2010

Berry College – Mt. Berry, GA

Climate Action Plan

BERRY COLLEGE

January 27, 2010

O'BRIEN & GERE

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I. Executive Summary

Berry College (Berry) is a private, residential, coeducational liberal arts college located in Rome, Georgia. Berry is situated on the world's largest continuous college campus, spanning more than 26,000 acres, and an enrollment of approximately 1,800 undergraduates and roughly 200 students in its business and education graduate programs, with a student to faculty ratio is approximately 12 to 1. In alignment to the vision of the Berry's Founder, Martha Berry, the College has a long history of contribution to environmental stewardship, particularly related to the maintenance and preservation of its vast areas of wetlands, pastures, streams and forest, and formally in 2009, through its Sustainability Committee, adopted the following defining mission:

> "The Berry College community is committed to environmental sustainability on our campus. To that end, we promote and foster environmental stewardship through education, research, policies, and actions."

Berry has developed this Climate Action Plan (CAP) in support of its participation in the American College and University Presidents' Climate Commitment (ACUPCC). This commitment establishes the following for Berry:

- In its Fiscal Year (FY) 2008 baseline year, Berry's gross greenhouse gas (GHG) emissions were 36,846 metric tons carbon dioxide equivalent ($MTCO_2E$).
- Berry has estimated an offset of 8,033 $MTCO_2E$ in FY2008 from the carbon sequestration provided by tracts of pre-merchantable timber in the past 17 years (FY 1993 through FY 2009) in its forest management program.
- After accounting for institutional growth, Berry's gross emissions are expected to increase to 42,059 $MTCO_2E$ by mid-century under business-as-usual scenarios.
- Berry is committed to questioning and evolving business-as-usual scenarios and has developed a long-range institutional commitment to carbon neutrality.

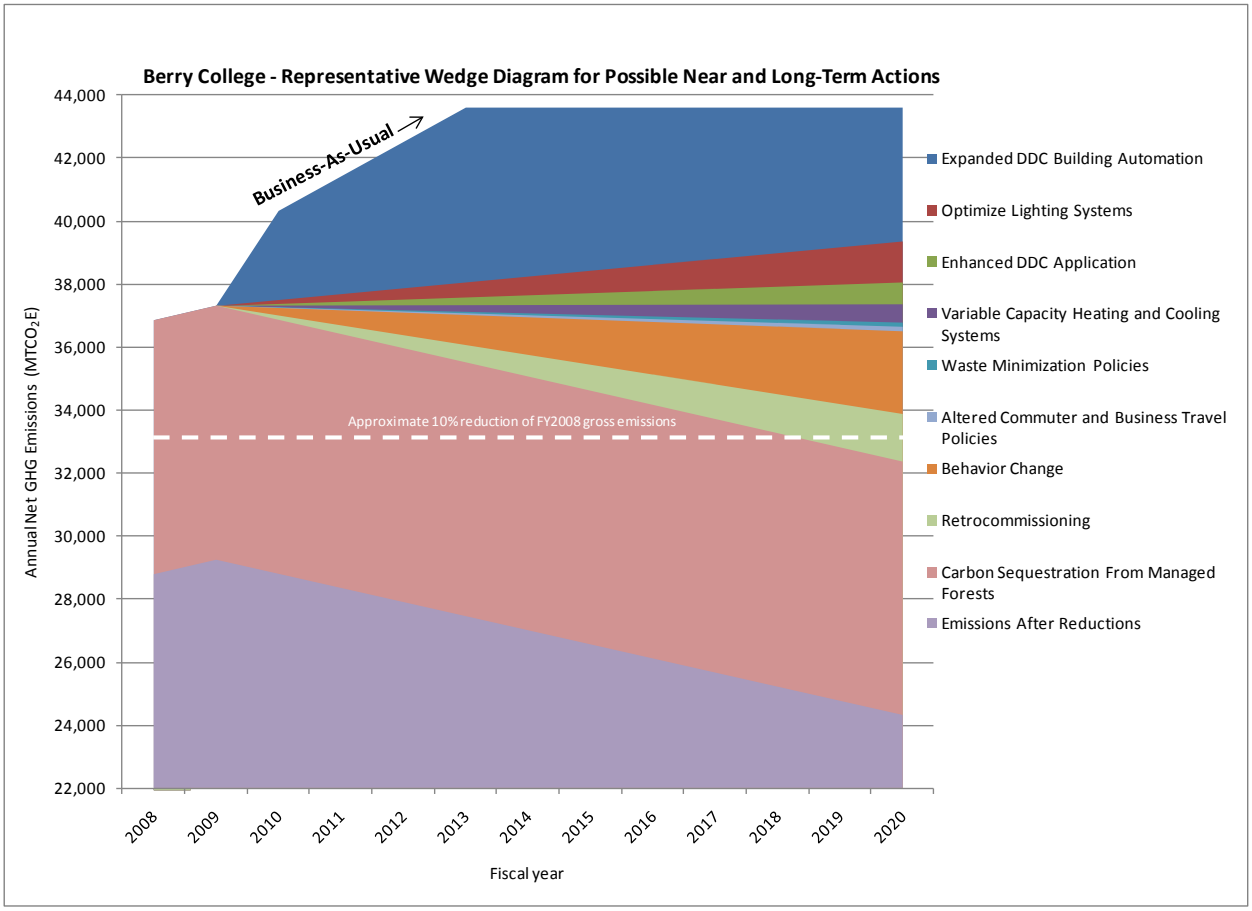
Berry intends to achieve carbon neutrality (no net GHG emissions) by, or as soon after 2050 as technology will allow. Berry will utilize a portfolio of strategies to mitigate these emissions. In addition to this long-term goal, Berry intends to strive for reductions in the near-term using initiatives such as the Governor's Energy Challenge (Governor's Challenge) issued by Georgia Governor Sonny Perdue in April 2008 as benchmarks. For examples, under this program, Governor Perdue has committed all state agencies in Georgia to reduce energy consumption per square foot in state facilities 15% percent FY 2007 levels by 2020. Using this, and other initiatives, as a benchmark will facilitate the implementation of energy conservation measures (ECMs) across campus and promote an awareness of behavioral changes throughout campus..

To achieve the College's mission of sustainability and to implement the recommendations of the CAP, Berry has established a Sustainability Committee that ultimately will include subgroups such as the following:

- Solid Waste, Composting, Waste Minimization, and Food Services
- Electricity and Space Heating and Cooling
- Sequestration and Land and Water Management
- Financing, Purchasing, Transportation and Green Cleaning

- Building-Level Initiatives, Recycling, New Building and Renovations, and Landscaping
- Education, Curriculum, Student Involvement, Commuting, and Special Events

Each potential emissions reduction project that is outlined in the CAP, or otherwise identified, to meet the commitment will be sponsored by at least one subgroup. The sponsor's role will be to guide the funding, implementation, and measurement/verification of the project. The figure below represents the potential types of emissions reduction projects for consideration under the CAP and a nominal graphical representation of the contribution of each project toward reaching carbon neutrality. These projects are considered potentially viable as of the date of this CAP due to factors such as, but not limited to, evolving federal and state GHG and climate related regulations, economic and technological influences, and Berry's academic mission. Berry will review the progress and continued viability of the projects on a periodic basis, and revise them, as necessary.



A sequential process of engineering, cost-benefit, implementation, and funding analyses is planned to set targets and develop the strategies. Preliminary engineering analyses have been completed for some strategies and a possible set of GHG goals and near term and long term projects developed. Berry's near-term focus will be projects related to behavior change strategies that can be promoted as policies for, and be viewed as challenges to, faculty, staff and students. Potential long-term projects are summarized in the table below. The selection and implementation of these projects will be governed by priorities established through future cost-benefit analyses and influenced by funding probabilities, including state and federal grant and loan opportunities.

Near Term (0-15 years) GHG Emission Reduction Projects

GHG Emissions Reduction Projects	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	GHG Reduction ($MTCO_2E$)
Conservation-Minded Behavior Change	3,300,000	7,000	2,600

Long-term (15+) GHG emissions reduction projects

Energy Efficiency Measure	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	GHG Reduction ($MTCO_2E$)
Expanded DDC Building Automation System Application	6,250,000	0	4,250
Lighting Fixtures and Controls	1,900,000	0	1,300
Enhanced DDC Application	1,000,000	0	700
New Science Building Renovations	800,000	6,000	600
Hermann Hall Renovations	195,000	0	100
Evans Hall	210,000	0	150
Retro-Commissioning	2,200,000	6,500	1,500
Totals	**12,555,000**	**12,500**	**8,600**

Finally, the ACUPCC asks signatories to commit to taking *"actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students."* As a signatory school, Berry has developed defining characteristics regarding the mission of the college. One of these includes a commitment to incorporate environmental sustainability within all activities of the college and especially Berry's core activities of education, practical and meaningful work experience and community service and research.

The CAP describes Berry's current educational offerings (curricular and co-curricular) related to climate change and sustainability. It also describes planned actions to make climate action and sustainability a part of the curriculum and other educational experience for all students. Finally, the CAP explains how the implementation of the ACUPCC will be integrated into Berry's educational efforts (*e.g.*, having students or classes update the GHG inventory), as well as how the entire campus

community, including alumni, will be made aware of Berry's participation in, and progress toward, implementing the ACUPCC. To address these elements, Berry worked with its faculty, staff, and students to identify how its sustainability curriculum can support the CAP effort.

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II. Acknowledgments

Berry would like to acknowledge those individuals and organizations that have contributed to the development of this Climate Action Plan (CAP), including Berry President Dr. Stephen Briggs, who has provided the leadership to make visionary commitments on behalf of the College. Berry also acknowledges O'Brien & Gere Engineers, Inc. (www.obg.com) for assisting with the engineering and scientific analysis in the development of this CAP.

Administration

Stephen Briggs	President
Brad Barris	Director of Purchasing; Sustainability Committee Member
Eddie Elsberry	Director of Environmental Compliance and Sustainability; Chair of Sustainability Committee
Brian Erb	Vice President for Finance
Debbie Heida	Vice President for Student Affairs & Dean of Students; Sustainability Committee Member
Mark Hopkins	Director of Physical Plant; Sustainability Committee Member
Scott Shank	Assistant Vice President for Finance; Sustainability Committee Member
Katherine Whatley	Provost; Sustainability Committee Member
Alexander Whitaker, IV	Chief of Staff; Sustainability Committee Member
Rick Woodall	Director of News and Editorial Services; Sustainability Committee Member
William Yeomans	Land Resources Director, Forestry Operations; Sustainability Committee Member

Faculty

Martin Cipolllini	Professor of Biology; Sustainability Committee Member
William Davin	Associate Professor of Biology; Sustainability Committee Member
Martin Goldberg	Senior Lecturer of Animal Science; College Veterinarian; Sustainability Committee Member
Duane Inman	Professor of Teacher Education, Sustainability Committee Member
James Watkins	Associate Professor of English, Rhetoric and Writing; Evans School of Humanities, Arts & Social Sciences Green Committee; Sustainability Committee Member

Students

Christine Clolinger	Sustainability Committee Student Assistant, Sustainability Committee Member
Nathan Schwartz	President, Students Against Violating the Earth (SAVE)
Laura Sutton	Student Government Association President; Sustainability Committee Member
Keiko Stobaeus	Student Sustainability Program Coordinator; Sustainability Committee Member

1.0 Introduction

1.1 Institutional Background: Berry College

Berry College (Berry) is a private, coeducational liberal arts college located in Rome, Georgia. Established in 1902 as the Boys' Industrial School as a boarding school for boys, its creation was the result of the vision and devoted efforts of Martha Berry. Martha Berry's willingness to offer them rudimentary instruction soon developed into a Sunday school that attracted numerous children from neighboring families. She then established four day schools, but after these schools appeared ineffective Martha decided in 1902 to use the 83 acres that she had inherited from her father to found the Boys' Industrial School. Eventually, her endeavor grew to include a girls' school (1909) and a junior college (1926). The junior college later expanded into a senior college, Berry College, which graduated its first class in 1932. Following Martha Berry's death in 1942, the college has continued its founder's focus on providing students with a comprehensive education of the head, the heart and the hands. Graduate programs were added in 1972 as Berry continued its record of sound growth. By the 1990s Berry annually enrolled approximately 1,800 undergraduates and roughly 200 students in its business and education graduate programs, with a student to faculty ratio is approximately 12 to 1. Since Berry's inception, students are encouraged to enrich their academic studies through participation in one of the nation's premier on-campus work experience program, and more than 90% take advantage of this unique opportunity to gain valuable real-world experience prior to graduation.

Berry has the world's largest contiguous college campus, spanning more than 26,000 acres of woodlands, meadows and streams. There are 47 primary buildings on campus, including 15 classroom facilities and 13 residence halls. In September 2009, Berry celebrated the completion of its two newest additions – the Audrey B. Morgan and Deerfield residence halls. Housing approximately 350 students, these amazing facilities feature beautiful vistas, spacious common areas and outdoor fireplaces among their amenities. Another recent addition is the 131,000 square-foot Steven J. Cage Athletic and Recreation Center, which opened in January 2008.

1.2 Program Background: Sustainability at Berry

Berry's history of environmental stewardship has been long associated with the maintenance and preservation of its vast areas of wetlands, pastures, streams and forests. The Georgia Department of Natural Resources (DNR) manages the 16,000-acre Wildlife Management Area on the campus through an agreement with Berry. DNR provides comprehensive services that include public safety, fire suppression and managed hunts on Berry property. 2007 marked a milestone year for Berry's environmental stewardship efforts as President Stephen Briggs committed the campus as a whole to

environmental stewardship by signing the American College and University Presidents' Climate Commitment (ACUPCC). That year also marked the beginning of the completion of a campus-wide greenhouse gas (GHG) emissions inventory conducted by the College. In 2009, to further elevate the importance of environmental stewardship at Berry, the Office of Environmental Health and Safety became the Office of Sustainability and Environmental Compliance, with a full-time director and a 20-member Sustainability Committee that serves as the driving force behind Berry's Climate Action Plan (CAP), recycling promotion, and student involvement in sustainability. To effectively implement the mission of the Sustainability Committee, it will ultimately consist of subgroups that may include the following focus areas:

- Solid Waste, Composting, Waste Minimization, and Food Services
- Electricity and Space Heating and Cooling
- Sequestration and Land and Water Management
- Financing, Purchasing, Transportation and Green Cleaning
- Building-Level Initiatives, Recycling, New Building and Renovations, and Landscaping
- Education, Curriculum, Student Involvement, Commuting, and Special Events

Mission Statement: The Berry College community is committed to environmental sustainability on our campus. To that end, we promote and foster environmental stewardship through education, research, policies, and actions.

This active involvement is reflected in Berry earning positive recognition for sustainability efforts on campus, posting a "B" grade on the latest College Sustainability Report Card (http://greenreportcard.org/report-card-2010/schools/berry-college).

Berry has developed its CAP as one means to balance the furthering its mission with the pillars of sustainability (society, economy, and environment). This CAP includes all campuses and satellite locations where the College has operational control and can enforce a change in policy. All references to 'College buildings' refer to those within the organizational boundary of the GHG emission inventory only (*i.e.*, those buildings and operations which daily operations are outside of the direct control of Berry).

1.3 Science Background: Climate Change Impact

In its Fourth Assessment Report released in 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) stated that:

- Warming of the climate system is "unequivocal" based on observations of temperatures, sea levels, and snow melts;
- Global concentrations of GHG in 2005 far exceeded the natural range that has existed over the last 650,000 years; and
- Most of the observed increase in global average temperatures since the mid-20th century is "very likely" (*i.e.*, greater than 90% confidence) due to the observed increase in anthropogenic or human-caused GHG concentrations.

Climate change will cause impacts on water resources, food production, ecosystems, weather patterns and human health in all parts of the world, including:

- Decreased water availability and increasing drought in mid-latitudes and semi-arid low latitudes;
- Decreased cereal productivity at low latitudes;

- Risk of extinction of global plant and animal species (up to 30% or even more depending on scenario);
- Increased warm spells, heat waves and heavy precipitation events; and
- Increased morbidity and mortality from changing weather patterns, changed disease vector distributions, and malnutrition.

Further, these effects will be felt over several decades due to the long atmospheric life spans of GHGs.

1.4 Policy Background: Evolving Climate Change Policy and Legislation

The United Nations Framework Convention on Climate Change (UNFCCC) coordinates international efforts to combat climate change. The Kyoto Protocol to the UNFCCC (1997) called on developed countries to reduce their total GHG emissions in the 2008 to 2012 commitment period by an average of 5% versus a 1990 baseline. Over the past decade, the European Union has undertaken high-profile steps to meet their Kyoto targets, including the establishment of the European Union Emissions Trading Scheme (EU ETS, 2007).

While the United States has not participated in the Kyoto Protocol commitments, U.S. federal policy on climate change has developed rapidly in recent months as evidenced by the following:

- *February 12, 2009:* The American Recovery and Reinvestment Act 2009 allocates over $36 billion for energy efficiency, conservation and renewable programs
- *March 10, 2009:* The USEPA releases a proposed rule for mandatory GHG reporting that would account for 85 - 90% of U.S. GHG emissions

There is a growing national policy for climate change action.

- *March 31, 2009:* A proposed bill establishing a cap-and-trade system with mandatory GHG reduction targets is circulated among lawmakers (American Clean Energy and Security Act of 2009)
- *April 17, 2009:* The USEPA releases a proposed endangerment finding stating that GHGs endanger human health and welfare; this was a follow-up to a 2007 U.S. Supreme Court ruling stating that CO_2 was a pollutant and as such was subject to regulation by the USEPA
- *May 19, 2009:* President Obama announces new vehicle fuel economy standards that harmonize states and the federal legislation / standards
- *June 26, 2009:* The American Clean Energy and Security Act of 2009 passes the House of Representatives
- *June 30, 2009:* USEPA grants waiver to the state of California to set its own, state-specific greenhouse gas emissions limits from cars
- *September 22, 2009:* USEPA finalizes GHG mandatory reporting rule
- *December 7, 2009:* USEPA finalizes endangerment finding that GHGs endanger human health and welfare

While numerous high profile federal environmental policies are emerging from the Obama Administration, voluntary and mandatory programs have been on-going for some time at the local, state, and regional levels. Prominent among these are:

- USEPA Climate Leaders
- The Climate Registry
- Regional Greenhouse Gas Initiative (RGGI)
- California's Global Warming Solutions Act (Assembly Bill 32)
- U.S. Mayors' Climate Protection Agreement
- ACUPCC

1.5 Background: The ACUPCC and Berry

The ACUPCC is an effort to make the U.S. Higher Education sector more sustainable, obtaining institutional commitments to "reduce and ultimately neutralize greenhouse gas emissions on campus" and "accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth's climate" (ACUPCC, 2007).

Climate change poses a fundamental challenge to the way individuals and organizations use energy and resources. ***The ACUPCC presents an opportunity to lead by example, educating the next generation of national, business and media leaders on how to address this challenge.***

ACUPCC Commitment

"We believe colleges and universities must exercise leadership in their communities and throughout society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve climate neutrality."

AMERICAN COLLEGE & UNIVERSITY PRESIDENTS CLIMATE COMMITMENT

Over 650 colleges and universities have committed to being carbon neutral at some point in the future. ***In June 2007, Berry became a signatory of the ACUPCC.*** Becoming a signatory to the ACUPCC requires implementation of the following:

- Establishing an institutional structure to oversee the school's ACUPCC: *Berry has developed a comprehensive structure designed to engage all areas of the Berry community in collaboration and consensus building, including creation of the Office of Sustainability and Environmental Compliance.*
- Completing a GHG emissions inventory within one year: *Berry has prepared a baseline GHG inventory and publicly posted it on the ACUPCC online reporting tool (AASHE, 2009).* The following provides a summary of the key metrics and results of Berry's GHG inventory.

Environmental Metrics at Berry in 2007-2008: A Snapshot

- Climate: 36,846 metric tons of carbon dioxide equivalent per year ($MTCO_2E$/yr) (gross emissions); offset of 8,033 $MTCO_2E$/yr from carbon sequestration of tracts of pre-merchanta timber (20% of gross emissions); 28,813 $MTCO_2E$/yr (net emissions); 28.5 $MTCO_2E$/GSF (gross), 22.3 $MTCO_2E$/GSF (net);
  20.6 $MTCO_2E$/FTE student (gross), 16.1 $MTCO_2E$/FTE student (net)
- Electricity: conventional = 33.0 million kWh; Purchased renewable energy = 0 kWh
- Stationary source fuel consumption: natural gas = 69,595 MMBtu; propane = 24,455 gallons; distillate oil = 537 gallons
- Potable water usage: 82.1 million gallons (based on nominal rate of 225,000 gallons per day)
- Waste: waste to energy = 0 US tons/yr, landfill = 538 US tons, recyclables = 215 US tons; Berry recycling rate: 27%, RecycleMania recycling rate: 22%
- Fleet fuel consumption: gasoline = 73,365 gallons; diesel = 10,015 gallons
- Commuting: faculty/staff = 3,614,807 miles, students = 2,158,137 miles
- Agriculture sources: inorganic fertilizer = 65,000 lb; organic fertilizer = 427,050 lb; livestock = 78 dairy cows, 261 beef cows, 19 sheep, 78 horses
- Directly financed outsourced travel: faculty/staff air travel = 660,778 miles; student air travel = 121,264 miles; train = 28,000 miles; taxi/ferry/rental = 118,267 miles; bus = 7,875 miles; personal mileage = 307,390 miles; abroad studies air travel = 339,146 miles
- Wastewater treatment: 61,593,750 gallons (estimated as 75% of water usage)
- Paper use: 4,517 million sheets of 0% recycled paper (45,170 lb)

- Developing a climate neutrality action plan (*i.e.*, this CAP) – including a target date for climate neutrality and interim progress milestones – within two years: *An extension was granted to Berry for submittal of the CAP by January 15, 2010. The Berry CAP has been developed in accordance with this timeline.*

- Choosing at least two of seven action steps towards GHG reduction: *Berry immediately adopted two tangible actions: 1) Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist; and 2) Participate in the Waste Minimization component of the national RecycleMania competition, and adopt three or more associated measures to reduce waste.*

- Implementing the work products of the CAP

- Integrating sustainability into the educational curriculum

- Making the CAP, GHG inventory, and progress reports publicly available: *Berry's GHG inventory and CAP have been made available on the AASHE website http://www.aashe.org/.*

1.6 Overall Approach: Development of the CAP within the ACUPCC Framework

The requirements of the ACUPCC signatory letter include development of an institutional action plan for becoming climate neutral (no net GHG emissions) by minimizing GHG emissions as much as possible through demand and supply side management and using carbon offsets or other measures to mitigate the remaining emissions.

The action plan has been developed within the approved ACUPCC timeline and includes:

- A target date for achieving climate neutrality as soon as reasonably possible;
- Interim targets for goals and actions that will lead to climate neutrality;
- Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students;
- Actions to expand research or other efforts necessary to achieve climate neutrality; and,
- Mechanisms for tracking progress on goals and actions.

1.7 Aligning the CAP with Berry's Future: College Planning Initiatives

Opportunities exist to align the goals and actions of the CAP with concurrent key initiatives already implemented as part of sustainability programs (*e.g.*, the College Sustainability Report Card), as well as with the Berry 10-year Capital Plan (Berry, 2007). Berry has already implemented a number of mitigation measures (both capital investments, as well as behavior change programs) as part of its campus operations and administrative and academic programs, including the following:

- Administration: Establishment of the Office of Sustainability and Environmental Compliance in 2009; purchasing approximately 65% biorenewable cleaning products and using organic-qualified pesticides on-campus when possible.
- Climate change and energy: Completion of the first GHG emissions inventory in 2008 and development of this CAP to meet the commitment to carbon neutrality in the long term; strive for reductions in the near-term using initiatives such as, but not limited to, the Governor's Energy Challenge (Governor's Challenge) issued by Georgia Governor Sonny Perdue in April 2008 as benchmark, which is based on a reduction of energy consumption per square foot 15% percent of FY 2007 levels by 2020; retrofitting the heating, ventilation, and air conditioning (HVAC) systems in eight campus buildings, as well as installing 2,400 double-paned windows in 14% of building space; installing HVAC with energy recovery wheels in 12 buildings, or 43% of building space; using geothermal grids for heating and cooling in 12 buildings, or 10% of building space; energy conservation measures such as the installation of motion sensor lights and thermostats, and procurement policies such as Energy Star appliances and Electronic Product Environmental Assessment Tool (EPEAT) registered computers
- Food and recycling: Dining services spends over 15% of its food budget on local foods, including produce from the school's organic garden; implementation of trayless cafeteria facilities in fall 2008, reducing food waste by about 30% and water consumption by 140,000 gallons per year; comprehensive waste minimization activities such as the elimination of polystyrene (Styrofoam) from dining facilities; encouraging the use of inter-office envelopes; diverting 20% of non-hazardous construction and demolition waste from landfills; implementing an aggressive

recycling program, including electronics, that has been reviewed to find methods of improvement; composting of all yard waste.

- Green building: Upcoming Leadership in Energy and Environmental Design (LEED) Silver certification of Morgan and Deerfield residence halls; installing motion sensor lights and thermostats, timers, and 100 LED lighting fixtures in four buildings or 19% of building space on campus; water conservation activities including installing waterless urinals, low-flow faucets (approximately 50% of campus buildings), low-flow showerheads, and low flow wasters.
- Student involvement: The Dean of Student Office employs seven student assistants who are ecology representatives (Eco-Reps), one for each residence hall area of campus and a student supervisor. The Office of Sustainability and Environmental Compliance employs ten paid student interns. The student government's Green Committee has worked with a student environmental group (SAVE) to establish Green Week, which features a light bulb swap and recycling education. Students also run a vegetable garden that provides produce and herbs to the college and the local community.
- Transportation: Berry partners with the Clean Air Campaign to offer financial rewards to faculty and staff who use alternative methods of transportation. A shuttle bus is available for transportation around campus. The school's vehicle fleet includes six electric golf carts for on campus use. Development of a bicycle share program, including a repair shop that can supplement the bicycle share program from the repairs of donated and abandoned bicycles.
- Investment priorities: Berry aims to optimize investment return and is currently invested in renewable energy funds.

Many components of these existing initiatives lend support to Berry's CAP or, in turn, can be supported and enhanced by the CAP. The development and implementation of this CAP provides opportunities for shaping existing internal and external initiatives. In turn, these initiatives provide guidance for the priorities outlined in this CAP. In summary, this CAP has been developed in the context of complementary objectives including:

- Berry's strategic academic vision and institutional mission
- Berry's sustainability vision and master planning objectives
- Federal, state and local government and community sustainability objectives

These concurrent programs have the aim of making Berry a more vibrant, livable, and resourceful community that is committed to the principle of leaving our environment better than we found it.

1.8 References

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2.0 Baseline Greenhouse Gas Emissions

As a signatory to the ACUPCC, Berry developed a baseline GHG emissions inventory to establish a benchmark against which future progress towards carbon neutrality can be measured, and to help establish priorities with regards to the primary emission sources responsible for the bulk of Berry's emissions (Berry, 2009a). The baseline GHG inventory is an integrated measure of Berry's institution-wide energy and resource usage. The inventory was developed for the baseline year, FY 2008 (July 1, 2007 through June 30, 2008). Sufficient, reliable information to estimate GHG emissions for prior fiscal years was not readily available.

Through this CAP, Berry will establish a long-term plan for achieving carbon neutrality, which will include prioritizing emission reduction projects to achieve meaningful overall GHG emissions reductions. Berry has already implemented a number of mitigation measures as part of its campus operations and administrative and academic programs, as indentified in the Introduction Section of the CAP. Section 2.7 provides additional details on mitigation measures implemented by Berry.

2.1 GHG Inventory Methodology

Berry's GHG emission inventory completed by the College was developed with the Clean Air – Cool Planet (CACP, 2008) Campus Carbon Calculator (V.6.1) which is based on the Intergovernmental Panel on Climate Change (IPCC) guidelines for national-level inventories, and represents state-of-the-art scientific methods for calculating GHG emissions. Emissions were considered from the six categories of GHG included in the Kyoto Protocol:

- CO_2
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulfur hexafluoride (SF_6)
- Hydrofluorocarbons (HFC)
- Perfluorocarbons (PFC)

2.2 Inventory Boundaries and Definitions

The establishment of inventory boundaries and definitions was the first step in developing a GHG inventory program. The two key inventory boundaries were:

- Organizational boundary – extent of the reporting organization defined on the basis of operational control, which includes all sources which Berry manages on a day-to-day basis. For clarification, Berry's old Normandy Dairy Complex is leased to a private foundation and is currently used as a retreat (WinShape Retreat). The daily operation of this facility is outside of the control of Berry and therefore was not included in the GHG inventory.
- Operational boundary – the scopes of emission sources (direct and indirect) that were included in the inventory:
    - Scope 1: Direct emissions (within the organizational boundary) including stationary, mobile, process, fugitive, and agricultural emissions.

- Scope 2: Indirect emissions (outside the organizational boundary) from purchased electricity, steam, and chilled water
- Scope 3: Other indirect emissions (outside the organizational boundary) from landfilled solid waste, employee and student commuting, business and study abroad air travel, wastewater, purchased paper, and transmission and distribution (T&D) losses from purchased electricity.

The following key definitions were established as part of the process:

- **Baseline year** – FY 2008, the earliest year for which comprehensive emissions data was available.

- **Reporting frequency** – at least every other year on a fiscal year basis, where the fiscal year occurs from July 1 to June 30.

- ***De minimis* threshold** – 5% (Climate Registry, 2007); emission sources that collectively contribute less than 5% of total GHG emissions were classified as *de minimis* and approximated using upper bound emission estimates in lieu of compiling detailed data. For Berry, the *de minimis* sources are refrigerants and chemicals; air, study abroad and other financed travel; solid waste; wastewater; and purchased paper.

- **Emission intensity metrics** – gross square footage and full-time equivalent (FTE) students, as required by the ACUPCC.

2.3 GHG Activity Description

A critical step in GHG inventory development was the identification of comprehensive activities that lead to GHG emissions from the organization. To identify these activities at Berry, an *ad hoc* committee comprised of staff, faculty and students was organized to meet the requirements of the ACUPCC agreement. Based on the committee's efforts, the following emission sources were identified:

- Scope 1 GHG emission sources
  - Stationary Sources: boilers, generators, and other appliances burning natural gas, propane, and distillate oil
  - Mobile Sources: Berry fleet vehicles burning diesel and gasoline
  - Fugitive Sources: refrigeration and air conditioning units using HCFC-22, HFC-404A, and HFC-410A
  - Agricultural Sources: synthetic and organic fertilizer application, and animal husbandry sources including dairy cows, beef cows, sheep, and horses.

- Scope 2 GHG emission sources
  - Purchased electricity.

- Scope 3 GHG emission sources
  - Employee and student commuting
  - Business and study-abroad air travel
  - Landfilled solid waste

- Aerobic wastewater treatment
- Uncoated freesheet paper.

Though not reported in its GHG emissions inventory, the Sustainability Committee considered the impact of carbon sequestration from its managed forests as part of the CAP. This is discussed and quantified in Section 2.7.5.

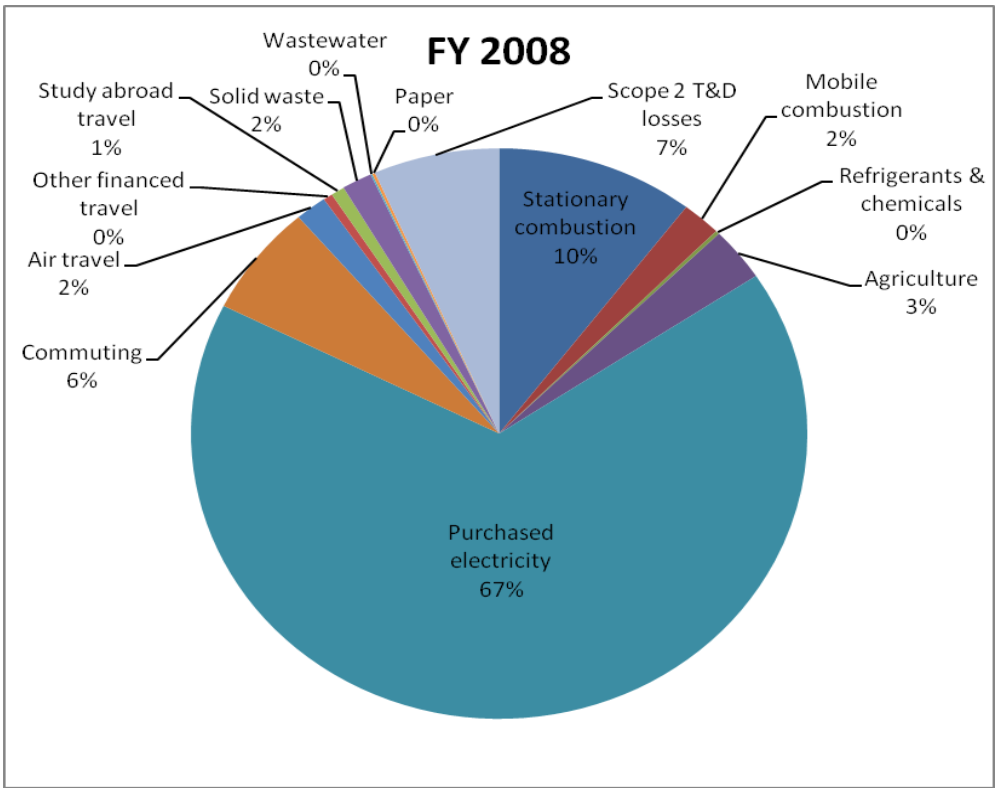
2.4 GHG Data Collection

Berry's *ad hoc* committee served as a clearinghouse for the data, much of which was compiled by students. The travel and commuting data were obtained by extrapolation of survey results conducted over 1 week in 2008. Solid-waste data was based on a weekly average during the 2008 Recyclemania competition. The remaining values were obtained by actual measurements during the time period.

2.5 Baseline year (FY 2008) carbon footprint

Total GHG emissions for the baseline year FY 2008 for Berry were 36,846 $MTCO_2E$. The primary emission sources were purchased electricity, stationary source combustion, and transmission and distribution losses. Together, these four source types accounted for 84% of total emissions, as shown in **Figure 2.1.** As Berry develops its long-term plan for achieving carbon neutrality, these sources will have to be prioritized in order to achieve meaningful overall GHG emissions reductions.

Figure 2.1 GHG Emissions By Source for FY 2008 (Baseline Year)



The table below lists emissions and emissions intensity by scope and source type for FY 2008.

Table 2.1 Emissions and Emissions Intensity by Scope and Source Type for FY 2008

Scope	***Source***	***FY 2008***
Scope 1 Emissions ($MTCO_2E$)	Stationary Sources	3,821
	Mobile Sources	756
	Refrigerants & Chemicals	75
	Agriculture	1,120
	Total Gross Emissions	*5,771*
Scope 2 Emissions ($MTCO_2E$)	Purchased Electricity	24,590
	Purchased Steam/ Chilled Water	0
	Total Gross Emissions	*24,590*
Scope 3 Emissions ($MTCO_2E$)	Faculty/ Staff Commuting	1,460
	Student Commuting	872
	Air Travel (directly financed, other financed, and study abroad)	1,050
	Solid Waste	583
	Scope 2 T & D Losses	2,432
	Wastewater	30
	Paper	58
	Total Gross Emissions	*6,485*
Scope 1 – 3 Gross Emissions ($MTCO_2E$)	***Total Gross Emissions***	***36,846***
	Gross Square Footage (GSF)	1,293,723
	Full-time Equivalent Students (FTE)	1,787
	Total Gross Emission Intensity per 1000 GSF	28.5
	Total Gross Emission Intensity per FTE	20.6
Scope 1 – 3 Net Emissions ($MTCO_2E$)	Purchased Offsets	0
	Carbon Sequestration[a]	-8,033
	Total Net Emissions	***28,813***
	Total Net Emission Intensity per 1000 GSF	22.3
	Total Net Emission Intensity per FTE	16.1

[a]Carbon sequestration provided by tracts of pre-merchantable timber in the Berry College Forest Management Program based on Chicago Climate Exchange (CCX, 2009) protocol (17-year period of FY 1993 through FY 2009)

On a normalized basis, Berry's institutional gross GHG emissions in FY 2008 were consistent with its peer institutions (baccalaureate colleges; AASHE, 2009, http://acupcc.aashe.org/ghg-scope-statistics.php) on a $MTCO_2E$ per 1000 GSF of building space basis (28.5 versus 28.0). However, on a

FTE student basis for FY 2008, Berry's gross GHG emissions were 20.6 $MTCO_2E$ per FTE, compared to the average emissions per FTE of its peer institutions of 9.3

Purchased electricity represents the largest source of emissions associated with Berry. Based on USEPA's Power Profiler (http://oaspub.epa.gov/powerpro/ept_pack.charts) for Berry's zip code (30149), the fuel mix for sources used to generate electricity in Berry's region consists of the following:

Table 2.2 Fuel Generation Mix for Grid Electricity in Mt. Berry, GA

Fuel Mix Type	Berry's Regional Fuel Mix	Average National Fuel Mix
Coal	64.7%	49.6%
Gas	11.0%	18.8%
Oil	0.5%	3.0%
Nuclear	17.3%	19.3%
Hydro	3.3%	6.5%
Non-Hydro Renewables	3.1%	2.1%

Based on this data, Berry's regional fuel mix for coal is approximately 15% higher than the average national fuel mix and for gas, it is approximately 8% lower than the average national fuel mix. Berry's regional fuel mix for the remaining fuel types is lower than, or similar to, the average national fuel mix. The Power Profiler report also indicates that the regional electricity emission factor for CO_2 is approximately 12% greater than the national average. This fuel generation mix contributes to emissions from purchased electricity at Berry accounting for 67% of the overall GHG emissions.

2.6 Historical trends in GHG emissions

Due to the lack of reliable historical data, Berry was not able to estimate GHG emissions for additional years. As such, a historical trend evaluation cannot be conducted.

2.6.1 Historical trends in GHG emission intensity

As noted in 2.6., reliable historical data was not readily available to estimate GHG emission intensity for additional years. As such, a historical trend evaluation for GHG emission intensity cannot be conducted. However, Berry will use the GSF and FTE intensity metrics calculated for FY 2008 in subsequent sections of the CAP to analyze future emissions scenarios.

2.6.2 Data uncertainty and proposed improvements

Uncertainty in GHG emission estimates is minimized for Scope 1 and 2 sources through the use of metered utility and resource data. The uncertainty is higher for Scope 3 sources, which relied on a commuting survey for commuting emission estimates. Approximately 10% of the students responded to a written survey distributed in the student center, and approximately 20% of the faculty and staff completed an on-line survey. College-reimbursed travel is currently not tracked in a way that is conducive for ACUPCC data collection purposes; therefore, the values included in the inventory represent an estimate.

Air travel is currently a *de minimis* source. However, Berry recognizes that the data available for use in the inventory was limited and therefore, air travel emissions could be underestimated. Berry will evaluate potential methods to improve the accuracy and availability of air travel records, thereby improving the quality of emission estimates for air travel. Since this evaluation will potentially impact multiple departments within Berry, a short-term solution may not be available.

2.7 Mitigation

Berry has conducted a variety of emission reduction activities in past years. Berry's past and current mitigation activities are summarized in Section 2.0 and described in more detail below.

2.7.1 Demand-Side Management

Berry has implemented, and continues to implement, demand-side management opportunities that will increase energy efficiency on campus. A prime example is the pending LEED Silver certification of the recently constructed Morgan and Deerfield Residence Halls. In addition, Berry has retrofitted the HVAC systems in eight campus buildings, including installing double-paned windows in two buildings, and the installation of motion sensor lights and thermostats. Berry has also implemented procurement policies specifying Energy EPEAT registered computers.

2.7.2 Alternative Fuels

Berry's college fleet includes six electric golf carts for on-campus use.

2.7.3 Recycling

Berry's recycling program has reduced GHG emissions by approximately 620 $MTCO_2E$ per year, by reducing the amount of landfilled solid waste available to produce methane. Average recycling rates for FY 2008 provided by Berry indicate that the amount of recycled waste is approximately 40 percent of landfilled waste. USEPA (2008) provides an online tool with emission factors to quantify the GHG emissions avoided by recycling rather than landfilling solid waste. Because Berry provided data on total recycled material, the USEPA emission factor for Mixed Recyclables of –2.88 $MTCO_2E$ / U.S. ton was used for the quantification.

2.7.4 Commuting

Berry provides a free campus shuttle program for its faculty students that coincides with class schedules. Based on default emission factors for automobiles and transit buses (CACP, 2008), using the bus rather than personal vehicles reduces the GHG emissions associated with commuting to campus by approximately 37% per passenger mile. Berry also provides financial rewards to faculty and staff that use alternative methods of transportation. Berry has developed a bicycle share program, including a repair shop that can supplement the bicycle share program from the repairs of donated and abandoned bicycles.

2.7.5 Carbon Sequestration

Berry sustainably manages approximately 20,000 forested acres of its campus. Even though carbon uptake occurs on all of this land, much of the resulting timber growth is harvested, thus resulting in no net carbon sequestration. However, portions of Berry's managed acreage totaling 3,797 acres contain pre-merchantable timber less than 17 years old. Since the trees in these areas are not eligible to be harvested, the carbon stored as the trees grow results in net carbon sequestration. Using CCX (2009) offset protocols in conjunction with data on forest type and tree age (Berry, 2007), annual carbon sequestration from these areas was estimated to be 8,033 $MTCO_2E$, with an average of 2.1 $MTCO_2E$ sequestered/per acre. This represents approximately 22% of Berry's gross GHG emissions from FY 2008. This carbon sequestration serves as an offset to Berry's GHG emissions, and is an effective means to achieve a goal of this CAP, which is to identify and implement means to reduce carbon emissions.

2.8 References

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3.0 Forecasting Business-as-Usual Emissions

An initial step in CAP development is to forecast the "business-as-usual" trajectory for emissions; that is, the forecasted emissions if no actions are taken to reduce GHG emissions. This business-as-usual trajectory allows Berry to account for organizational growth when considering its path to carbon neutrality. The forecast layers Berry's long-term plans for campus expansion onto its baseline GHG emissions on an intensity basis (*e.g.,* $MTCO_2E$ per GSF, or FTE students). Forecasted emissions will be considered in the goal setting steps (as discussed in Chapter 4) to identify the emissions reductions required in the future for Berry to become carbon neutral.

3.1 Available data sources

In order to forecast the business-as-usual trajectory, the following data sources were considered:

- Berry (ACUPCC, 2009) baseline GHG inventory, covering FY 2008
- Berry (2007) 10-Year Capital Plan
- Planning documentation provided by the Berry College Vice President for Finance and Corporate Treasurer and the Berry College Director of Environmental Compliance and Sustainability

3.2 Forecasting methodology

GSF and FTE are the emission intensity metrics required in ACUPCC reporting. Emission intensities can change over time in either direction based on changes in campus activities. Often emission intensities from multiple years in the GHG inventory are used to find an average emission intensity that incorporates possible fluctuations. A confidence interval around the average is then calculated to estimate the accuracy of the intensity metrics. However, performing this check for Berry would require that additional years be covered in the GHG inventory. For the purpose of business-as-usual forecasting, the FY 2008 value for emission intensity per GSF or FTE was used since that was the only year covered by the GHG inventory.

Scope 1-3 emission sources were placed into two categories based on which future changes would more likely impact the resulting emissions [building space (GSF) or population (FTE)].

- Sources dependent on GSF: stationary combustion, refrigerants & chemicals, purchased electricity, and transmission and distribution (T&D) losses; these comprise approximately 84% of total GHG emissions
- Sources dependent on FTE: mobile combustion, commuting, air travel, other financed travel, study abroad travel, landfilled solid waste, wastewater, and paper; these comprise approximately 13% of total GHG emissions
- Agriculture, which is not expected to be associated with changes in GSF or FTE; this comprises approximately 3% of total GHG emissions

Based on the emission profile, it is expected that GSF will be the dominant metric for the forecasting of future emissions.

The table below provides the emission intensity for each emissions source from FY 2008.

Table 3.1 Gross Emissions Intensity by Emissions Source (FY 2008 data)

Sources dependent on GSF ($MTCO_2E$ per 1000 GSF)	**Emission Intensity**
Stationary combustion	2.953
Refrigeration & chemicals	0.058
Purchased electricity	19.007
Transmission and distribution losses	1.880
Sources dependent on FTE ($MTCO_2E$ per FTE)	
Mobile combustion	0.423
Commuting	1.304
Air travel	0.340
Other financed travel	0.101
Study abroad travel	0.147
Solid waste	0.326
Wastewater	0.017
Paper	0.032

After establishing baseline emissions intensity, the emissions intensity metrics can be forecast for the future based on master planning and professional judgment.

The Berry College (2007) 10-Year Capital Plan identifies approximately 236,000 square feet of additional building space that will be added to the campus by FY 2013. This corresponds to a growth rate of approximately 47,200 GSF per year through 2013. No additional building space beyond FY 2013 is planned at this time.

FTE is estimated to increase to 2,200 students by FY 2013. For the purpose of this CAP, the FTE student population is currently projected to plateau between 2,000 and 2,400 through FY 2050, although this number is subject to change. This corresponds to a growth rate of approximately 83 FTE students per year through 2013. The table below provides projected GSF and FTE estimates based on these growth rates.

Table 3.2 Projections for Emissions Intensity Metrics

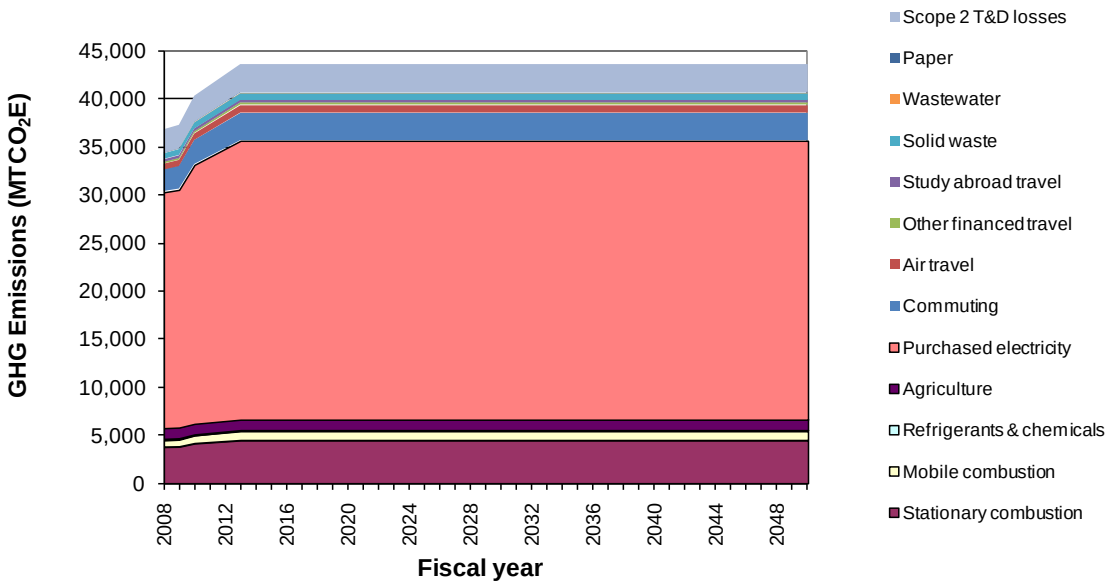
Fiscal Year (FY)	**1000 GSF**	**FTE**
2008	1,294	1,787
2010	1,420	1,886
2020	1,530	2,200
2030	1,530	2,200
2040	1,530	2,200
2050	1,530	2,200

By multiplying the emission intensity established for the Scope 1-3 emission sources by the projected future intensity metrics (GSF and FTE), future GHG emissions for the Scope 1-3 emission sources can be forecasted.

3.3 Results

Forecasted business-as-usual emissions show an increase in total $MTCO_2E$ emissions from 36,846 $MTCO_2E$ emissions in the baseline year (FY 2008) to a plateau of 43,596 $MTCO_2E$ in FY 2013. This represents an 18% increase in emissions by 2013 compared to the baseline level.

Figure 3.1 Forecasted Gross GHG Emissions by Source through 2050



In 2050, the forecasted relative contribution of each emission source to total GHG emissions is similar to that in the baseline year. This similarity exists because this is a business-as-usual forecast, in which the emission intensity present in the baseline inventory is assumed to remain constant into the future.

In order for Berry to achieve its long term commitment to carbon neutrality, it will need to depart from this business-as-usual scenario and reduce emission intensity over time. Note that in future years, it is expected that the forecasted gross emissions will continue to be partly offset by carbon sequestered in Berry's sustainably managed forests.

3.4 Uncertainty

The business-as-usual GHG emission forecast is based on the assumption that emission intensity remains constant. However, emission intensity is variable, and the above forecasts are based on the GHG inventory for FY 2008. In order to evaluate uncertainty in the GHG emissions forecast, a sensitivity analysis utilizing the 95% lower confidence limit and upper confidence limit on the emission intensity is generally utilized to estimate lower and upper bound future emissions, respectively. In this case, though, a confidence interval cannot be calculated because the GHG inventory only includes emission intensity metrics from one fiscal year. As additional GHG

inventories are compiled and as additional planning documents become available in future years, Berry will review and update its emissions forecast.

3.5 References

American College & University Presidents Climate Commitment (ACUPCC). 2009. 2008 Greenhouse Gas Report for Berry College. (Available at http://acupcc.aashe.org/ghg-report.php?id=663)

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4.0 Interim and Long-term Emissions Reduction Goals

4.1 Background

The ACUPCC does not specify a timetable for when each signatory must achieve its long-term commitment to carbon neutrality. It is common practice for institutions involved in climate action to establish interim and long-term emissions reduction goals as a critical planning step in achieving ambitious climate neutrality goals.

Internationally, the Intergovernmental Panel on Climate Change (IPCC, 2007) recommends that CO_2 concentrations in the atmosphere should be stabilized at 450 parts per million (ppm) – approximately double pre-industrial levels – to avoid dangerous anthropogenic interference with the earth's climate system. To stabilize at 450 ppm, GHG emissions must reach at least 25% below 1990 levels by 2020, and 80% below 1990 levels by 2050.

Nationally, the American Clean Energy and Security Act of 2009 (ACESA) is a proposed bill that has passed the U.S. House of Representatives and establishes a cap-and-trade system with mandatory targets of reducing GHG emissions relative to 2005 levels by 3% by 2012, 20% by 2020, 42% by 2030, and 83% by 2050.

On a state level, the Georgia Carbon Sequestration Registry Act (GCSRA) was enacted in 2004, and establishes a system for registering carbon storage in Georgia forests. The GCSRA does not establish emissions reduction goals; it just provides a foundation for possible sale of carbon sequestration credits.

The table below summarizes these various proposed goals for GHG emissions reductions:

Table 4.1 Interim and Long-term Climate Action Goals

Scope	Organization	GHG Emission Reduction Goal
International	IPCC (2007)[a]	• 25% below 1990 levels by 2020 • 80% below 1990 levels by 2050
National	ACESA (2009)[b]	• 3% below 2005 level in 2012 • 20% below 2005 level in 2020 • 42% below 2005 level in 2030 • 83% below 2005 level in 2050
State	Governor's Challenge (2008) GCSRA (2004)[c]	• 15% below 2007 energy consumption per SF by 2020 • None

[a] – also recommended in the ACUPCC Implementation Guide

[b] – passed the U.S. House of Representatives on June 26, 2009
[c] – enacted on May 11, 2004

While the absolute targeted emissions reductions appear daunting when viewed over decades, the table below shows that they appear more achievable when viewed on an annual basis.

Table 4.2 Annual Emissions Reduction Goals

Organization	Targeted Emissions Reduction (% below baseline level)	Target Year	Commitment Period[a]	Corresponding Annual Emissions Reduction (% per year below baseline level)
IPCC	25%	2020	12	2.1%
	80%	2050	42	1.9%
ACESA	3%	2012	4	0.8%
	20%	2020	12	1.7%
	42%	2030	22	1.9%
	83%	2050	42	2.0%

a – Target Year minus Baseline Year (Berry's baseline year is FY 2008)

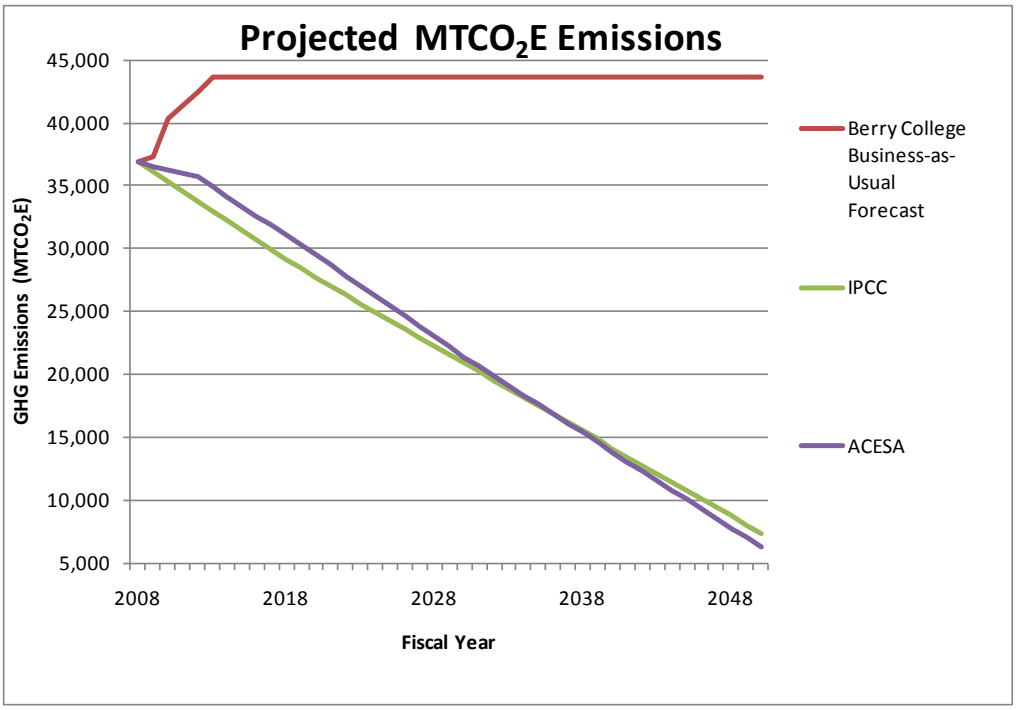
The various goals above suggest that the range of "interim" goals (through and including 2020) require annual GHG emissions reductions of between 0.8 – 2.1%, and the range of "long-term" goals (beyond 2020 through 2050) require emissions reductions of between 1.9 – 2.0%.

4.2 Methods

To determine potential future emissions reductions trajectories for the College, Berry applied the interim and long-term goals described above, substituting the baseline year of FY 2008 for goals that refer to 1990 as their baseline year. This provides a frame of reference for what could conceivably be the Berry's GHG emissions reduction trajectory.

For reference, the figure below includes the business-as-usual emission forecast for Berry developed in the previous section of this CAP (blue line, trending along the upper portion of the graph).

Figure 4.1 Potential Berry GHG Emissions Reduction Trajectory



Using these goals as a frame of reference, Berry would need to decrease GHG emissions by approximately 15,000 $MTCO_2E$ by 2020 and by approximately 36,500 $MTCO_2E$ by 2050, relative to the College's business-as-usual trajectory. If Berry begins taking action in FY 2010, this would involve reductions of 800 to 900 $MTCO_2E$ annually to meet the total reduction goals for FY 2050. Any remaining gross emissions in FY 2050 would be offset by carbon sequestered in Berry's sustainably managed forests.

4.3 Results

The following table shows how an annual GHG emissions reduction of 900 $MTCO_2E$ would equate to actual energy and resource usage reductions for various emission sources, based on FY 2008 emissions projections.

Table 4.3 - Annual GHG Emissions and Resource Reductions

Scope	Source[a]	Annual GHG Emissions Reduction ($MTCO_2E$)[b]	Approximate Corresponding Annual Usage Reduction	Usage Units (substance used)
1	Stationary sources	93	1,800	MMBTU (natural gas)
	Mobile sources	18	2,000	Gallons (gasoline)
2	Purchased electricity	601	884,000	kWh
3	Commuting	57	141,000	vehicle miles
	Air Travel	15	19,100	passenger-miles
	Solid Waste	14	13	US tons
1-3	Total[c]	900		

a - T&D losses, while listed as a contributor to the GHG inventory, are excluded from this table because the end-user does not have direct control over reducing these emissions, except through reduction in Scope 2 usage (which is already accounted for in this table). Process and fugitive emissions are also excluded from this table due to their small (< 3%) contribution to total emissions.
b - The target overall reduction of 900 $MTCO_2E$ is distributed among sources according to the percentage contribution of each source.
c - Relatively small reductions in emissions from other emissions sources are not shown in the table, but contribute to the 900 $MTCO_2e$ total shown for Scopes 1-3.

4.3.1 Economic Feasibility

In setting interim and long-term goals, it is necessary to consider the economic feasibility of achieving these goals.

From a macroeconomic view, a study of the economics of climate change and climate action (Stern, 2006) concluded that the cost of climate action by mid-century could represent as much as 5% of world gross domestic product (GDP) per year, with a best estimate of 1% of GDP per year. This cost assumes that climate action would begin immediately; if delayed, the costs would rise significantly. Roughly applied to Berry, which has an annual operating budget on the order of $90 million for FY 2011, adjusted for inflation, this analysis implies that the cost of climate action for Berry College could be nearly $1,000,000 per year by mid-century.

With regard to estimating the costs of climate action, one of the key uncertainties is the future availability and cost of renewable energy, given the important role that renewable energy will likely play in achieving large-scale GHG emissions reductions. Currently, the cost of renewable power exceeds that of fossil fuel based power. However, if future costs of renewable power reach a break-even point or fall below that of fossil fuel based power, then energy switching and large-scale GHG emissions reduction projects will become more economical.

The Energy Information Administration (EIA, 2008) of the U.S. Department of Energy uses the National Energy Modeling System to project the production and cost of various energy sources through 2030. The EIA projects a 32% increase by 2030 in the renewable electricity generation capacity in the U.S. The EIA also projects significant reductions in the capital costs of important renewable energy technologies.

Table 4.4 - Projected Reduction in Capital Costs (2006$/kW) from 2010 to 2030 (%)

Biomass	Hydro	Landfill Gas	Offshore Wind	Solar PV	Solar Thermal
(19%)	(11%)	(6%)	(12%)	(25%)	(28%)

The EIA projects that capital costs of biomass and solar technologies – which may be particularly suitable for higher educational institutions – will decline by approximately 20 to 30% by 2030, increasing the likelihood that Berry will be able to utilize significant increments of renewable energy to help meet our emissions reduction goals.

The EIA also provides projections of unit costs of fossil fuel energy through 2030 (EIA, 2008). For petroleum, EIA projects increases of up to 50% in crude oil prices (in 2006$/barrel) from 2010 to 2030. For natural gas, EIA projects increases of up to 16% in prices (in 2006$/million BTU) from 2010 to 2030. While these are high-range price projections, even under medium range projections from the EIA, crude oil and natural gas prices remain essentially constant from 2010 to 2030 (in 2006$).

As renewable energy costs decline and fossil fuel energy costs potentially increase through 2030, switching from fossil fuel to renewable energy will become more cost-effective, and can be an important emission reduction strategy. In the meantime, Berry can also achieve significant GHG emission reductions through demand-side management, which involves reducing the consumption of energy through energy-efficient technologies and conservation-minded behavioral changes.

4.3.2 Regulatory Framework

Regulatory developments associated with climate change policy in the United States may also impact interim and long-term emission reduction goals.

In 2007, the Supreme Court ruled that the U.S. Environmental Protection Agency (USEPA) has the authority to regulate GHG under the Clean Air Act. The USEPA has responded with an advance notice of proposed rulemaking (USEPA, 2008). This has been followed by a series of key regulatory developments in 2009 under the Obama administration:

- March 10, 2009 - USEPA issues draft mandatory GHG reporting rule for large U.S. emitters (*e.g.*, facilities with annual emissions greater than 25,000 $MTCO_2E$ from direct stationary combustion)
- April 17, 2009 - USEPA proposes finding that GHGs endanger human health and welfare, officially recognizing them as pollutants
- June 26, 2009 - ACESA of 2009, which establishes an economy-wide GHG cap and trade program, passes the U.S. House of Representatives.

- September 22, 2009 – USEPA issues final mandatory GHG reporting rule for large U.S. emitters (*e.g.*, facilities with annual direct emissions (Scope 1) greater than 25,000 $MTCO_2E$)
- December 7, 2009 – USEPA issues final endangerment finding that GHGs endanger human health and welfare

In summary, whether through the USEPA or the U.S. Congress, comprehensive U.S. Federal regulation of GHG is forthcoming.

4.4 References

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5.0 Identification and Prioritization of GHG Emission Reduction Projects

5.1 Background

In the previous section, it was concluded that Berry would have to reduce GHG emissions by approximately 1%-2% per year below baseline (FY 2008) levels in order to meet potential interim and long-term emission reduction goals. This equates to a reduction of approximately 15,000 $MTCO_2E$ by 2020 and by approximately 36,500 $MTCO_2E$ by 2050, relative to Berry's business-as-usual trajectory, and is equivalent to reductions of approximately 800 to 900 $MTCO_2E$/yr. It is assumed that during this time period, remaining gross GHG emissions would be offset by carbon sequestered in Berry's sustainably managed forests.

5.2 Emission Reduction Strategies

In order to identify potential emission reduction projects that could help realize the annual targets discussed in the previous section, the following strategies were considered:

Demand Side Reduction Strategies

Per the breakdown presented in Section 4, GHG emissions at Berry are primarily largely associated with the consumption of fuels to heat, cool, or power Berry facilities and/or facility related operations. Therefore, consideration was given to identify potential strategies to reduce the demand for fuel consumption and thereby reduce the resulting generating emissions. Considerations were made as to changes in:

- *Technologies*: Evaluation of existing facilities and operations for the identification of either changes to existing technologies or application of alternate technologies that could result in the reduction of fuel consumption demand and emissions.
- *Behavior/Policy*: Evaluation of the current stated or unstated behaviors and/or policies that could be changed to reduce fuel consumption demand and emissions

Given Berry's use of purchased electricity as the primary means to heat, cool, light or power its facilities and/or facility related operations, strategies to reduce the demand for electricity consumption through technology and behavior/policy were also considered as part of this CAP.

Supply Side Reduction Strategies

The ACUPCC recognizes emissions associated with emissions generated by others to supply the needs of Berry facilities and operations. Therefore, in addition to addressing the campus demand side of emission generation, consideration was also given strategies that could alter how the demands are supplied and their associated emissions. Primarily, this strategy focused on examining opportunities to change the way utilities are supplied through the use of alternate fuels and/or technologies.

Behavior Change Strategies

Because of the importance of the impact of behavioral change on GHG emissions and energy reduction, Berry conducted a survey of its Sustainability Committee during the development of this

CAP to rank the willingness (on a scale of 1 to 5, with 5 representing most willingness) to implement best practices involving behavior change. The topics in the survey included:

- Water conservation
- Energy conservation
- Waste production
- Recycling/food services
- Transportation/parking
- Other miscellaneous topics such as tree planting, curriculum programs regarding sustainability, and supporting "sustainability-minded" businesses and organizations.

The questionnaire used in the survey, and its results, are included as Appendix A to this CAP. For those topics with a median value of 4 or 5, Berry expects to achieve up to a 10% reduction in GHG emissions with the implementation of such key behavioral changes. In general, behavior changes associated with personal habits or commitments (*e.g.*, turning off electronic equipment when leaving a room for an extended period of time, thermostat setbacks).

Offset Strategies

In addition to reducing Berry's gross GHG emissions, GHG emissions that are reduced elsewhere can be claimed as offsets if they are financed by Berry. As described in previous sections of the CAP, Berry sustainably manages approximately 20,000 forested acres of its campus, which includes managed acreage totaling 3,797 acres that contain pre-merchantable timber less than 17 years old. Since the trees in these areas are not eligible to be harvested, the carbon stored as the trees grow results in net carbon sequestration. Annual carbon sequestration from these areas was estimated to be 8,033 $MTCO_2E$, with an average of 2.1 $MTCO_2E$ sequestered/per acre, which represents 22% of Berry's gross GHG emissions from FY 2008. This carbon sequestration serves as an offset to Berry's GHG emissions, and is an effective means to achieve a goal of this CAP, which is to identify and implement means to reduce carbon emissions. Berry has assumed that these forestry management practices will be consistent through the time period considered for the CAP.

In addition, opportunities for offsets include the purchase of renewable energy certificates (RECs) for green power or carbon credits for external GHG emissions reduction projects. Local or community offset projects may be favorable because the benefits can be more tangible and immediate.

5.3 Campus Evaluations

Determining the best approach to applying these strategies to the Berry campus required further examination of the energy consumption on campus. In evaluating how to apply these strategies, a study of the top electricity-consuming facilities at Berry was carried out. The study was based on available utility data from July 2008 through May 2009 (inclusive). This dataset indicated that Berry had a total electrical energy consumption of approximately 33.0 million kWh in the FY 2008 period.

Recognizing this distribution of energy consumption and the large quantity of buildings on campus, a focused energy audit effort was proposed. Buildings were selected for audit that:

- Represented large quantity energy consumers and/or
- Represented a facility that was considered inefficient and/or

- Represented a type of space or utilized a type of technology/practice that was representative of other buildings on campus.

Based on these criteria and in consultation with Berry, the following facilities were selected for an energy audit:

- New Science Building
- Clara Hall
- Hermann Hall
- Evans Hall
- Ford Complex (Admissions, Dining Hall, Gym, Theater, Music Recitation)

The result of these building energy audits is reported in detail in O'Brien & Gere's January 2010 Energy Audit Report. Note that the significant energy reduction opportunities identified from this effort have been incorporated into this CAP as potential projects below. However, the audits identified a range of additional recommendations for energy reduction at the specific facilities and across campus. These additional opportunities may be incorporated into capital and maintenance/repair planning where appropriate

5.4 Identification of Potential GHG Emission Reduction Projects

Berry has identified behavior, policy and facility initiatives that will be further developed and implemented to drive reductions in GHG emissions and to migrate to carbon neutrality. Berry's near-term focus will be projects related to behavior change strategies that can be promoted as policies for, and be viewed as challenges to, faculty, staff and students. The potential projects will likely be fashioned in part after those identified in the questionnaire described in Section 5.2. Examples of these strategies (in ***bold italics*** below), along with other potential projects, are provided below,

Behavior/Policy

- Establish a College policy to increase facility use and occupancy
  Berry will evaluate a campus-wide space planning/use policy to share and consolidate facilities and increase space utilization. Targeted focus will be applied to considering grouping evening and weekend classes in one or a few buildings to minimize the need to condition and light multiple facilities, and to distributing classes throughout the day to minimize the need for additional facilities. Berry will consider fostering coordination across colleges and departments to maximize efficient space utilization.

- Implementation of a campus-wide temperature set point policy [68 degrees Fahrenheit (degrees F) in winter, 74 degrees F in summer]
  Berry will work with faculty and staff to define and implement a temperature set point policy and foster communication and awareness across campus so that behavior affects energy use in campus facilities. Implementing this policy may require changing building occupant expectations, but the potential for energy savings is substantial, and the cost would be minimal.

- Eliminate or reduce space heaters, utilize computer peripheral switching, install vending machine occupancy sensors, and eliminate private office kitchenettes
  Berry will continue to strive to reduce and eliminate "incidental" plug loads that could be reduced or eliminated through behavioral changes or at minimal cost. These included space heaters, vending machines, computer peripherals, and private office kitchenettes.

- Utilize software that offers network level control over PC power management settings
  Set computers, monitors, printers, copiers and other business equipment to energy-saving features and turn off at the end of the day or after extended periods of non-use.

- Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist
  Berry will purchase ENERGY STAR equipment whenever practical. Individuals or college units making product purchases from categories where ENERGY STAR equipment is available will analyze the short and long-term costs and savings before the purchase is made. This policy was identified as a tangible action under the ACUPCC when Berry signed the commitment, and Berry intends to continue with this policy where practical (http://www.berry.edu/president/bcsp/esp.asp).

- Replace older plumbing fixtures with water-saving lavatory faucets and toilet flush valves
  Berry will continue the existing program to replace fixtures and consider application of alternate water-savings fixtures. This can be done in conjunction with any general renovation that effect bathroom facilities at Berry.

- Water conservation strategies as part of outreach efforts to faculty, staff and students
  As a means to promote conservation efforts tied to this CAP and environmental stewardship as a whole, Berry will consider individual metering of buildings, where departments would be accountable to conservation standards. ***Also, incentive and reward programs would encourage water conservation toward achieving a target indoor per capita water use metric.*** Berry will consider conducting system-wide leak detection programs. Outdoor water usage strategies may include incorporating natural landscaping and permeable pavement, and minimizing the use of potable water and groundwater for outdoor watering purposes, cleaning and washing.

- Participate in the Waste Minimization component of the national RecycleMania competition, and adopt three or more associated measures to reduce waste
  Berry has participated in RecycleMania for the past 3 years and intends to continue its participation. In addition, Berry has established a campus recycling program (http://www.berry.edu/president/bcsp/recycling.asp), promoted the use of inter-office reusable envelopes for campus mail, and encourages the cancellation of unnecessary or duplicated subscriptions. These actions were identified as a tangible action under the ACUPCC when Berry signed the commitment, and Berry intends to continue with this policy where practical. ***Berry's Sustainability Committee and student groups such as SAVE will be charged with education awareness programs to promote recycling throughout campus. Berry will also consider double sided printing as another waste reduction opportunity. General recycling efforts such as a move-out donation program (residence hall furniture, shelves, storage units, etc.) would further promote the values of "reduce, reuse, recycle." Composting of cafeteria food waste.***

- Reducing or altering commuter travel and business travel as a means to mitigate GHG emissions
  Berry will consider expanding its bicycle and car sharing programs as a means to reduce GHG emissions. The programs may include incentives such as reduced parking fees for commuters that use options other than single-occupant vehicle usage. For business travel, efforts to reduce GHG emissions may include:

  - Improving the access and availability of video-conferencing capabilities
  - Discussion of air travel policies and guidelines, including improvements to an accounting system to enable a more comprehensive estimate of GHG emission related to business travel

- Implement administrative and purchasing policies
  Consider treating energy metrics and GHG emissions like dollars, and tracking them with similar diligence and transparency. Procurement directives could then be established in response to an evaluation of such data.

Facility Initiatives

- Implement Energy and Atmosphere Considerations in New Building Design
  Berry is awaiting LEED certification for new construction on campus and is committed to the continued consideration of energy efficiency and reduction in atmospheric impacts through the construction of new facilities. Whether formally part of LEED or a similar program, Berry will institute a policy of requiring the consideration of energy and atmospheric issues during the design and construction of new facilities so as to reduce the per square foot impacts over time.

- Optimize lighting systems
  Berry has already updated lighting systems throughout campus by changing from T12 to T8 fixtures. Additional initiatives will be undertaken to the further improve lighting efficiency including: the application of occupancy sensors and lighting controls to minimize lighting during unoccupied periods, maximization of daylighting levels and diming/eliminating artificial lighting, the selective reduction of general area lighting and application of task lighting, and consideration of new lighting technologies including high efficiency compact lighting and LED.

- Application of Direct Digital Control (DDC) Building Automation Systems
  Berry has implemented DDC building automation systems on approximately 57% of the existing campus buildings. Berry continues to apply DDC systems to the remaining significant and appropriate buildings to provide a foundation from which to measure, monitor and control the operation of the building.

- Building Ventilation Control
  The proper ventilation of facilities is essential to maintaining a healthy environment for its occupants, but also requires a large application of energy. Utilizing building DDC systems, Berry will look to apply variable volume systems to reduce or eliminate the application of ventilation during low or unoccupied periods and will consider the application of CO_2 monitoring for spaces with widely varying occupancies to more accurately provide the proper ventilation to the space requirement.

- Energy Recovery Systems
  Energy is recoverable from systems requiring high ventilation and exhaust. Berry already applies energy recovery systems to recover available sensible and latent energy from exhaust streams of multiple applications on campus and will continue to apply energy recovery technologies to new buildings with similar operating requirements.

- Economizer Applications
  Energy can be reduced by applying economizer capabilities to eliminate the application of mechanical conditioning systems. Berry will select equipment and utilize DDC controls to apply air and water side economizer systems to reduce the required mechanical conditioning and save energy.

- Variable Capacity Heating and Cooling Systems
  Berry will apply variable speed drives and controls to allow the DDC system to modify the volume of air delivered to the space and quantity of heating hot water and chilled water required to be generated/circulated to condition the space to varying space loads.

- DDC Set Point Reset
  Berry will utilize DDC systems to reset the space comfort set points during unoccupied periods and to consider modifying the heating hot water and chilled water set points with changes in the outside air temperature to reduce the energy required to generate the water temperature without impacting the space humidity control or responsiveness to changes in space loads.

Long Term Alternative Energy Initiatives

Long-term GHG reduction plans take a visionary approach focused on applying alternative technologies and driving long-term results. Berry will continue to assess the application of alternative energy technologies on campus on either a demonstration basis that aligns with the curriculum and community objectives or as a broader use application to displace traditional energy consumption points. Among the current technologies that Berry will consider are:

Photovoltaic/ Solar Water Heating

Photovoltaic (PV) technology uses semiconductor materials such as silicon to convert sunlight directly into electricity. Solar cells are the basic building blocks of the complete system. Large parking areas, parking decks and building roofs could be considered viable locations for PV arrays. PV also is a summer peaking generation source, which could allow Berry to moderate a portion of its summer time peak demand. Reducing peak demand not only has beneficial cost implications, but helps to stabilize the local utility grid by reducing delivery stress on the system during the peak hours of electricity consumption. Solar thermal water heating systems can provide hot water for commercial use. The solar system pre-heats the water to the maximum hot water supply temperature. However the economics of PV/solar water heating systems as stand along programs do not typically support economic payback given the limited solar potential in the Rome, Georgia area and Berry current avoided utility costs. However, availability of alternate funding sources, changes in solar technologies and desire to implement on a demonstration basis will all be considered in the continued consideration of solar systems, particularly as part of a larger renovation or construction initiative.

Geothermal (Ground Source) Heat Pumps

Geothermal heat pump (GHP) technology uses the earth's renewable energy, just below the surface, to heat or cool a building, and to help provide domestic hot water. The system uses conventional electricity driven heat pump unit to extract heat from, or reject heat to a common heat transfer loop buried in the ground (ground loop), on the source side of the heat pump. GHP systems require a sizeable open area at ground level to facilitate the construction of the ground loop. For the portions of the campus have the free area required for the ground loop, GHP will be considered for Berry. The reliability and efficiency of these systems will continue to be as the technology gains larger application. Berry will consider the applications of this technology where land availability and building load application warrant.

Biomass Fuels

Biomass fuel technologies are considered by operations that have the potential to utilize fuels generated directly or in combination with commercially available fuels as an alternative to traditional fossil fuels. Combustion facilities can burn biomass fuels derived from many types of sources including wood, agricultural residues, wood pulping liquor, municipal solid waste (MSW) and refuse-derived fuel. Berry has operations that may have the potential to facilitate development of bio-fuels from wood and agricultural wastes, but Berry does not have significant combustion technologies that could convert biomass fuel into useful energy. Therefore, consideration of this alternative fuel technology would also require the development of systems that could utilize the fuel and displace the addition of future comparable fossil fuel loads.

Offsets/RECs

- ***Carbon sequestration***: Continued or increased sustainable forest management practices (approximately 2.1 $MTCO_2E$ sequestered per acre). ***Students will assist in the management practices, as well as the accounting of the pre-merchantable timber to estimate GHG emission reductions.***
- ***Stationary combustion****:* Price of carbon: $4-9 per $MTCO_2E$
- ***Electricity****:* Purchase RECs through utility company; $0.02 - $0.035 per kWh.

5.5 Prioritization of Potential GHG Emission Reduction Projects

A sequential process of engineering, cost-benefit, implementation, and funding analyses is planned to set targets and develop the strategies. Preliminary engineering analyses have been completed for some strategies and a possible set of GHG goals long term projects developed. These possible projects are summarized in Table 5.1. Implementation of these projects will be governed by priorities established through future cost-benefit analysis and influenced by funding probabilities, including state and federal grant and loan opportunities.

Potential specific projects in these categories may be selected by Berry in the near and long-term and will be prioritized using a cost-benefit index such as the following:

$$\frac{\text{Annual Energy Cost Savings}}{\left(\text{Project Cost} \div \text{Annual GHG Reduction}\right)}$$

Traditionally, projects may have been ranked based only on financial metrics such as simple payback. However, the index used in this evaluation considers both financial and environmental benefits. A higher index indicates greater benefit for a given cost. At Berry, projects are typically executed on the

scale of an entire building rather than a renovation or upgrade of a specific infrastructure system such as HVAC or lighting. As such, prioritization, funding, and implementation of individual projects that may reduce GHG emissions will be considered as part of larger projects. Examples of specific projects are provided below for the illustrative purposes of this CAP. The selection and implementation of these and additional projects will be considered as technology improves and becomes more cost-effective, thereby providing a fiscally sound approach for Berry.

Near Term (0-15 years) GHG Emission Reduction Projects

GHG Emissions Reduction Projects	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	GHG Reduction ($MTCO_2E$)
Conservation-Minded Behavior Change	3,300,000	7,000	2,600

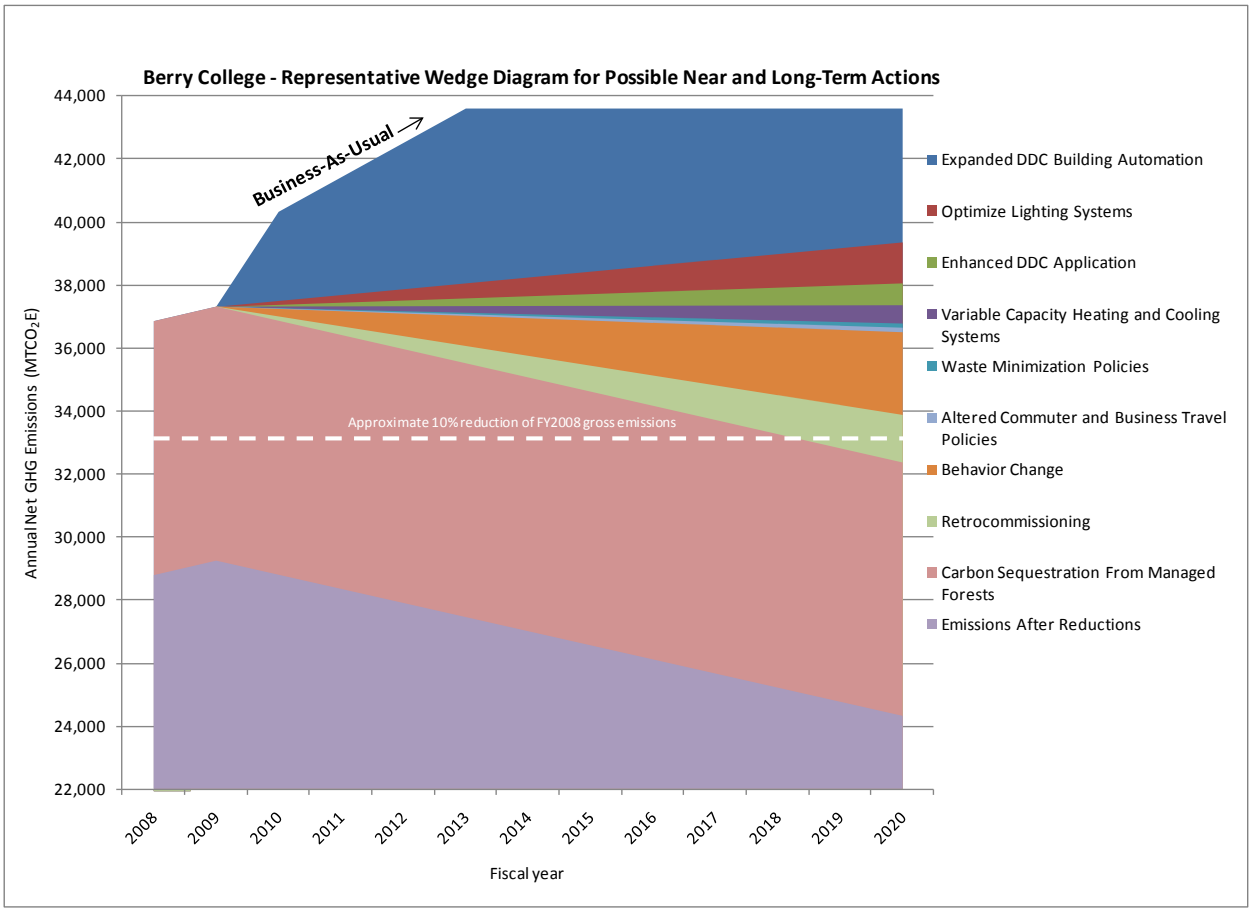
Long-term (15+) GHG emissions reduction projects

Energy Efficiency Measure	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	GHG Reduction ($MTCO_2E$)
Expanded DDC Building Automation System Application	6,250,000	0	4,250
Lighting Fixtures and Controls	1,900,000	0	1,300
Enhanced DDC Application	1,000,000	0	700
New Science Building Renovations	800,000	6,000	600
Hermann Hall Renovations	195,000	0	100
Evans Hall	210,000	0	150
Retro-Commissioning	2,200,000	6,500	1,500
Totals	**12,555,000**	**12,500**	**8,600**

These projects are considered as potentially viable as of the date of this CAP due to factors such as, but not limited to, evolving federal and state GHG and climate related regulations, economic and technological influences, and Berry's academic mission. The figure below represents the potential types of emissions reduction projects for consideration under the CAP and a nominal graphical

representation of the contribution of each project toward reaching carbon neutrality. Berry will review the progress and continued viability of the projects on a periodic basis, and revise them, as necessary.

Figure 5.1 Representative Wedge Diagram for Possible Near and Long-Term Actions



Other projects that demonstrate value as teaching tools or as high-visibility demonstration projects may also be considered for implementation. The CAP is a living document. As new emission reduction technologies develop and become viable, the CAP will be updated with a new prioritization of projects. It is expected that at a minimum, a progress report on the implementation of the CAP, including an updated schedule of proposed projects will be provided by January 2012, and every 2 years thereafter in accordance with ACUPCC guidance.

5.4 References

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6.0 Education, Research, and Public Engagement

6.1 Background

The ACUPCC asks signatories to commit to taking "*actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.*" ACUPCC guidance recognizes that each school will make its own determination of how to fulfill this part of the Commitment. Furthermore, participating institutions will (1) find their own creative and unique means of doing so; (2) develop a means of reviewing progress and expanding their reach over time; and (3) share their efforts with other signatories so that all of the institutions will be able to meet the ultimate goal to have graduates that can help all of society restore the earth's climate to a safe level and achieve sustainability over several generations. (ACUPCC, 2009).

As a signatory school, Berry has developed defining characteristics regarding the mission of the college. One of these includes a commitment to incorporate environmental sustainability within all activities of the college and especially Berry's core activities of education, practical and meaningful work experience and community service and research:

"The Berry College community is committed to environmental sustainability on our campus. To that end, we promote and foster environmental stewardship through education, research, policies, and actions."

This section of the CAP describes Berry's current educational offerings (curricular and co-curricular) related to climate change and sustainability. It also describes planned actions to make climate action and sustainability a part of the curriculum and other educational experience for all students. Finally, this section explains how the implementation of the ACUPCC will be integrated into Berry's educational efforts (*e.g.*, having students or classes update the GHG inventory), as well as how the entire campus community, including alumni, will be made aware of Berry's participation in, and progress toward, implementing the ACUPCC.

To address these elements, Berry worked with its faculty, staff, and students to identify how its sustainability curriculum can support the CAP effort. Specifically, Berry considered the following areas, based on ACUPCC guidance:

- Relevant course offerings
- Relevant course requirements
- Pedagogical methods
- Specific actions

Implementation of potential actions in each of these areas will be led by the Education, Curriculum, Student Involvement, Commuting, and Special Events subgroup within Berry's Sustainability Committee.

6.2 Relevant course offerings

The following topics regarding mandatory and voluntary academic coursework at Berry were reviewed as part of the educational component of the CAP. Berry's efforts to address these topics are provided below each item in *italics* font.

a. The interdependence of humans and the environment
Berry currently has courses in the Environmental Science (EVS) program and the Philosophy and Religion (PHIL) Department that address the interdependence of humans and the environment: EVS 104 Introduction to Environmental Sciences, and PHIL 359 Environmental Ethics. Additional courses and an additional program in Environmental Studies/Sustainability are under consideration.

b. How to assess the effects on humans and on the biosphere of human population dynamics; energy extraction, production and use; and other human activities such as agriculture, manufacturing, transportation, building and recreation
Berry currently has a course in the EVS program and the Economics (ECO) Department that addresses this topic: EVS 405 Environmental Science Methods, and ECO 470 Environmental Economics.

c. The relationship of population, consumption, culture, social equity and the environment
The courses identified under a. above address this topic.

d. How to apply principles of sustainable development in the context of their professional activities
The courses identified under a. above address this topic. In addition, Berry is also currently considering a call for proposals for course development to include sustainability in courses throughout the curriculum, which could apply principles of sustainable development to careers within the various majors.

e. Technical, design, scientific and institutional strategies and techniques that foster sustainable development, promote energy and natural resource efficiency and conservation, prevent and control the generation of pollution and waste, remediate environmental problems, and preserve biological diversity
The coursed identified under b. above address this topic. Berry currently treats these topics mainly through co-curricular activities (student work and undergraduate research), but is willing to introduce them into the curriculum as appropriate.

f. Social, cultural, legal and governmental frameworks for guiding environmental management and sustainable development
Berry is quite interested in addressing environmental policy and the processes that govern it into our curriculum. This topic is addressed where appropriate in the coursework described in this section.

g. Strategies to motivate environmentally just and sustainable behavior by individuals and institutions
The courses identified under item a. above address this topic. In addition, Berry is interested in scaling up our treatment of these issues in the curriculum.

6.3 Relevant course requirements

The following describes the extent to which the topics below are made available (and how they could be made available if not presently done so) to academic programs to educate Berry students about sustainability. Berry's efforts to address these topics are provided below each item in *italics* font.

a. Freshmen orientation
Berry currently addresses sustainability on a basic level during freshman orientation, in part by providing reusable water bottles for use during outside activities, to reduce the number of disposable bottles used. Berry is open to additional opportunities to emphasize sustainability at this early point in our students' college experience.

b. Requiring students to take courses introducing these concepts
Berry is currently reviewing its general education program and could incorporate sustainability concepts into a new program. Please also refer to 6.2.d. above for additional actions.

c. Providing elective courses on these concepts to all students
Berry currently has elective course available to all students (see 6.2.a. and 6.2.b. above) and is committed to developing additional courses.

d. Integrating these concepts into existing courses
As described in 6.2.d. above, Berry is currently considering a call for proposals for course development to include sustainability in courses throughout the curriculum.

e. Offering existing courses to more students
As Berry hires new faculty, we could leverage new and replacement positions to enable the teaching of additional sections of courses that introduce or engage sustainability.

f. Creating new multidisciplinary and interdisciplinary courses
Please refer to 6.3.b. above for current and anticipated actions.

g. New programs, institutes, and colleges
Berry currently has under consideration a program on Environmental Studies which would incorporate topics about sustainability and environmental policy.

h. Integration across the curriculum
Please refer to 6.3.b. above for current and anticipated actions.

6.4 Pedagogical methods

The following describes the type and extent of pedagogical methods that are used or anticipated to be used at Berry to facilitate systems thinking and the interdisciplinary concepts of climate change and sustainability. Berry's efforts to address these topics are provided below each item in *italics* font.

a. Inquiry-based and experiential learning – in which students learn through the process of discovering knowledge themselves and/or through direct experience
Many programs within our School of Science and Math use Inquiry-Based Learning (IBL) methods in courses. These methods are easily extended into the other schools.

b. Case-based learning – in which students learn through discussions of real-world examples and the associated collaboration and debate
This method is primarily used at present in the School of Business, but could easily be extended into the other schools.

c. Co-curricular student campus projects and experiences – in which students learn about climate change and sustainability outside the classroom
Berry offers many opportunities for co-curricular experiences that could include learning about climate change and sustainability. We also have an extensive, developmental student work experience program which has helped and will help students learn about climate change and sustainability. The work experience program is voluntary, with approximately 80% of students participating each semester. There are numerous positions which exist or could be created to give students the opportunity to learn about climate change and sustainability and to help the institution plan to become more sustainable.

Students have already been employed gathering and analyzing data on Berry's carbon footprint, on the amount of waste generated, and the material recycled on campus. Students were also employed to help with our USEPA compliance audit and to help solve identified issues. Seven student work positions were created in 2009 to create Eco-Reps for each residence hall area. Their major accomplishments to date include:

- *Researched peer and aspirant college's recycling programs*
- *Developed recycling program for WinShape residence halls*
- *Designed posters on saving electricity, saving water*
- *Updated campus recycling posters*
- *Designed a campus poster for toilets*
- *Co-sponsored the Berry Middle School Project GREEN Berry providing staff support and ticket sponsorship (using proceeds from selling bracelets and necklaces made from recycled materials)*
- *Sponsored an information table for America Recycles Day*
- *Worked with Residence Life to unplug refrigerators and micro-frigs in the residence halls over Christmas break*
- *Developed a recycling pick up system for the Townhouses*
- *Began planning for publicity for Recyclemania"*

A student team has been formed ("Eco-reps") to help identify ways for students in the residence halls to help with conservation efforts aimed at reducing Berry's carbon footprint.

As part of the student work experience program, Berry has formed the Berry Enterprises Student Team (BEST), which helps develop and support student enterprises with student planners, accountants, public relations, and human resources staff. All student enterprises developed to date have the potential to generate at least small amounts of income or budget relief for the College. We are beginning to consider other enterprises that would be non-profit initiatives. An enterprise that coordinates the student sustainability efforts on campus would be an excellent next step.

d. Student internships and practicum experiences
All schools use internships extensively in their curricula; these would be available for use in investigating climate change and sustainability.

e. Outreach partnerships – in which students learn about opportunities to benefit their local communities as well as about internship opportunities.
Berry has an extensive volunteer program and service programs with connections to community and regional organizations. We will be able to use these programs even more than we have in the past to help students connect what they are learning in the classroom with the effects of climate change and sustainability on the local community.

6.5 Specific actions

The following describes actions that has Berry undertaken or is planning to undertake to further the promotion of sustainability among its students. Berry's efforts to address these topics are provided below each item in *italics* font.

a. Establish a sustainability graduation requirement
Berry does not currently have, nor does it have plans to have, a sustainability graduation requirement. However, as described throughout this section, Berry plans to introduce sustainability concepts throughout the curriculum, so that students will be comfortable with the ideas and application of sustainability before they graduate.

b. Include students and faculty on design committees for new buildings (or research projects intended to look at alternatives to new construction)
Berry has a policy of including at least two students on planning and design committees for new facilities and on committees charged with considering reuse of existing facilities. For example, there were two student members of the design committee for the two new residence halls, which are LEED Silver pending buildings. One of the two students is now the Head Resident for the buildings. An open charrette process was used for the residence halls, providing all students, faculty, and staff the opportunity to respond to the design concepts.

c. Invite students and faculty to join and fully participate in campus sustainability committees as well as CAP committees and sub-committees
Berry is committed to continuing its efforts in this area. Berry's Sustainability Committee (which was established in September 2007 shortly after Berry's signature of the ACUPCC) includes students (including up to 10 paid interns) as part of its mission and goals. The students lead the efforts to prepare the GHG inventory and will continue to maintain the inventory to provide the updates required by the ACUPCC. The committee will ultimately be divided into the subgroups to implement the commitments of the ACUPCC that may include:
- *Solid Waste, Composting, Waste Minimization, and Food Services*
- *Electricity and Space Heating and Cooling*
- *Sequestration and Land and Water Management*
- *Financing, Purchasing, Transportation and Green Cleaning*
- *Building-Level Initiatives, Recycling, New Building and Renovations, and Landscaping*

- *Education, Curriculum, Student Involvement, Commuting, and Special Events*

d. Participate in national climate change awareness raising and action initiatives like "Focus the Nation" and the "National Teach-In on Global Warming"
Berry is committed to continuing its efforts in participating in such initiatives.

e. Encourage and empower student environmental activism and clubs
Berry is committed to continuing its efforts in this area. A new student group of environmental educators was formed this fall (Eco-Reps for the residence halls). In addition, Berry has long had a student organization committed to environmental issues. S.A.V.E., Students Against Violating the Earth, has been a leader in campus recycling, campus clean-ups of creeks and other areas, and education about campus issues. The Student Government Association and Omicron Delta Kappa, our leadership honorary, have spearheaded Green Week, involving multiple student organizations in educating and practicing environmental stewardship. For example, our Student Government Association sponsored a light bulb exchange offering a fluorescent bulb to any student who brought in an incandescent bulb.

f. Organize an annual campus climate summit
While not organizing a campus climate summit, our student groups work together for Green Week and for Earth Day programming.

g. Invite nationally renowned expert speakers on climate change and sustainability to your campus
Berry has done this in the past and is committed to continuing its efforts in this area. For example, Berry's Gloria Shatto lecture series, named for Berry's President from 1980 to 1998, who believed "strongly in the notion that there is more to an education than what can be found in textbooks."

h. Create Student Life residential environmental education initiatives such as "Eco-Reps," on-campus sustainable living opportunities, *etc.*
Please refer to 6.5.b., e and f above. Berry has begun discussions about possible places to designate as "on-campus sustainable living opportunities." Berry is committed to making these opportunities available to our students. As a residential academic community, our residence life staff and our residence halls are key aspects of all sustainability programs.

6.6 Communication and Engagement

Berry's Sustainability Program maintains a web site (http://www.berry.edu/president/bcsp/overview.asp) that provides a medium for describing Berry's participation in the ACUPCC and for receiving feedback, publicizing events, and posting documentation, policies, and tips on sustainability activities such as recycling and energy conservation. The mission of sustainability on campus is also spearheaded by the Student Government Association's Green Committee and a student environmental group SAVE. These organizations have established events such as Green Week, which features a light bulb swap and recycling education activities. Student involvement has also resulted in the creation of a vegetable garden that provides produce and herbs to the college and the local community. Berry has participated in Recyclemania for the past 3 years and actively promotes the event on the above website and

throughout the campus to encourage continual improvement in recycling rates and waste minimization. These keystone programs forms the basis for the communication and engagement activities at the student level on campus.

On an administrative level, Berry makes a list of mutual funds, equity holdings, and fixed income holdings available to trustees, senior administrators, and select members of the community. A seven person committee comprised of administrators and trustees deliberates and makes decisions on proxy votes. A list of votes cast on proxy resolutions on a company-specific level, including the number of shares, is available to the public at the investment office. Berry currently aims to optimize investment return and is currently invested in renewable energy funds.

Berry's community engagement process is exemplified by the Bonner Center for Community Engagement (http://www.berry.edu/service/BCCE/index.asp). This Center facilitates partnerships that: (1) promote community service, civic responsibility, social awareness, and academic scholarship, and (2) advance the college's motto "not to be ministered unto, but to minister." These venues serve as means to increase Berry's public engagement on sustainability, and in particular its ACUPCC commitments, in various ways such as:

- Berry College Volunteer Services (BCVS), a student-led organization that plans extracurricular service opportunities in Rome-Floyd County, GA and attempts to raise the social consciousness of the campus by hosting educational events that focus on community needs.

- Co-curricular leadership programming that promotes the theories and practices of servant leadership and encourages civic participation.

- Bonner Scholars Program, a co-curricular scholarship program for students who have demonstrated active citizenship through service, that offers an intensive experience in community-based work and leadership development and that focuses on civic engagement, community building, diversity, international perspective, social justice, and spiritual exploration.

- Community-based learning initiatives that offer students experiences outside the classroom that link course content to practical application of knowledge thereby promoting the understanding of the intersection of academic scholarship and service to humanity.

The Bonner Center for Community Engagement defines two types of partnerships based on the duration, responsibilities, and learning opportunities of the volunteer activities. Each type of partnership requires an increasing level of responsibility from community partners in the role of co-educators: (1) One-Time Volunteer Opportunity (*i.e.*, special event, weekend service project) and (2) Ongoing Volunteer Placements (including Bonner Scholars Program).

Berry also partners with the Clean Air Campaign to offer financial rewards to faculty and staff that use alternative methods of transportation.

Following the submittal of this CAP to the ACUPCC website, Berry anticipates facilitating at least one on campus and one community stakeholder session to review the CAP and to the solicit feedback for consideration of future revisions to the CAP. A biennial update of the campus emissions inventory and tracking toward climate goals is required by the ACUPCC. The following actions are recommended to facilitate the biennial update:

- Develop and implement a system for tracking and disseminating monthly building performance, including energy use and water consumption.
- Develop and implement a system for tracking and disseminating fleet emissions and fuel consumption.
- Develop and implement a system for tracking and disseminating air travel emissions.

6.7 Additional Environmental Priorities

There are many environmental impacts, such as water consumption, that relate to GHG emissions, but are not explicitly/fully captured by the GHG emissions inventory. Sample actions under Berry's consideration include:

- Developing explicit policies and strategies regarding campus landscaping and land use practices that foster water conservation, reduce erosion and sedimentation, improve downstream water quality, and enhance biodiversity.
- Implementing an athletics sustainability program.
- Establishing a single administrative position to coordinate toxic and hazardous materials management.
- Designing and implementing an integrated pest management program.
- Incorporating sustainability topics and certifications into the professional development requirements for Facilities staff.

6.8 References

American College and University Presidents' Climate Commitment (ACUPCC). 2009. Education for Climate Neutrality and Sustainability: Guidance for ACUPCC Institutions (Available at: http://www.presidentsclimatecommitment.org/resources/guidance-documents/academic)

AASHE CAP Wiki (Available at: http://www.aashe.org/wiki/climate-planning-guide/education-research-and-public-engagement.php).

ACUPCC Academic Guidance (Available at: http://www.presidentsclimatecommitment.org/html/solutions_academics.php).

APPENDIX A

Best Practices Involving Behavioral Changes Questionnaire

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Respondent Function	Water Conservation										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Staff	1	1	5	1	5	5	5	1	5	5	1
Staff	5	5	5	5	5	5	5	5	5	5	5
Faculty	5	5	4	5	5	5	2	5	5	5	1
Student	4	1	5	5	5	5	5	5	3	3	4
Faculty	3	4	5	4	5	5	3	5	5	5	3
Staff	5	4	5	2	4	3	1	5	4	5	1
Student	5	5	4	5	5	5	4	4	4	5	3
Median	5	4	5	5	5	5	4	5	5	5	3
Mode	5	5	5	5	5	5	5	5	5	5	1

1 is least willing; 5 is most willing

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Respondent Function	Energy Conservation														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Staff	1	1	1	1	3	1	1	1	1	5	5	5	5	4	3
Staff	4	5	5	5	5	5	5	5	5	5	5	5	1	5	5
Faculty	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5
Student	5	5	5	5	4	5	4	3	3	5	5	5	5	5	5
Faculty	4	5	5	5	5	2	4	4	5	5	5	5	1	3	3
Staff	4	5	5	5	5	3	4	3	3	5	5	5	1	4	4
Student	5	5	5	5	5		5	5	5	5	5	5	4	5	5
Median	4	5	5	5	5	4	4	4	5	5	5	5	3	5	5
Mode	4	5	5	5	5	5	5	5	5	5	5	5	1	5	5

1 is least willing; 5 is most willing

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Respondent Function	Waste Production					Recycling/Food Services										
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Staff	2	2	5	1	1	3	1	1	3	3	1	1	1	1	1	1
Staff	5	5	5	5	5	5	4	5	5	5	4	5	5	4	2	5
Faculty	5	3	3	3	4	5	1	5	5	5	5	5	5	1	1	3
Student	5	3	3	5	4	4	4	5	5	5	5	4	3	3	4	4
Faculty	4	5	5	4	4	4	5	5	5	5	2	2	4	4	1	4
Staff	4	5	3	3	3	5	4	3	4	4	5	3	4	4	1	4
Student	5	5	5	5	5	3	4	4	5	5	5	5	5	4	1	4
Median	5	5	5	4	4	4	4	5	5	5	5	4	4	4	1	4
Mode	5	5	5	5	4	5	4	5	5	5	5	5	5	4	1	4

1 is least willing; 5 is most willing

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Respondent Function	Transporation/Parking														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Staff	1	1	1	1	5	1	1	1	1	1	5	3	4	4	1
Staff	4	5	5	5	5	5	4	4	5	5	5	5	5	5	4
Faculty	1	1	2	3	3	1	1	1	1	2	3	2	3	2	2
Student	3	4	5	4	5	4	4	4	4	2	4	5	5	4	3
Faculty	5	3	3	4	5	5	4	5	5	3	5	5		1	1
Staff	5	3	3	3	4	4	3	4	5	4	4	5	4	5	1
Student	1	3	3	3	5	5	5	4	5	4	4	5	5	5	3
Median	3	3	3	3	5	4	4	4	5	3	4	5	5	4	2
Mode	1	3	3	3	5	5	4	4	5	2	5	5	5	5	1

1 is least willing; 5 is most willing

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Respondent Function	Other								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Staff	1	1	1	1	1	1	1	1	1
Staff	5	5	3	3	5	5	5	5	3
Faculty	3	3	5	5	5	5	5	5	5
Student	5	4	3	4	5	5	5	4	2
Faculty	3	2	2	2	3	3	4	4	4
Staff	3	2	1	2	3	3	4	4	5
Student	5	5	4	5	5	5	5	5	4
Median	3	3	3	3	5	5	5	4	4
Mode	5	5	1	5	5	5	5	5	5

1 is least willing; 5 is most willing