful assessment of an institution’s sustainability performance than other systems available today.” With over 125 participating institutions already signed up for Version 1.0 (AASHE, 2010), it seems that many universities feel the comprehensive assessment is worth the time and money.

**How Important are They?**

As this topic becomes a top-tier issue along with academic quality and campus life, it is expected that these ratings and rankings will play a role in students’ selections. Though no data that suggests students’ college decisions would be dependent on sustainability issues (Moltz, 2008), students do want the information provided by these assessment systems.

The prestige that comes with a university’s school or department named one of the best in the country may seem to matter more to the university itself than prospective students. Indeed, colleges are often eager to be ranked, the Princeton Review’s first green rating was no exception, garnering a high response rate, so much so that there is worry that schools
focus on where they stand in relation to other schools rather than on actual sustainability issues (Moltz, 2008). But prospective students (and their parents) keep buying the guides and reading the lists. So it seems that the ratings and rankings do carry some weight throughout the scope of higher education, though it remains uncertain just how much.

In fact, though not significant statistically speaking, a Princeton Review survey found that 63% of over 10,000 college applicants said that a college’s commitment to the environment could potentially affect their decision to attend (Zernike, 2008). Some schools have seen interest rise after implementing sustainable initiatives and highlighting them to prospective students through letters or tours, suggesting that going green can be a boost to recruitment (Hsu, 2008). Some schools seem to think that their green image really does matter when landing prospective students. Ciannat Howett, director of sustainability initiatives for Emory University, puts great importance on being on the leading edge of the green campus movement, saying, “If you want to get the best and the brightest to come to your campus in this day, you are going to need to be showing your commitment to sustainability” (Wood, 2010).

The competition that is created, especially by rankings, is certainly a positive. Even if a school starts more symbolic rather than significant sustainability efforts, they are likely achieving at least some progress and raising awareness of the issues to some degree, which is better than no action at all. A positive trend in this light is that ranking lists are fairly reliant on the more comprehensive rating systems. So even if a school is taking easy steps in an effort to win a label or spot on a top-ten list, the lack of substantial effort will be picked up by the more rigorous rating systems and then reflected by the ratings.

**Incentives Conclusions**

There are several financial incentives for renewable energy available. The University has implemented several renewable energy projects recently, including a 174-panel solar hot water system on top of Morrison Residence Hall, thirty one geothermal wells at the Botanical Garden Education Center, a solar hot water system that will be installed on top of Fetzer Gym when the roof is replaced, and a photovoltaic system to light the stairwells at the future Bell Tower Parking Deck. These investments have been allocated by the student-run Renewable Energy Special Projects Committee, an arm of Student Government, with funds from the $4 per semester green energy fee (UNC Sustainability, 2009). The University would be wise to apply for funding from state and federal renewable energy programs to bolster the green energy fee for future renewable energy infrastructure investments on campus.

UNC has benefited from the rankings and assessment tools. The University and the Sustainability Office have participated in voluntary assessment tools in the past and is currently participating in STARS as a pilot program. This shows the University’s intent to gauge the status of sustainability on campus and have areas for improvement brought to attention. Their efforts have been rewarded with high marks by several different assessment systems: an A– from the Sustainable Endowments Institute’s College Sustainability Report Card 2010; a Green Rating of 96 out of a possible 99 points (in the top

To date, UNC is doing very well with actual achievements. Moving forward there needs to be an effort to make sure not to simply go after the “low hanging fruit,” those projects which are easy to achieve and hype, but to also go after ambitious, and perhaps less glamorous, projects that will have the biggest substantive results. There are various financial incentives to help the University do this, and the desire to stay a nationally recognized leader in campus sustainability will undoubtedly help fuel the fire.
Part II – UNC Policy Review Against LEED for Existing Buildings

The aim of this section is an analysis of University polices that relate to LEED EBOM operations by examining four buildings on the campus of the University of North Carolina to see if they meet the nine prerequisites of LEED for Existing Buildings: Operations and Maintenance. Existing policies are compared to LEED criteria as a standard of robust and successful sustainable policies.

LEED for Existing Buildings

The U.S. Green Building Council (USGBC) was formed in 1993, and the members soon realized that there was a need for a system to define and measure “green” buildings. In August 1998, the first Leadership in Energy and Environmental Design pilot project program, called LEED Version 1.0, was launched. After extensive modifications, the second version, Version 2.0, was released in 2000; Version 2.1 followed in 2002, and Version 2.2 in 2005. In April 2009, the newest and current system, Version 3.0, was launched. Versions vary slightly in the distribution of points and organization of individual credits; effort is also made when updating the rating systems to incorporate emerging green building and monitoring technologies (USGBC, 2009b).

Overview

The LEED Green Building Rating Systems are voluntary tools used to evaluate environmental performance based on existing, proven technologies and practices, over a building’s lifecycle. LEED for Existing Buildings: Operations and Maintenance (LEED EBOM) is a set of performance standards for certifying the ongoing operations and maintenance of existing buildings of all sizes, both public and private, with the intent to promote high-performance, healthy, durable, affordable, and environmentally sound practices. Following the guidelines in LEED EBOM helps building managers and owners to improve performance and maintain it over time, reduce cost streams and environmental impacts, create healthier and more productive workplaces, and receive public recognition (USGBC, 2009a).

The LEED EBOM system is organized into five environmental categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. There are two additional categories: Innovation in Design or Operations, which covers any sustainable building expertise or measures that are not covered by the five main environmental categories, and Regional Priority, which provides incentive to address geographically specific environmental issues (USGBC, 2009b).

Prerequisites and Credits

To be certified under LEED EBOM, a building must meet the minimum program requirements, meet the prerequisite credits, and earn points from achieving additional credits to attain a certification level.

The minimum program requirements are characteristics that a project must possess and are designed to define the types of buildings that each LEED Green Building Rating System
was designed to evaluate. Examples of these requirements include, must include a minimum of 1,000 square feet of gross floor area, and compliance with all applicable federal, state and local building-related environmental laws and regulations.

There are 100 base points, as well as a possible 10 additional points, 6 for Innovation in Design and 4 for Regional Priority. Depending on how many points are awarded for completing credits, there are four different certification levels awarded:

- **Certified**: 40-49 points
- **Silver**: 50-59 points
- **Gold**: 60-79 points
- **Platinum**: 80 points and above

The numerous credits allow opportunity to build up points towards the different certification levels. Most credits are worth one point, but several can earn a building multiple points. No credit is mandatory; each project must decide which credits to work towards to earn enough for the desired certification level.

The prerequisites are the focus of this project. No points are awarded for prerequisite achievement. There are nine prerequisites for all LEED EBOM projects that fall under four of the five environmental categories (LEED specifies no prerequisite for Sustainable Sites). The following is a list of the prerequisites with brief descriptions of their intent. For full information consult the *LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition* (USGBC, 2009b).

- **Sustainable Sites:**
  - None
- **Water Efficiency:**
  1. *Minimum Indoor Plumbing Fixture and Fitting Efficiency*: to reduce indoor water use within the building as a means of reducing burdens on potable water supply and wastewater systems.
- **Energy & Atmosphere:**
  2. *Minimum Energy Efficiency Performance*: to establish the minimum level of operating energy efficiency relative to buildings of similar type to reduce environmental and economic impacts from excessive energy use.
  3. *Fundamental Refrigerant Management*: to reduce stratospheric ozone depletion.
- **Materials & Resources:**
  1. *Sustainable Purchasing Policy*: to reduce the environmental impacts of materials acquired for use in building operations, maintenance and upgrades.
  2. *Solid Waste Management Policy*: to facilitate the reduction of waste generated by the building occupants that is disposed of in landfills or incinerators.
• **Indoor Environmental Quality:**
  1. *Minimum Indoor Air Quality Performance:* to enhance air quality inside the building, thus contributing to the health and well-being of the occupants.
  2. *Environmental Tobacco Smoke Control:* to prevent or minimize exposure of building occupants, indoor surfaces and systems to tobacco smoke.
  3. *Green Cleaning Policy:* to reduce the exposure of building occupants and personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment.

**Background**
The University’s Sustainability Office has future plans for LEED EBOM certification projects. This gap analysis will hopefully act as a first step for the Sustainability Office in the attempt to get LEED for Existing Buildings certifications in the future. Because policies are a key component of these prerequisites, this will be a valuable metric to judge current University policies to determine how effective they are for continued sustainability.

**Methodology**
Firstly, a thorough working knowledge of the LEED-EBOM rating system, particularly the nine prerequisites, was gained through a detailed review of literature relating to LEED in general and LEED EBOM specifically; this included many documents from the U.S. Green Building Council, especially the *LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.*

The scope of this project was restricted by time. Due to this limitation I decided to focus on only four buildings. From the hundreds of buildings on campus, the following four were chosen for this project: the Addition to Carrington Hall, School of Nursing; the FedEx Global Education Center; Knapp-Sanders Building, School of Government; and McColl Building, Kenan-Flagler Business School.

Cindy Shea, the Director of the University’s Sustainability Office, helped guide my selection of these buildings. Looking at the nine prerequisites, a short list of criteria for selecting buildings was developed. These criteria included: building and control systems age, existing energy conservation measures, interested occupants, and past or planned retro-commissions. Considering these criteria we developed a list, primarily consisting of newer buildings on campus. From these I selected four that I felt offered the best chance for certification in the near future based on my prior knowledge of existing green building elements and recentness of construction.

Numerous contacts were made with various University offices and departments and managers of the four study buildings, starting with several suggestions from Cindy Shea. Many meetings were scheduled and emails sent to collect all the various information. As this information was found, it was compiled and compared against the LEED specifics, and slowly the report began to take shape, as gaps in the prerequisites were found. From these gaps, and insight from Part I, I drew my conclusions and recommendations.
Results: University Policies vis-à-vis LEED Prerequisites
This section details findings for each of the nine prerequisites as they apply to University-wide policies. Further results discussion by building can be found in the Results Summary section, starting on page 28.

Water Efficiency Prerequisite 1 – Minimum Indoor Plumbing Fixture and Fitting Efficiency
This prerequisite requires calculations to be done to demonstrate plumbing performance at or below the LEED water use baseline, calculated assuming 100% of a building’s indoor plumbing fixtures and fittings meet the plumbing code requirements of the 2006 editions of the Uniform Plumbing Code (UPC) or International Plumbing Code (IPC) pertaining to fixture and fitting performance. The water use baseline is set depending on the year of the last substantial competition\(^8\) of the building’s plumbing system: 1993 or later has a baseline of 120%, before 1993 has a baseline of 160%. Development of a policy requiring economic assessment of conversion to high-performance fixtures and fittings as part of any future indoor plumbing renovation is also required (USGBC, 2009b).

Because they were all completed after 1993, all four of the buildings in this study would have to have their water use calculations assuming 100% UPC or IPC compliance at or below 120%. Not surprisingly, no such building-specific calculations have been done (C. Martin, personal communication, March 29, 2010) though the University has implemented several water efficiency measures including the installation of many water-saving technologies including low-flow fixtures and dual-flush toilets. In addition, the University has set the goal of designing plumbing systems that are 20-30% more efficient that the North Carolina code when planning new buildings and renovation projects (UNC Sustainability Office, 2008).

WE 1 – Minimum Plumbing Efficiency Conclusions
With no calculations such as these required by LEED done for any buildings on campus, none of the four study buildings meet this prerequisite and neither would other campus buildings. There is, however, a basis for a policy detailing conversion to high-performance fixtures as part of future renovations, which covers one part of these requirements.

This prerequisite calls for several documents about the building’s operations to be prepared: the current sequence of operations; a building operating plan detailing occupancy schedule, equipment run-time schedule, design set points of HVAC equipment, and design lighting levels; a systems narrative describing the mechanical and electrical systems; a preventive maintenance plan; and an energy audit (USGBC, 2009b).

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\(^8\) Substantial completion is defined as either initial building construction or the last plumbing renovation of all or part of the building that included 100% retrofit of all plumbing fixtures and fittings as part of the renovation.
\(^9\) All information regarding the University’s energy systems was collected during a personal interview with Christopher Martin, Director, and Jessica O’Hara, Data Analyst of Energy Management, on March 29, 2010.
Currently there is no effort to compile this information for campus buildings, and none of the four buildings for this study meet these documentation requirements. However, these practices are known by various facilities services departments and need only be formally documented.

**EA 1 – Energy Efficient Best Management Practices Conclusions**

No campus buildings, the four in this study included, meet this prerequisite. It does, however, appear that this would be an easy gap to fill for campus buildings, as the information called for is known by various University personnel, it is simply not documented in the format that LEED requires.

**Energy and Atmosphere Prerequisite 2 – Minimum Energy Performance**¹⁰

This prerequisite has two options for completion depending on if the project building is eligible for an Energy Star performance rating using the EPA’s Energy Star Portfolio Manager tool or not. If it is a building must score an energy performance rating of at least 69. Buildings that are not eligible have two options to use alternative energy efficiency measures developed by LEED to compare the project building to other buildings of similar type. The intent, in either case, is for the project building to score a certain amount better than its “peer buildings,” that is, buildings of the same type in similar climates (USGBC, 2009b).

None of the four buildings in this study have rated by the Energy Star Portfolio Manager. However, University’s Energy Management office has a Portfolio Manager account and has started the process of entering data for all appropriated campus buildings to receive performance ratings; as of March 2010, only a handful of buildings have been submitted and rated.

The problem with university buildings is that they often house several activities and therefore are difficult to classify into the set building types in Portfolio Manager. Energy Management has been entering University buildings in the “other” category, which is a problem for LEED certification, as no performance rating is available for the “other” category. If it is deemed that University buildings do not qualify for an Energy Star efficiency rating then they must use an alternate method described by LEED using an offline spreadsheet calculator to benchmark against national data from Portfolio Manager. This would not be an issue for Energy Management as they have several years of data for all campus appropriated buildings to enter into the spreadsheet calculator.

**EA 2 – Energy Performance Conclusions**

Currently, all four buildings do not meet this prerequisite, but the University is in the process of having data for all appropriated buildings entered into the Energy Star Portfolio Manager tool. If it is found that the alternative method should be used for campus buildings, the University has the data to complete this too. In short, this prerequisite is not currently met by any of the four buildings in this study, or most campus buildings. It is,

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¹⁰ All information regarding the University’s energy systems was collected during a personal interview with Christopher Martin, Director, and Jessica O’Hara, Data Analyst of Energy Management, on March 29, 2010.
however, one of the easier gaps to achieve, as all appropriated buildings are in the process of being entered into Portfolio Manager.

**Energy and Atmosphere Prerequisite 3 – Fundamental Refrigerant Management**

This prerequisite calls for zero use of chlorofluorocarbon (CFC)-based refrigerants in heating, ventilating, air conditioning and refrigeration (HVAC&R) base building systems, unless a third-party audit shows that system replacement or conversion is not economically feasible or a phase-out plan for CFC-based refrigerants is in place (USGBC, 2009b). The campus-wide Chilled Water Systems produces the chilled water used in the air conditioning systems of each of the four buildings in this report.

On the University's campus, chilled water, which is used to cool buildings and equipment, is provided by either the District Cooling Systems comprised of a network of chiller plants and underground piping or by one of eight stand-alone chillers dedicated to individual buildings.

The District Cooling System for the main campus consists of five chiller plants with a combined capacity of 50,000 tons. The plants are interconnected by 22+ miles of underground piping and operated as one production system using a networked control system. After it is chilled, the water flows into a loop piping system at up to 100,000 gallons of chilled water per minute, which distributes the water to bridge interface systems that control the flow of chilled water in and out of each of the campus buildings. When the water has been used and subsequently warmed, it is returned to a chiller plant to be chilled again and the cycle repeats.

This system includes water chillers that use refrigerants designated R-11 and R-22, which chlorofluorocarbon- (CFC) based refrigerants; a chiller is the machine that removes heat from the water in the process described above. The different “Rs” indicated the particular refrigerant used in the chiller. The system used to contain eleven R-11 chillers, but during the 2008-2009 winter five were phased out, leaving the current system with six R-11, two R-22, eighteen R-134A, and five absorption chillers. R-134A is a popular ozone-friendly replacement for R-12 (EPA, 2009).

The University is currently undergoing a third-party audit of the system. As this audit covers the entire campus system, it covers the refrigerants used in the HVAC systems for each of the four buildings in this report. Despite the fact that the University’s system does use CFCs, this audit could find that the four buildings do meet this prerequisite. To do this the audit must first of all be done by a third-party, which it is. Next, it must show that “system replacement or conversion is not economically feasible.” Replacement of a chiller is considered not economically feasible if “the simple payback of the replacement is greater than 10 years” (USGBC, 2009b).

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11 All information regarding the University's refrigerants was collected during a personal interview with Douglas Mullen, Facility Mechanical Engineer, Chilled Water Systems, Energy Services, on March 1, 2010.
EA 3 – Refrigerant Conclusions

No building on UNC’s main campus, including this study’s four buildings, would qualify for zero use of CFCs due to the CFC-based refrigerants used in the chillers used for all the chilled water for all of campus, meaning that the HVAC&R systems in these buildings use water chilled with CFC-based refrigerants. However, the audit could prove to meet the prerequisite. There would then be several leakage requirements that would have to be met for certification for any campus building.

Materials and Resources Prerequisite 1 – Sustainable Purchasing Policy

This prerequisite requires that an Environmentally Preferable Purchasing (EPP) policy that covers product purchases that are within the building and site management’s control be in place. At a minimum, this EPP policy must include ongoing consumables. Additionally, the policy must include at least one of the following: durable goods, facility alterations or additions, or reduced mercury in lamps (USGBC, 2009b).

The University has undertaken several environmentally preferable purchasing initiatives in the past several years. There is not, however, a unified policy for purchasing that covers all the types of purchases that the prerequisite calls for.

Due mainly to student demand, Carolina Dining Services (CDS) follows some environmentally friendly purchasing efforts. Much of the milk and meat is bought from local sources, and CDS works with its food distributors to incorporate as much locally grown food as possible, as well as follow Monterey Bay Seafood Watch Guidelines. All CDS locations also use non-bleached napkins, and coffee shops on campus sell Fair Trade coffees.

Several campus departments throughout campus have examples of environmentally preferable purchasing (often done for economic rather than environmental reasons), but it is rare for these to be an official policy that explicitly states goals and criteria. Paper purchasing varies between campus departments and differs in whether paper is chlorine free and the amount of recycled material. For example, Academic Technology and Networks, which operates many of the campus computer labs, uses 100% recycled paper, while Administrative Information Systems buys a minimum of 30% recycled content paper, and will not, for performance reasons, use 100% recycled paper.

Ongoing Consumables

Ongoing consumables are items that are replaced frequently, such as: paper (printing and copy paper, notebooks, notepads, and envelopes), toner cartridges, binders, batteries, and desk accessories (USGBC, 2009b). As noted above, there is no University-wide sustainable purchasing policy for paper, though since many of the different paper-consuming departments are taking the initiative to make environmentally preferable purchasing choices, a University-wide policy on paper purchasing could be smoothly implemented. A new policy encouraging the purchase of recycled toner cartridges for financial reasons has been put into place. There are currently no environmentally preferable policies that I could find that covered the purchasing of binders, batteries or desk accessories.
**Durable Goods**

LEED requirements for durable goods, items that have a higher cost and are replaced infrequently, gives the option of either electric-powered equipment and furniture (USGBC, 2009b). The University has had an Energy Efficiency Purchasing Policy in place since 2006. This mandates that energy consuming equipment, including computers, appliances, lighting, and office equipment, purchased by the University is Energy Star certified. Purchases that do not fit into an Energy Star product category must include energy efficiency in the selection criteria. This meets the requirements for sustainable purchasing of electric-powered equipment.

**Facility Alterations and Additions**

This includes base building elements such as building components (studs, insulation, doors, windows), panels, attached finishing (drywall, trim, ceiling panels), carpet and flooring, adhesives, sealants, and paints (USGBC, 2009b). These items are mostly sold through Facilities Services to individual departments or offices, and there is no EPP policy for any of these materials.

**Reduced Mercury in Lamps**

This requires a policy that specifies the maximum level of mercury permitted in indoor and outdoor mercury-containing lamps of 90 picograms per lumen-hour or less, and requires at least 90% compliance (USGBC, 2009b). Both the Energy Efficient Lighting Policy and Energy Use Policy of the University prohibit incandescent and halogen lighting without approval from Energy Management, but neither mention mercury content as a purchasing criteria. The Department of Environment, Health and Safety (EHS) has policies and procedures for disposal of mercury-containing lamps, as well as a Mercury Free UNC program. The Mercury Free UNC program looks to eliminate non-essential uses of elemental mercury from campus laboratories and covers mainly equipment such as thermometers, barometers, microscopes, and various other measuring devices; the program does cover some lamps including fluorescents. However, this only applies to laboratories and therefore would not fully cover any of the four buildings.

**MR 1 – Purchasing Conclusions**

In regards to the first requirement – ongoing consumables – currently there are only various independent initiatives that cover only some of the required products. Right now, the various sustainable purchasing initiatives are separated and, in some cases, conflicting. This issue is complicated in that it covers many different aspects of campus operations. Any comprehensive sustainable purchasing policy for ongoing consumables will need to work with Staples, the University’s main supplier of office supplies.

The second requirement is met, as the University has a sufficient policy that covers one of the three additional categories. The Energy Efficiency Purchasing Policy meets the Durable Goods: Electric-Powered Equipment requirements.

If the University were to adopt a formal and comprehensive EPP policy, all four buildings in this study, and all buildings on campus, would meet this prerequisite. In addition, the individual schools housed in Knapp-Sanders, McColl and Carrington could adopt their own
EPP policies for goods covered by Ongoing Consumables, which, in conjunction with the University-wide Energy Efficiency Purchasing Policy, would meet the requirements. The Energy Efficiency Purchasing Policy would have to be referenced in the school-specific policies, so the one EPP policy submitted for LEED covered the additional category.

Materials and Resources Prerequisite 2 – Solid Waste Management Policy\(^\text{12}\)

The Materials and Resources Prerequisite #2 calls for a Solid Waste Management Policy that covers the building and site that addresses: ongoing consumables (paper, toner cartridges, glass, plastics, cardboard and old corrugated cardboard, food waste, metals, and batteries); durable goods (office equipment\(^\text{13}\), appliances\(^\text{14}\), external power adapters, televisions and other audiovisual equipment); facility alterations and additions (building components and structures\(^\text{15}\), panels, attached finishings\(^\text{16}\), carpet and other flooring material, adhesives, sealants, and paints and coatings); as well as recycling all mercury-containing lamps (USGBC, 2009b).

The University's Facility Services has University-wide policies and practices that cover nearly all of these requirements:

**Ongoing Consumables**

The Office of Waste Reduction and Recycling (OWRR) recycles all but two of the materials listed in the minimal list of materials by LEED for the entire University. One, batteries, is recycled University-wide by another department, the Department of Environment, Health & Safety. The other, food waste, is recycled by OWRR but only at Lenoir Dining Hall, Rams Head Dining Hall and the Friday Center for Continuing Education.

LEED requires that Ongoing Consumables cover, at a minimum, the following: paper, toner cartridges, glass, plastics, cardboard, food waste, metals, and batteries (USGBC, 2009b).

**Paper** – OWRR recycles office paper, mixed paper, newspaper, telephone books, glossy magazines and catalogs, and confidential paper. The OWRR website provides detailed information on exactly what items should be recycled as what category (for example, glue-bound journals should be sorted into office paper instead of mixed paper) and special procedures (such as confidential paper).

**Toner Cartridges** – University employees can recycle their inkjet printer cartridges by sending them through campus mail to the OWRR or by requesting mailing bags (postage prepaid). Students can also recycle cartridges in housing community offices.

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\(^\text{12}\) Unless otherwise noted, all information about recycling at UNC is from the Office of Waste Reduction and Recycling website Materials Recycled (OWRR, n.d.).

\(^\text{13}\) Computers, monitors, copiers, printers, scanners, and fax machines

\(^\text{14}\) Refrigerators, dishwashers and water coolers

\(^\text{15}\) Wall studs, insulation, doors, and windows

\(^\text{16}\) Drywall, trim and ceiling panels
Glass – Clear, brown, green, and blue glass can be recycled by placing bottles in the appropriately marked bins (indoors) or recycling sites (outdoors).

Plastics – Similar to glass, “narrow mouth” plastic containers placed in indoor bins or outdoor recycling sites will be recycled by OWRR.

Cardboard (including corrugated) – In accordance with the Orange County Landfill Owners Group ban, all corrugated cardboard on campus is sorted and recycled. Clean, broken-down cardboard placed in one of the University’s blue corrugated cardboard containers located next to trash dumpsters on campus will be recycled. The only exception is for cardboard contaminated by food waste (for example, pizza boxes) or wax coatings.

Food Waste – OWRR currently only recycles food waste from the two dining halls on campus, meaning that there is no policy for the food waste from all four buildings to be recycled or composted. This is the weak link of this policy at a university-wide level. However, there remains some further discussion regarding Knapp-Sanders and the FedEx Global Center, which can be found in the next section of this report.

Metals – Aluminum and steel cans can be recycled at indoor bins and outdoor sites. OWRR also recycles copper wire and scrap metal (including aluminum).

Batteries – The Department of Environment, Health & Safety recycles all types of batteries including lithium, nickel-cadmium, mercury, zinc, lead acid, alkaline, zinc carbonaire, and silver oxide (DEHS, 2010b).

Durable Goods
The Office of Waste Reduction and Recycling recycles all of the materials listed in the minimal list of materials by LEED. Usually, if the equipment is still functional it is sold at the State Surplus Property Agency’s retail store, located at Facilities Services off of Airport Drive.

Office Equipment – This includes computers, monitors, copiers, printers, scanners, and fax machines. All of these are recycled in several different ways, depending on its functionality: working equipment is sold through State Surplus Property, non-working equipment is repaired for use in North Carolina schools, and computer equipment that cannot be repaired is recycled.

Appliances – This covers refrigerators, dishwashers and water coolers. Any appliances on inventory at UNC Chapel Hill are sent to State Surplus Property to determine if they can be reused or sold, and any items to be disposed are transported to Orange County’s white goods recycling facility.

External Power Adapters – These are collected and sold through State Surplus Property if operational, and recycled if not.

Audiovisual Equipment – Any AV equipment, including televisions, is sold through State Surplus Property if working, or sent to the Orange County landfill for recycling if not. Transparency film is sent to OWRR for recycling.
Facility Alterations and Additions
The Department of Facilities Planning and Construction states in the University's Design and Construction Guidelines that a construction and demolition waste plan is required for all projects; contractors are required to develop their waste management plan jointly with the OWRR. A “Building Material Walkthrough and Inventory of Valuable & Reusable Materials” is done to create an inventory of materials to be reused in the project, salvaged for use in other projects, or to be recycled. All construction projects must submit a “Solid Waste Management Plan” before beginning any site work.

From these guidelines it is unclear if there are individual policies for the specific waste categories set out by LEED: building components and structures (wall studs, insulation, doors, and windows), panels, attached finishings (drywall, trim and ceiling panels), carpet, and other flooring material, adhesives, sealants, and paints and coatings (USGBC, 2009b).

Recycling of Mercury-Containing Lamps
The Department of Environment, Health & Safety collects and recycles mercury-containing lamps, including CFL light bulbs and fluorescent light tubes, as well as many other mercury-containing equipment and supplies (DEHS, 2010a).

MR 2 – Recycling Policy Conclusions
The University’s current recycling policies cover many, but not all, of the materials required by LEED. Only one of the categories for Ongoing Consumables (food waste) is not recycled University-wide. All of the materials listed in the minimal list of materials for Durable Goods are currently recycled. Facility Alterations and Additions materials are recycled, but it is unclear if LEED-ready policies exist for them. Mercury-containing lamps are also recycled.

The gaps in University policy for solid waste management policies are: food waste and facility alterations and additions materials.

LEED explicitly allows the Ongoing Consumables component of this prerequisite to be applied to multiple buildings at the same time. This is a big plus for any University efforts to get multiple campus buildings LEED EBOM certified.

Indoor Environmental Quality Prerequisite 1 – Minimum Indoor Air Quality Performance
This prerequisite’s requirements depend on if the project building is able to meet ASHRAE Standard 62.1-2007 (Case 1) or not (Case 2). Both cases have several requirements and calculations that need to be done for certification.

IEQ 1 – Indoor Air Quality Conclusions
While I was unable to determine if University buildings meet all of the specific LEED requirements, the general feeling of building managers is that indoor air quality in University buildings is very good. However, to receive credit for this prerequisite, certain calculations and tests must be done. These must be done during the performance period – the continuous, unbroken time of over one full week during which sustainable operations
performance is being measured – so even if these have been done previously, they would have to done again during specific projects’ performance periods.

**Indoor Environmental Quality Prerequisite 2 – Environmental Tobacco Smoke Control**
This prerequisite has two requirement options (for non-residential buildings, which all four of my buildings are), of which the building must follow one. Option 1 is to simply prohibit smoking in the building, and to prohibit on-property smoking within 25 feet of entries, outdoor air intakes, and operable windows (USGBC, 2009b).

Smoking has been banned in University buildings for years, and since January 1, 2008, the University has operated under a smoke free policy, maintained by the Department of Environment, Health and Safety, that is more stringent than the requirements of this prerequisite. The no-smoking boundary extends to 100 feet from all University facilities, both on and off campus, and includes state-owned vehicles. The official policy reads,

“While the University already prohibits smoking inside its buildings and facilities, beginning January 1, 2008, the policy will expand to prohibit smoking in State-owned vehicles and in the outdoor areas controlled by the University up to 100 feet from University facilities.”

Enforcement ranges from verbal reminders to citations that result in a fine of up to $25 and additional court costs. The official map and a copy of the entire policy can be found in the Appendix.

**IEQ 2 – Environmental Tobacco Smoke Control Conclusions**
Due to the University’s strict “UNC Smoke Free” policy, all four buildings, and all buildings on campus, easily meet the criteria for this prerequisite.

**Indoor Environmental Quality Prerequisite 3 – Green Cleaning Policy**
This prerequisite calls for the building and site to have a green cleaning policy that addresses the following (USGBC, 2009b):

1. Purchase of sustainable cleaning and hard floor and carpet care products
2. Purchase of sustainable cleaning equipment
3. Standard operating procedures addressing utilization, management and audit process of cleaning and hard floor and carpet maintenance system
4. Strategies for promoting and improving hand hygiene
5. Guidelines for safe handling and storage of cleaning chemicals
6. Training of maintenance personnel in the hazards of use, disposal and recycling of cleaning chemicals, dispensing equipment and packaging

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17 All information regarding the University’s housekeeping policies was collected during a personal interview with William Burston, Director, Housekeeping Services, on February 12, 2010.
7. Provide for collection of occupant feedback and continuous improvement to evaluate new technologies, procedures and processes

The Department of Housekeeping Services, under Facilities Services, maintains University-wide cleaning policies that meet several, but not all, of these requirements.

The last four requirements in the above are covered by current policies and practices:

4. All four buildings have recently had hand-sanitizing stations installed in them – three in Carrington, four in McColl, ten in Knapp-Sanders, and four in FedEx Global Center.
5. Housekeeping’s standard operating procedures dictate safe handling and storage of cleaning chemicals in all buildings; specifying where and how much of different cleaners and chemicals can be stored.
6. Training for all new employees covers all the necessary requirements for hazards of use, disposal and recycling of cleaning chemicals, dispensing equipment and packaging.
7. An annual survey sent out to official building “customers” is used to collect occupant feedback; while certain occupants are sent the survey directly, it is available to all through Housekeeping’s website.

The first three bullets in the list above are gaps for all four buildings. Current University housekeeping policies do not address the purchasing requirements for sustainable cleaning products or equipment, or the standard operating procedure for how cleaning and maintenance system will be utilized, managed and audited.

IEQ 3 – Green Cleaning Conclusions

The major shortcoming concerning this prerequisite is the current lack of a comprehensive policy for the purchase of sustainable cleaning products and equipment. Secondly, housekeeping’s standard operating procedures do meet some of the requirements, but fall short of requirement #3 above. Adding to the current standard operating procedures in order to establish procedures for addressing how the cleaning and hard floor and carpet maintenance system will be consistently utilized, managed and audited should not be a major hurdle. This addendum needs to be sure to address cleaning to protect vulnerable occupants.

The University’s commitment to the (OS1) Green Certified Program, a comprehensive high performance cleaning system, is something that should be encouraged and expanded. None of these four buildings are covered by the University’s (OS1) practices currently, but maintaining them up to (OS1) standards would be a huge move in the right direction. A study done by study by Dr. Michael Berry (2006) found that “(OS1) would be the best overall cleaning program for the University's academic, office, and other non-resident hall buildings.” The (OS1) process would cover the LEED quality control and products/equipment purchasing requirements.
This is another instance where the University has begun to take steps in the right direction but there is ample opportunity for much more to be done. Some amending of the current standard operating procedures and the creation of purchasing policies for sustainable cleaning products and equipment are the gaps.
Results: Summary
All of the prerequisites are affected by University-wide policies to some degree. The current extent of several University policies prevents various prerequisites from being met for campus buildings. The following is a summary of findings regarding University-wide policies as they apply to the LEED prerequisites.

University Policy Positives
WE 1: Plumbing Efficiency – Currently there is a precedent for the LEED-compliant policy detailing conversion to high-performance fixtures as part of future renovations.

EA 1: Planning and Documentation
While actual documentation is not nearly to LEED-level standards, the information that would make up these documents is known by University personnel and could be put into LEED-complaint form relatively easily.

EA 2: Energy Efficiency
Energy Management, a part of University Facilities Services, is in the process of entering in data for all appropriated campus buildings into the Energy Star Portfolio Manager tool; data is known for several years.

EA 3: Refrigerant Management
System-wide audit of chillers that use CFC-based refrigerants is currently underway. This could prove to meet LEED requirements for use of CFC-based refrigerants due to economic infeasibility of chiller replacement.

MR 1: Sustainable Purchasing
Environmentally preferable purchasing policies have become common throughout University departments. This is encouraging because these departments will not be surprised if an EPP is imposed and will already understand the reasoning.

MR 2: Solid Waste Management
OWRR’s current recycling policies come very close to meeting LEED specifications with only two gaps. Many items are recycled or sold for reuse at the surplus retail store.

IEQ 1: Internal Air Quality
Unclear, while this project was unable to determine if UNC meets all the requirements, the newer buildings on campus seem to have very good indoor air quality.

IEQ 2: Tobacco Smoke
UNC’s Smoke Free policy is actually more robust than LEED requirements.

IEQ 3: Green Cleaning
UNC Housekeeping’s policies partially meet requirements. (OS1) cleaning is in place in some buildings with plans for expansion.
**University Policy Gaps**

*WE 1: Plumbing Efficiency*
Calculations for LEED baseline need to be done, and if similar calculations have been done they must be recalculated during the performance period.

*EA 1: Planning and Documentation*
Actual documentation of buildings' sequence of operations, building operating plan, systems narrative, and preventive maintenance plan do not widely exist, but the information is known, just not documented to LEED requirements. Energy audits to ASHRAE Level I walk-through need to be done for performance periods.

*EA 2: Energy Efficiency*
Buildings still being entered into Energy Star’s Portfolio Manager tool; buildings' energy performance ratings are unknown. University buildings pose a potential problem of not fitting into Energy Star categories; need to look into the EPA’s Laboratories for the 21st Century (Labs21) program and determine LEED acceptance.

*EA 3: Refrigerant Management*
Chillers that serve the entire University HVAC system use CFC-based refrigerants. If audit does not determine that chiller replacement is economically infeasible then this is a major obstacle for LEED EBOM certification.

*MR 1: Sustainable Purchasing*
A comprehensive University EPP policy is needed, and it could prove to be complicated to produce and implement due to vastness of University operations and multitude of departments/schools/offices/etc.

*MR 2: Solid Waste Management*
Two gaps in OWRR’s policies are food waste and batteries, but batteries are recycled by the Department of Environment, Health & Safety. A unified, comprehensive policy is needed at the University scale. Partnerships with student groups in certain buildings could be formed to aid OWRR in collection for food waste recycling in buildings besides dining halls.

*IEQ 1: Internal Air Quality*
Unclear, while this project was unable to determine if UNC meets all the requirements, all required calculations would have to be done during the performance period, meaning any previous calculations would be unusable.

*IEQ 2: Tobacco Smoke*
No gaps.

*IEQ 3: Green Cleaning*
The major gap is an EPP policy for purchasing sustainable cleaning products and equipment. In addition, the current standard operating procedures need the addition of procedures for addressing how the cleaning and hard floor and carpet maintenance system
will be consistently utilized, managed and audited. The (OS1) program should be expanded.

The Four Buildings
The table below indicates where the four specific buildings examined in this report stand in meeting the requirements of the LEED EBOM prerequisites. Y=all requirements met; M=most requirements met; P=requirements partially met; N=requirements far from/not met; U=unclear.

<table>
<thead>
<tr>
<th>Building</th>
<th>WE1</th>
<th>EA1</th>
<th>EA2</th>
<th>EA3</th>
<th>MR1</th>
<th>MR2</th>
<th>IEQ1</th>
<th>IEQ2</th>
<th>IEQ3</th>
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<tbody>
<tr>
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<td>N/P</td>
<td>P</td>
<td>P</td>
<td>N*</td>
<td>M</td>
<td>U</td>
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<tr>
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<td>N/P</td>
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<td>N</td>
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* The School of Government has an EPP policy written but not adopted.

The analysis uncovered much more substantial results regarding University policies and how they could be written and implemented differently to be more continuously and effectively sustainable. It is evident from the table above that no specific building had policies differing from University policies that covered all four buildings. However, minor differences did emerge between buildings, which are discussed below. These differences have little to do with overarching University policies, but are interesting when considering these specific buildings for LEED EBOM certification.

Knapp-Sanders
The most interesting building-specific development was in Knapp-Sanders, home to the School of Government located on the eastern edge of campus along South Road. Knapp-Sanders had – by far – the highest interest from its occupants. My main contacts for Knapp-Sanders were Mary Tiger, Project Director of the Environmental Finance Center, and Sean Downing, Director of Facilities and Distribution Services. Both were very helpful, interested and active in perusing information to see how Knapp-Sanders stacks up against LEED requirements. Ms. Tiger and Mr. Downing, plus the SOGreen effort of School of Government students, faculty and staff, are willing to put in extra effort to help their building achieve certification.

Food waste generated in Knapp-Sanders is not enough to be recycled and composted by OWRR along with the waste from Lenoir and Ram’s Head dining halls, which is in line with existing OWRR recycling policy. However, the occupants have taken upon themselves to compost according to OWRR guidelines at some small events, and have also done audits on food waste. Building personnel are willing to set up some kind of system to transport the food waste to Lenoir to have it picked up there with Lenoir’s waste (S. Downing, personal communication, February 9, 2010).

The School of Government has a sustainable purchasing policy written, with LEED as a basis, but it has not been formally adopted. If this policy covers all the minimum categories
in LEED Version 3 and is put into effect for the building’s operations, then it would have a leg up for certification. In addition, reduced flow water devices have been installed in the building, and the building’s waste stream has been evaluated for the past two years (M. Tiger & S. Downing, personal communication, February 9, 2010).

The personnel and students in the School of Government are very concerned with their building’s environmental impact. Working with Ms. Tiger and Mr. Downing, I found that the occupants of Knapp-Sanders are eager to become LEED EBOM certified and, more importantly, are willing to actually do the legwork required to get all the pieces together.

**Addition to Carrington Hall**

Carrington Hall is the main building for the School of Nursing at UNC, located in the west-central part of campus at South Columbia Street and Medical Drive. The Addition to Carrington was completed in 2005 and became the first building in the UNC system to achieve LEED certification, with a Certified rating in the LEED for New Construction v. 2.0/2.1 system.

Carrington continues to boast several green building features that earned it certification in 2007 (UNC Sustainability, 2008). These include: an extensive green roof and high albedo roof surfaces; a permanent temperature, humidity, and CO₂ monitoring system; a building profile designed to bring in natural daylight; efficient plumbing fixtures; wheatboard paneling and cabinets; various indoor air quality measures; and recycling areas on each floor for paper, glass, plastics, metal, and cardboard. Because of these features and its previous certification, the Carrington Addition is a prime candidate for LEED EBOM certification.

According to Sam Deal, Facilities Manager at the School of Nursing (personal communication, February 15, 2010), in the Addition of Carrington there is no return air; 100% of the air is fresh, which likely would help the building meet Indoor Environmental Quality Prerequisite #1. Occupants also have an interesting in cutting back on electricity usage and the Addition is under consideration for (OS1) cleaning; these could help with Energy and Atmosphere Prerequisite #2 and Indoor Environmental Quality Prerequisite #3 respectively.

**FedEx Global Education Center**

Opened in 2007, the FedEx Global Education Center is home to multiple departments, including the Study Abroad Office and the Global Research Institute. Located along the western edge of campus at the corner of Pittsboro and McCauley Streets, the FedEx Center is a rather new addition to UNC’s campus.

Like the Carrington Addition, the Global Education Center has many sustainable building features that make it a good candidate for LEED EBOM certification. The two most notable features are a green roof and an underground cistern that captures excess rainwater for further use. Additional green features include: recycling bins in high-traffic areas; a three-story day-lit atrium; translucent walls along corridors; vertical fins on the western façade keep out unwanted glare and heat gain; compact fluorescent lights with photo-
occupancy sensors to adjust lighting to available sunlight and room usage; a permanent temperature, humidity and CO₂ monitoring; and efficient plumbing fixtures (UNC Sustainability, 2008).

**McColl Building**

As the main building for UNC’s prestigious Kenan-Flagler Business School, McColl is a well used and high-profile building on south campus off Skipper Bowles Drive.

The indoor air quality of McColl is expected to perform very well and meet the standards required by LEED, though I was unable to determine for certain if this is already the case. According to Facility Maintenance Supervisor Scott Blalock (personal communication, February 9, 2010), the building’s indoor air system undergoes multiple checks annually, due to building workers who are sensitive to indoor air irritants; none have filed complaints regarding indoor air quality. This bodes well for McColl meeting the requirements of Indoor Environmental Quality Prerequisite #1.

Kenan-Flagler students make up UNC’s chapter of Net Impact, an international nonprofit organization that looks to educate individuals to “use the power of business to create a more socially and environmentally sustainable world” (Net Impact, 2010). This group would likely be a viable resource for aiding in EBOM certification efforts for McColl.
Conclusions and Recommendations

Incentives
The University should use available financial grants and production incentives for future renewable energy projects. These funds combined with the $200,000 collected annually from the $4 per semester green energy student fee (UNC Sustainability, 2009) would provide financial support of significant renewable energy projects.

The University and the Sustainability Office have done well to voluntarily provide information for several sustainability assessment programs. Looking forward, the only recommendation is to continue with this trend, especially by maintaining a rating from the STARS program. Any areas that show room for significant improvement from assessment programs should be investigated.

Sustainability is often expressed scientifically or numerically in environmental or economic terms, such as X acres of trees saved or Y million dollars saved per year. As sustainability continues to become a premiere issue on campuses nationwide, and elsewhere, the topic increasingly becomes linked with “green” buzzwords and eco-friendliness. There is a significant need for actions, and incentives to encourage them, to go beyond the environmental dimension of sustainability. The economical and, in particular, the social aspects of this line of thinking must be given the time, effort and press as the environmental. UNC should show a true commitment to comprehensive sustainability by encompassing all three aspects.

LEED for Existing Buildings Policy Analysis
This look at UNC Chapel Hill’s University-level policies as examined against LEED for Existing Buildings’ prerequisites revealed some significant gaps and major room for improvement in the University policies.

There were also several encouraging positives. The University is moving in the right direction on many fronts, as evidenced by the many awards received by the University, even though the existing policies might not be to the high standards of LEED. Sustainability is already moving forwards at UNC, and the students, faculty and staff understand the reasons for it and have reacted positively to past sustainable initiatives.

University Policies
Many operations policies will need updating to be up to LEED standards. I recommend that these policies be done at a comprehensive, University-wide scale. This will not only make all affected policies adhere to an industry standard for building operations policies and ensure compliance with LEED EBOM prerequisites, but will make the University operate in a more sustainable way.

Some policies need to be created, or rewritten at a University scale. There are also several instances where the University can expand on already successful and sustainable actions,
such as finding ways to recycle food waste in buildings besides the dining halls, and expanding the (OS1) program.

One factor that repeatedly came up was the divided nature of the various University departments. For policies to be truly sustainable and have maximum impact, they need to be comprehensive and cover all applicable University operations. A prime example of this is purchasing; there are several environmentally preferable purchasing policies at UNC, each created by and for different departments of campus operations, and even policies for the same products, such as paper, have different standards.

There needs to be more cohesion and intra-departmental participation to create more comprehensive policies. Policies can be formulated to delegate different aspects to different departments. An example of this could be recycling; the official University policy could detail the many recycled materials handled by the Office of Waste Reduction and Recycling (OWRR) and the few done by the Department of Environment, Health and Safety.

The fractured nature of campus operations is also evident in information dissemination. There are several different outlets for University information that could be related to sustainability, but they all operate independently from one another in a manner that is not user friendly. This has negative impacts within the University when considering information sharing between the independent departments. This also makes compiling data about various aspects of campus operations for voluntary reporting assessment tools difficult. A centralized effort for all campus information would likely be unrealistic for a school the size of UNC, but the different online information outlets could be linked together for much more effective information gathering.

**Future LEED for Existing Building Projects**

One of my biggest recommendations for future UNC LEED EBOM certification projects is the use of LEED’s Portfolio Program to streamline certification of multiple buildings on campus. The Portfolio Program is currently in a Pilot Program phase, which includes higher education participants. It will offer a “volume certification path” to enable building owners to integrate LEED principles as a standard feature of building operations (as well as design and construction). The Portfolio Program’s volume certification submittal documentation will make it easy to submit policy documents for multiple projects on campus, effectively streamlining the documentation and certification process by recognizing standardized and consistently delivered performance throughout the University’s portfolio of buildings (USGBC, 2010).

One of the most important things that will need to be considered when campus buildings are applying for LEED EBOM certification is that any policy called for by these prerequisites must adhere to the LEED 2009 Existing Buildings: Operations & Maintenance policy model found in the 2009 Edition Reference Guide. Any policies required throughout the LEED EBOM rating system must contain, at a minimum, the components listed by the policy model (USGBC, 2009b). Existing University policies that meet the requirements of prerequisites (or credits) must highlight all the listed minimum components; it is not
necessary to develop new, separate policies to replace current ones if they have the components. In short, University-wide policies will need to adhere to the components of the policy model for campus buildings to be certified when reporting the University-wide policies for adherence to the prerequisites. The Portfolio Program should aid the University with submitting documentation of policies that cover multiple building certification projects.

**UNC Sustainability: Moving Forward**
Achieving LEED for Existing Buildings certifications will help solidify UNC as a campus sustainability leader. It is important to achieve operations and maintenance efficiency in existing buildings, and to not only construct new buildings with these issues in mind. Focusing on LEED for New Construction would be a major mistake; because no matter how environmentally friendly a new building is it still an additional building that demands water and energy and generates waste.

There will need to be some significant changes made to University policies before campus buildings can achieve LEED for Existing Buildings: Operations and Maintenance certification. These policy improvements will help make the University more effectively sustainable and allow for LEED EBOM certifications as a result.
References


