

Centre College Climate Action Plan



Report from Advisory Committee to the President
2009

Foreword

Dear Reader:

I am pleased to offer words of introduction to the College's Climate Action Plan. Since choosing to be a charter signatory on the President's Climate Commitment, Centre College has moved in very positive directions with regard to sustainability and the manner in which we treat our environment. Professor Preston Miles and his broad-based committee have worked hard to create a Climate Action Plan that makes sense for this institution and capitalizes on the College's leadership in this aspect of community life.

Centre College, in more recent years, has become a regional and even national leader among liberal arts colleges with regard to environmental concerns. We have some distance to travel, of course, and this Plan moves us decidedly in that direction. I invite you to read this Plan and find ways in which you might contribute to its success. And, while I believe that sending informed and responsible citizens forth each spring as Centre graduates remains our highest calling, the work that we can do as a collective here at the College is also valued.

Good reading – go green!

Sincerely,

John A. Roush
President, Centre College

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1.0 Executive Summary

In 2007 President Roush became one of the first 100 signatories of the American College and University Presidents Climate Commitment. This step served to stimulate efforts on our campus to address the environmental impact of college operations. We find that elimination of GHG emissions is justified from several perspectives – climate impact, economic impact, and social responsibility, and is fully consistent with the College’s mission and traditions.

Working within the ACUPCC timeline, we have taken immediate and concrete actions to address climate change, we have conducted an analysis of the greenhouse gas emissions from college operations, and here we present a map to guide the college to greenhouse gas neutrality.

Our GHG emissions inventory showed that over 70% of our emissions are from natural gas and electricity used for operation of our campus facilities. Purchased electricity is the largest contributor since the power on our regional grid is generated primarily by coal-fired plants. Air travel accounts for 20% of our emissions and 4% are due to commuting.

We recommend that Centre achieve climate neutrality within a generation. We offer the following timeline:

- 2020 – Reduction of GHG emissions by 25% from 07/08 levels
- 2030 – Reduction of GHG emissions by 50% from 07/08 levels
- 2040 – Climate neutrality

Should we not meet this timeline, carbon offsets should be purchased equivalent to any shortfall.

In light of the large proportion of our emissions that derive from building operations and the availability of proven approaches for significant improvements in HVAC efficiency, a large portion of emissions reductions can be accomplished in this area. Individual actions and new policies can bring about important improvements in energy conservation. Exploration of alternative energy projects can make a significant contribution. Careful examination of our travel decisions can provide significant savings. With strong leadership and cooperation across the campus, we are confident that the first milestone, of 25% reduction by 2020, will be met.

The opportunities and changes in operations the College will encounter in the coming thirty years certainly mean this document is not a plan, but rather a vision for the future. As a vision, it sets out broad goals and articulates shared values and should stimulate action. Detailed operational plans and schedules must now be developed. Renovation projects must be funded and executed; policies and practices must be examined and revised. At appropriate intervals, this plan must be revisited and reaffirmed.

2.0 Introduction

In spring 2007, President John Roush became one of the charter signatories of the American College and University Presidents Climate Commitment. This bold step has become a turning point in the efforts of Centre College to promote sustainability and environmental responsibility. Below we lay out the reasoning behind President Roush's decision, a summary of the information the Advisory Committee has reviewed, and finally a vision that will guide our efforts in achieving greenhouse gas neutrality.

The Advisory Committee assembled in fall 2007 and began study of methods to achieve GHG neutrality. By November, the committee recommended, and the President adopted, three immediate actions: (1) energy conservation in all new construction, (2) Energy Star purchasing policy, and (3) participation in RecycleMania. By fall 2008, our first comprehensive inventory of greenhouse gases (based on FY 07/08) was completed. This gave us insight into what actions would have the greatest impact for conservation and efficiency. The 07/08 GHG inventory is presented as Appendix 2. As part of the commitment, Centre makes all of these documents publicly available on the ACUPCC website [1]. During AY 08/09, additional strategies were studied and the broad outline for this climate action plan began to emerge. Notes from the discussions and actions of the Advisory Committee for 07/08 and 08/09 can be found in Appendix 3 and 4.

Evidence of recent climate change is now convincing and the impact of human activities to accelerate that change is now widely accepted. Centre College recognizes its responsibility to respond to this challenge.

Centre's options for emissions reductions occur in the context of national and world-wide political and technological environment. We can't adopt technologies that are not available, comply with regulations that have not been enacted, or purchase renewably generated electrical power when the capacity is not available. Our greatest opportunity to influence the global climate question is through the lives of our students. Therefore, our primary responsibility will remain to educate and inspire students to become future national leaders who will advocate for change, will invent the scientific and technological opportunities and formulate the political will to lead this major societal transformation.

2.1 Centre's Position

Centre has a long history of interest in environmental action, going back at least to the first Earth Day in April 1970. [2] Students and faculty have practiced recycling, advocated utility conservation, and taught and learned about the larger issues involved. Both as individuals and through organizations, sensitivity to environmental concerns has been a hallmark of our campus.

Efficiency and frugality have always been part of campus operations. The recognition the College has achieved on "best buy" and "most affordable" lists is due to productivity in many areas, but certainly we could not have been as successful in this regard unless the costs for building operations were low relative to other institutions. [3]

As an institution approaching its 200th year, our decision-making considers a long time-frame and an intention to serve future generations. The College's Strategic Plan considers issues and goals relating to sustainability and environmental concerns. As part of the global citizenship

goal, the plan calls for us to investigate extending the current minor in Environmental Studies to a major, and to establish a sustainability component to the curriculum. As part of the engaged and experiential learning goal, the plan suggests consideration of a center for environmental/sustainability studies [4]. In November, 2008, the Advisory Committee asked the Planning and Priorities Committee to include two explicit goals regarding the environmental impacts of college operations: 1) Pursue energy conservation and carbon emissions reduction measures vigorously and continuously throughout the College's administrative, academic, athletic, and facilities management operations; 2) Build and manage all campus facilities with attention to the best principles of sustainability, including the sharp reduction and mitigation of greenhouse gas emissions. [5]

Centre has made remarkable progress incorporating global citizenship into the experiences of our students, in classrooms, convocations, in overseas study opportunities. Our Strategic Plan affirms, "Educating students to be citizens of the world; men and women who are globally engaged and prepared to respond to opportunities from all parts of the world." With that engagement we also become involved in the challenges facing the world, and as is becoming increasingly clear, the economic and social disruptions resulting from climate change may be one of the greatest global challenges.

Efficiency improvements in building operations provide a return on investment with quantifiable payback periods. The savings in future operational budgets mean that new ventures are not constrained by these essential services.

2.2 The ACUPCC

The American College and University Presidents Climate Commitment was launched in March 2007, and President Roush was among the first 100 charter signatories in spring 2007.

The ACUPCC recognizes the unique responsibility that institutions of higher education have as role models for their communities and in training the people who will develop the social, economic and technological solutions to address global warming.

The ACUPCC calls on institutions of higher education to respond to "a challenge of massive proportion which will require transforming our economy, our institutions, our daily lives within a *generation*. No other institution in society has the influence, the critical mass and the diversity of skills needed to be successful" (italics added) [6].

Membership of the Advisory Committee of staff, faculty, and students is given as Appendix 5.

2.3 Recent GHG Mitigation Actions

Energy and resource conservation – frugality -- have long been important operational principles for our Facilities Management efforts. Without this pattern, Centre would never have been able to provide educational excellence at moderate costs.

Centre has experienced a dramatic advance in campus facilities in the past several years. Table 2.3 summarizes five major projects in the past five years. All of these buildings have been designed and constructed to best current practices for energy conservation. As impressive as this record is, the net increase of almost 200,000 additional square feet of space will undoubtedly increase our carbon footprint and make our task more difficult.

College Center	New construction and major renovation	Crouse 103,000 sq ft Sutcliffe- 124,000 sq ft	\$22 million	2005	
Pearl Hall	New construction	56,000 sq ft	\$15million	2008	awarded LEED gold certification. EPA Energy Star certification pending.
Campus Center	New construction	45,500 sq ft	\$15 million	2009	anticipated LEED certification
Norton Center	Major renovation		\$1.2 million	2009	
Science Center	New construction	45,000 sq ft	\$20 million	2010	anticipated LEED certification

In 2003, Centre executed an energy services contract with Ameresco (now LG&E). This project provided a campus-wide energy management system and many lighting and water retrofits across 80% of campus. The total project cost was \$426,000 and had an impressive 5-year payback period. Post-construction audits (2006) confirmed the projected savings. Many of the system modifications begun through this ESCO project have been extended in recent years through the normal budgeting priorities and efforts of our Facilities Management department, particularly lighting and water retrofits.

Beginning in winter 2007, the College has been more aggressive towards shutting down buildings over the holiday period. In winter 2008, an estimated \$5,000 to 10,000 dollars were saved through this effort. A more aggressive effort in energy saving is planned for 2009.

The number and diversity of recent capital projects to improve operational efficiency is truly remarkable. A list of some of those improvements is presented as Appendix 7.



Figure 2.3 The Dilemma. Efficient new buildings are still new buildings. The addition to Young Hall is designed to incorporate efficient heating and cooling methods, but adds 45,000 sq feet of new conditioned space.

3.0 Targets

Because of the enormity of the task, the range of people and offices involved, and the financial and technological dimensions of the task, it is essential that we set clear and challenging goals to guide a process that will take decades to complete. These goals must be quantitative and must include intermediate steps, and plans for adjusting the goals. Our committee has wrestled with both the approach to goal-setting and with the goals themselves.

3.1 The Target and the Timeline

Targets and timelines must be concrete and quantitative if they are going to demand respect and command compliance. Profound changes, such as we see being necessary, cannot be accomplished quickly. Changes of this magnitude must be generational. We translate the generational dimension to approximately 30 years – Centre College will achieve GHG neutrality by 2040.

A generational target of 2040 acknowledges the enormity of the challenge facing us. But, 30 years is too long a period to serve as concrete operational planning. We must set intermediate goals that are consistent with the planning and budgeting horizon of the College, and will serve as target dates to measure progress in a reasonable fashion.

Using the planning horizon of the College’s strategic planning system, we suggest 10 year intermediate goals. By 2020 we must reduce our emissions levels by 25%. By 2030 we must reduce our emission levels by 50%. By 2040 we will realize the vision of GHG neutrality.

- 2020 – 25% reduction from FY 07/08 levels
- 2030 – 50% reduction from FY 07/08 levels
- 2040 – Greenhouse gas neutrality

Our baseline year is our first complete GHG inventory in FY 07/08, which reported a total of 17,000 metric tons of CO₂ equivalent.

These goals are not relative to student enrollment, campus area, or to number of campus buildings. As we make decisions regarding student enrollment based on other dimensions of our institutional mission, or as we add additional facilities, our ultimate goal remains climate neutrality in a generation and the work that must be done to accomplish this goal becomes more difficult. If the college is not able to reduce greenhouse gas emissions for the 2020, 2030, and 2040 targets, we suggest that carbon offsets be purchased equal to the difference between our goal and any remaining emissions.

The 2020 milestone is the most critical since early actions provide continuing returns. We call for an early update of this plan is conducted to identify specific projects (including costs) that can reasonably be expected to meet the 2020 targets.

3.2 Comparison with Business as Usual

A way to illustrate the magnitude of the task confronting us is through comparison with a projection of what future emissions levels might be in the absence of our struggles. For the period 1989 through 2009, the average year-to-year enrollment increase was 1.7% [10]. We make a “business as usual” projection, by assuming the same enrollment trend and assuming that GHG emissions increase in proportion to enrollment.

Comparison of our emissions goals with the business-as-usual forecast illustrates how enormous our task will be. By our first milestone in 2020 the BAU projection is 20,908 mtCO₂e/ yr for the college. Our goal for 2020 of 25% reduction below 2008 actual, calls for emissions no greater than 12,800 mtCO₂e/yr. Early and dramatic action will be necessary to meet this target.

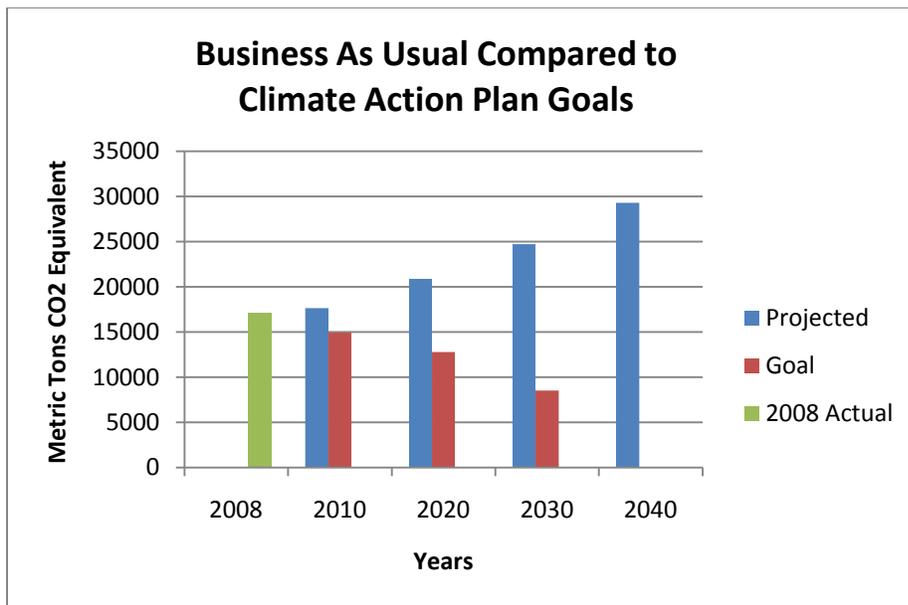


Figure 3.1 Illustration of the Business As Usual Case. Future emissions are projected proportional to the annual enrollment growth average for 1989-2009. For comparison, the actual emission for FY 07/08 was 17,079 mtCO₂e.

4.0 Emissions Reduction Strategies

The greenhouse gas inventory of FY 07/08 identified the emissions arising from various types of campus activities. Certainly we will make efforts to reduce emissions in all categories, but most urgent attention must be directed to the largest components -- purchased electricity, 54%, and natural gas used for space heating and hot water, 17%. The operation of our buildings, laboratories, gymnasiums, and dormitories accounts for over 70% of our emissions. So these are the areas where changes we implement will have the greatest impact. We recommend both changes in individual behaviors and changes in the operation and design of our facilities.

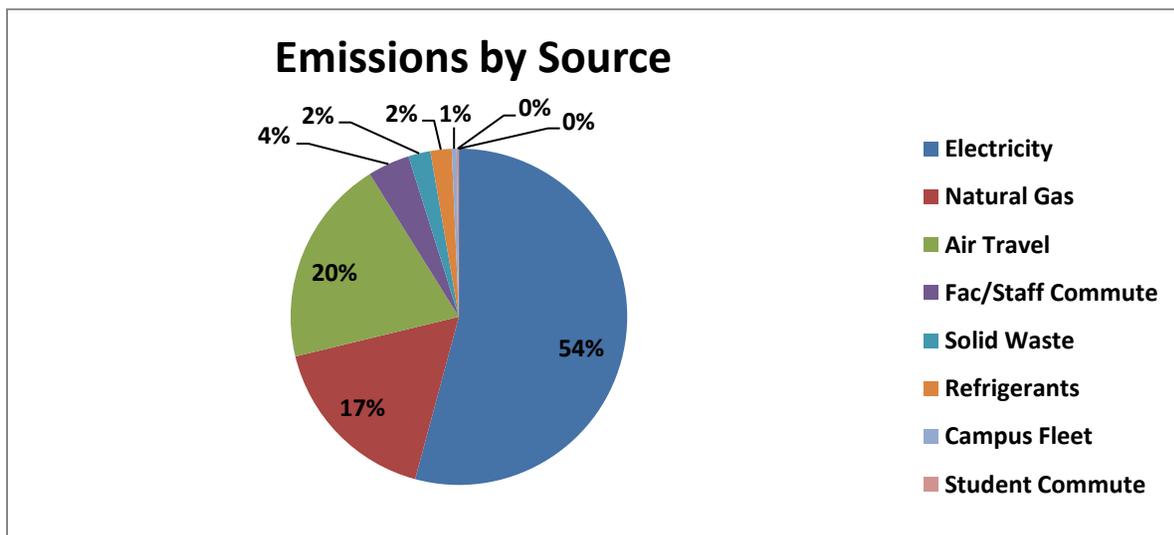


Figure 4.1 FY 08 GHG Emissions by Source.

Centre's opportunities for emissions reductions are shaped by the generation methods used to supply the regional electrical grid. Electrical power costs in Kentucky are among the lowest in the United States. In central Kentucky, electricity generation is about 95% coal, 4% natural gas, and 1% hydro. Thus actions we take to reduce electric power consumption will have a lower economic return and a greater GHG emissions reduction than similar actions taken by schools in regions with a high proportion of either hydro or nuclear power.

4.1 Changing our Behaviors – Conservation

Some of the climate and environmental impact of Centre College derives from day-to-day actions of the approximately 1500 students and employees of the Centre community. Some of these actions are the result of individual, voluntary decisions -- a faculty member may leave the lights on in a classroom, a student may open a dorm window and forget to close it when leaving, or a recycling opportunity may be missed. In some cases our behaviors can be governed by institutional policy – temperature set-points for building HVAC and regulations on space heaters are examples. But often general policies cannot anticipate specific situations (i.e. drafty offices). Therefore our conservation efforts must include both policy decisions and efforts that influence voluntary individual behaviors.

One of the best ways to change the beliefs of individuals about climate change is by first changing their behaviors. An example is Centre's excellent recycling program. In a very real fashion, the development of recycling habits can be considered a "gateway behavior". When a student or staff member develops a habit of recycling aluminum cans, they gain awareness of the importance of their actions; by changing a habit, they can make a contribution. Likewise a habit of turning off lights when leaving a room will make an individual feel like they are contributing to reducing greenhouse gas emissions. This awareness then sets the stage for their changes in beliefs – in a sense, the operational precedes the cognitive. So there are two reasons for the continuing public education efforts in energy and resource conservation we recommend; first, the thousands of individual actions have an important cumulative effect on GHG emissions, and second, the new habits that are developed will lead to new understandings of climate/energy issues.

Every year we have a new group of incoming students, slightly more than one-fourth of the campus each year. And of course, we have new employees joining the College every year. We must make continuing and systematic educational programs to inculcate values of energy and resource conservation in the behaviors of all members of the Centre community.

An approach that has been successful on other campuses is designated and trained student environmental representatives in individual dormitories. The eco-reps program was initiated by Tufts University in 2001 [11] and there are now about 40 such program in operation around the country. In most cases, the program operates outside the Student Life Residents Assistance programs, is funded through college work-study funds, and is directed by sustainability staff.

4.2 Changing Our Built Environment - Efficiency

Personal behaviors and individual actions are important to our institutional success, but they will not produce the necessary reductions in use of natural gas and electricity to heat, cool, and ventilate our buildings. The College must adopt concrete plans to renovate and update our

building mechanical systems to accomplish our goal. Building performance must be monitored and re-certified at appropriate intervals. This effort must be well-planned and aggressive if we are to meet our timeline.

“Energy efficiency is the use of technology to provide greater access to energy services with less consumption of energy resources such as fuel and electricity. Efficiency is not the same as conservation. Conservation entails doing without energy services through frugal behavior or deprivation. Efficiency entails doing more with less.” [12]

One of the three tangible actions adopted in fall 2008 was a resolution that best available engineering practices be adopted for energy and resource conservation in the design and construction of all new buildings and major renovations [13]

In section 2.3 some important recent efficiency efforts were described. This excellent progress must accelerate. Centre must develop and execute a systematic and vigorous plan to reduce the GHG impact of operating campus facilities.

During 2009, our Facilities Management department developed and began utilizing the SchoolDude software system to track utilities use by each building and each utility meter. This system will allow us to readily identify the most and least efficient buildings. From this information, plans can be developed to improve or replace those buildings. Projects will be selected by considering the impact of renovation dollars, balancing costs for updates of our least efficient buildings and update costs for our buildings with highest energy consumption.

Architecture 2030 is an independent organization that calls on architects to lead the effort in addressing GHG emissions from buildings. That organization contends that nationwide, at the current rates of replacement and renovation, by 2035 approximately 75% of our built environment will be new or newly renovated [14]. To the extent that national patterns of building/renovation apply on our campus, this prediction suggests that Centre has great opportunities for improving energy efficiency if best available technologies continue to be used in all new construction and major renovation.

Marilyn Brown and colleagues at Oak Ridge National Laboratory set out the broad potential for energy efficiency improvements in buildings. They identify emerging technologies and policy changes that can lead to a 23% reduction of the forecasted energy consumption of buildings in the United States in 2025. [15] Among the innovations they identify are: improved building envelope, HVAC system improvements (including reduced duct losses, variable speed air handlers, and ground coupled heat pumps), heat pump water heating, water heating dehumidifiers, and solar water heating. The authors point to solid state lighting and advanced geothermal heat pumps as practices having great potential in the near future.

If we assume that the generalizations made for the nation as a whole (ORNL and Architecture 2030) will apply at least roughly to our campus facilities, then a target of 25% reduction in GHG emissions from campus facilities by 2020 is possible.

Jerry Williams and Chris Chivetta, principals of 8760 Engineering, a consulting firm specializing in energy efficiency, characterized our 2020 goal as “bold but achievable,” particularly since we are “doing a lot already.” Their judgment is that Centre’s energy costs of \$1.30 per sq ft are not high and reflect the good work that has been done in the past several years to improve operational efficiency. The low-hanging fruit has been picked. Jerry identified some possible

projects: Olin Hall, the Old Quad (Cooper/Ganfield/LaMotte/Tyler/Stephenson/Vinson), Crounse-Sutcliffe, Jones VAC, the north side dorms (Acheson/Caldwell/Cheek/Evans/Yerkes), and Boles pool. [16].

4.3 Travel and Transportation

Beyond contributions from electricity and natural gas, the next largest segments are air travel, at 20%., and student and staff commuting and campus fleet at slightly less than 5%.

4.3.1 Air Travel In most systems for assessment of GHG emissions, air travel and commuting are considered a Scope 3 indirect activity and are not considered by some schools. We have chosen the more inclusive definition to better represent our responsibilities. Air travel includes all study abroad programs, both long term and Centre term, all athletic travel, and all business air travel.

The Advisory Committee suggested and the International Studies Committee accepted the as an additional criterion to their process of evaluating all overseas studies proposals in 2009, that “environmental impact considerations can be balanced against the valuable educational benefits of off-campus study educational benefits” [17]. International programs are an integral part of Centre’s educational program and the emissions due to the necessary travel is the responsibility of the institution.

In spring 2009, the President asked all sports teams to reduce their travel plans by one off-campus event. Additionally, there are conversations in place concerning the membership and travel arrangements for our athletic conference. The primary objective of these conversations is reducing the amount of time our athletes must spend away from campus and their academic responsibilities and reduction in total athletic travel budgets. Coincidentally, the anticipated changes will lead to significant GHG savings since high altitude jet exhaust has a particularly large environmental impact.

Business travel includes all staff travel for student recruitment, development, international programs, and extracurricular programs. This is an enormous range of activities with valid priorities. We can make no projection of possible savings in this area, but suggest continued attention must be given to this opportunity.

4.3.2 Commuting As an almost completely residential campus, Centre enjoys an advantage with respect to commuting. Since about 95% of students live on-campus, and a significant number live in apartments in downtown Danville, the GHG contribution from student commuting is small. We should continue educational programs to make students aware of climate impact of their driving decisions, but there is little opportunity for significant reduction in this already small number.

With over 300 employees and a location in a rural area, it is somewhat surprising that over 70% of our staff reside in Boyle County. The county with second highest number of employees is Fayette County, at 8%. Beyond encouraging carpooling and high mileage vehicles, there seems to be little opportunity for significant reductions in this area.

5.0 Offsets and Alternative Energy

The most direct strategy to reduce greenhouse gas emissions – reduction in energy consumption, was discussed in the previous section. But energy consumption cannot be eliminated. So the committee has also investigated on-site alternative energy sources, renewable energy credits and the related topic of carbon offsets.

5.1 Renewable Energy Certificates.

It is important to distinguish between REC's (sometimes called green power, green tags, and tradable renewable certificates, TRC's) and other forms of alternative energy and GHG mitigation programs. A renewable energy certificate is the environmental attribute that supports the development and expansion of generating electricity through renewable sources. The purchase of REC's, supports the generation and expansion of non-emitting methods of electricity generation.

In order to make the economics of green power profitable, developers produce and deliver their renewable electricity onto the transmission grids for the cost of coal-based energy (six cents per kWh), and then they must sell REC's to pay the additional cost of production through sustainable means. Recognized agencies examine costs and certify that REC's meet environmental and consumer protection standards. InterCounty Energy supplies green energy REC's for electricity generated by landfill methane capture and combustion.

In spring 2008 the student body voted overwhelmingly to impose upon themselves a green fee [18]. This additional fee of \$20 per student per year was to be directed to the purchase of renewable energy certificates from E.ON-US. In fall 2008, the Board of Trustees voted unanimously to approve this change in tuition and endorsed the student initiative. The additional charge was incorporated into tuition bills for AY 09/10. In addition to the student green fee, the College established an account into which employees can make voluntary contributions. The balance in that account was included in establishing the size of the REC purchase.

On August 13, 2009, the contract was signed between Centre and E.ON-US for 162 blocks of 1,000 kWh each month for the next 12 months. This environmental attribute will be the equivalent of avoiding the emissions of 1,754 tons of CO₂ per year.

In Danville, we are fortunate that our electricity supplier, E.ON-US, offers REC's sourced from the Mother Ann Lee hydro station. Lock 7 Hydropartners purchased this 80-year old facility from Kentucky Utilities in 2005. They have rehabilitated two of the station's three turbines and distribute the power produced to Salt River Rural Electric Cooperative, who in turn sells the Renewable Energy Credits or environmental attributes through E.ON-US to consumers. Because of the proximity of Mother Ann Lee to our campus and our personal relationships with the plant operators and utility representatives, we have good confidence the Centre contribution is going to expand the availability of renewably sourced electrical energy into the electricity grid, meets the requirement for additionality, and is reducing the demand for coal-generated power.

Significantly, the Mother Ann Lee hydro station is one of only 28 U.S. hydro plants to receive the 'super green', Low Impact Certification form the Low Impact Hydro Institute [19].

The student green initiative for FY 10 will represent about 5% of the electricity use of the college.



Figure 5.1 Mother Ann Lee hydrostation

5.2 Carbon Offsets

A carbon offset is a credit that counterbalances the purchaser's greenhouse gas emissions by funding an off-site greenhouse gas reduction project. Carbon offsets can be classified into four general types: energy efficiency projects, renewable energy projects, biological sequestration, and technological/geological sequestration. A wide variety of organizations currently offer carbon offsets. In some cases offsets are sold directly, but most often through brokers. The most widely known is the Chicago Climate Exchange. Prices on the CCX have ranged more than ten-fold in the past two years. Uncertainty about the impact of the Copenhagen conference is influencing the speculation in the new market. The integrity of carbon offsets should be scrutinized carefully. Among the critical issues that demand investigation are (1) additionality, (2) permanence, and (3) leakage.

The Mountain Association for Economic Development (MACED) is an organization dedicated to economic development in the Appalachian region. The MACED office is in nearby Berea Kentucky. MACED through its Forest Opportunities Initiative, certifies and validates private forest landholdings in the Appalachian region of Kentucky, Ohio, Tennessee, Virginia and West Virginia and sells the resulting offsets through the Chicago Climate Exchange. Scott Shouse, project manager for the Forest Opportunities Initiative, expressed willingness to make direct sales to Centre College, thus reducing transaction costs. The regional proximity of these landholdings makes the MACED program attractive. [20]

We have considered international offset programs in regions of the world that are particularly at risk for habitat destruction. The markets in this area are uncertain and should be examined closely. Projects that protect existing forests are important because deforestation accounts for about 20% of global warming.

The Advisory Committee discussed internal carbon sequestration opportunities. In this scenario, the College would acquire marginal farmland in the nearby area for reforestation. The benefit of this approach is that it is local and hands-on. Recovering marginal farmland from over-grazing and poor land use practices and the high rate of sequestration of young forests could lead to

significant carbon offset rate. The College would follow best practices for reforestation and soil and water conservation, and calculate offsets according to the best available models. In this scenario, the College would avoid the costs of certification by a third party and avoids all transaction costs. The opportunity to involve students and the community in the program is also attractive.

Local energy efficiency projects are a developing type of emission offsets. In this situation, the sponsoring organization (Centre) would perform energy audits, home weatherization, or insulation for low-income homeowners and the resulting energy savings are then translated to corresponding emissions reductions as an offset. The opportunity to involve our undergraduates and simultaneously serve the local community makes this a particularly attractive possibility. Development of an appropriate certification process and adequate oversight will be essential to the success of this type of program. The Colorado Carbon Fund, operated by the Colorado Governor's Energy Office, is the first state-wide program to develop, certify, and sell voluntary carbon offsets from energy efficiency and renewable energy projects.

The ACUPCC has published a white paper, "Investing in Carbon Offsets: Guidelines for ACUPCC Institutions," [21]. That organization recommends that priority be placed upon "avoiding emissions through smart planning and conservation, reducing emissions through efficiency, and replacing emissions-intensity activities with cleaner alternatives." (p6). The report recognizes that net zero GHG emissions are unlikely to be achieved without offsets in the near future (p10). And goes on to say, "the short term use of high-quality offsets can be an effective way to drive real reductions in GHG emissions now, and can serve as a useful tool for internalizing the costs of GHG emissions and accelerating innovation on campuses to reduce GHG emissions more quickly. As such, the ACUPCC supports smart investments in offsets as an effective way to help create the GHG-free future," (p10). The ACUPCC is relatively unique in accepting only absolute reductions in emissions, not projects that avoid future emissions. (p26).

The study abroad and athletics programs are essential parts of the College's educational mission, but are a significant fraction of our total air travel and for that reason are uniquely visible part of our GHG emissions. Purchase of offsets for these air miles could demonstrate our responsibility for environmental impact of these programs.

The Advisory Committee recognizes that carbon offsets will be essential to meeting our goal of GHG neutrality. The committee recommends continued study of offsets, particularly biological sequestration and conservation offsets, and particularly local efforts.

5.3 Purchases versus Investment

Some colleges and universities have chosen to achieve climate neutrality immediately by purchase of carbon offsets equivalent to the entire emissions inventory. College of the Atlantic is a leader in this regard; having made this decision in 2008 and now offsets all emissions through purchase of carbon credits.

The prices of carbon offsets sold through the Chicago Climate Exchange have ranged from a high of \$6 per ton in early 2008, to present price of \$0.25 per ton. This volatility is due primarily to low confidence in the market and uncertainty in proposed legislation and regulation. Prices for high quality carbon offsets with demonstrable chain of verification range from \$1.50 to \$6.00 per ton, depending upon the type of the projects involved [22]. So Centre College could choose to

completely offset all emissions for \$5,000 to \$100,000 per year. Such a decision would certainly attract significant attention among special interest groups. With the anticipated implementation of cap and trade legislation at the national level, it is reasonable to expect the cost of offsets will increase in the future.

The trade-off to purchasing carbon credits is that the money spent could be directed toward investment in energy efficiency and conservation. The long range impact of internal efficiency investments would certainly be greater. Advisory committee suggests that energy efficiency efforts are preferred over offsets.

5.4 On-Campus Renewable Power

As a complement to energy efficiency measures, the installation of onsite alternative energy technologies can reduce the amount of GHG emissions. Among these alternatives are solar thermal water heating, solar photovoltaic electricity generation, wind turbine electricity generation, and biomass and biogas sources for building space heating. For large campuses with central heating plants, co-generation facilities are also possible.

At the present time, alternative energy technologies have relatively high capital costs and thus relatively long payback periods. In our region, solar photovoltaic is considered “good” with a power opportunity of 4.0 kWh/m²/day. Wind generation is considered “poor” with a power class of 1, wind speeds of 0-12.8 mph, and a wind power density at 50 m of 0-200 W/m² [24].

Centre is currently investigating a solar thermal water heating installation for Boles Natatorium. This building uses a great deal of natural gas for water heating (over \$40,000 in FY 07/08). The feasibility study involves establishing a Power Purchase Agreement in which an outside entity purchases and installs the equipment and the College enters into a long-term agreement to purchase the hot water produced. If the payback period for the project is appropriate, a project proposal will be submitted through our Capital Projects system.

We have recently submitted a proposal to the U.S. Department of Energy through the Recovery Act - Smart Grid Demonstrations. This project would be collaboration with Inter-County Energy Cooperative, East Kentucky Power Cooperative and the University of Kentucky. As currently planned, solar panels will be installed on the roof of a campus building and a small wind turbine installed at a location to be determined. Should this proposal receive support, we see advantages from both the direct reduction in our dependence upon coal-generated electricity and also educational and outreach opportunities.

These initial efforts will have only modest impact, but if successful they have potential for future expansion.

6.0 Financing the Plan

For this plan to be effective and meet the aggressive timeline that we lay out, a systematic financing plan is essential.

6.1 Capital Projects System

Our capital projects system governs all major internally funded opportunities. The system provides an opportunity to balance costs and benefits and allows us to anticipate needed expenditures several years into the future. The total amount to be directed to capital projects is determined by the Board of Trustees and the individual projects selected by the Capital Projects Committee. Understandably, there are always more worthwhile projects than available funding and priority decisions must be made.

Examples of energy savings projects that have been funded recently through the capital projects system include replacement of fan-coil units in Carnegie Hall, and the replacement of the hot water heater and some room heat exchangers in Bingham dormitory.

To meet our targets for GHG emissions we must work aggressively to identify project opportunities, to demonstrate the return on investment, and advocate for these projects. In light of our institutional commitment to GHG neutrality, the College should give special consideration to energy conservation projects.

To accomplish this objective our Facilities Management department should work with the PCC to identify appropriate energy conservation and renovation projects prioritize the projects, get them included on the 10 year capital plan, and then rally enough support for final selection.

6.2 Performance Contracting

Energy performance contracting is a turnkey service that provides customers with a comprehensive set of energy efficiency measures and guarantees that the savings produced by a project will be sufficient to finance the full cost of the project. The energy services company (ESCO) evaluates existing facilities and identifies all of the possible energy-saving opportunities, evaluates the investment return for each sub-project, develops the engineering designs and specifications, arranges financing, manages the project, and trains staff to maintain systems. Most importantly, the ESCO guarantees that the savings will cover all project costs.

Our previous experiences with performance contracting were described in section 2.3 (page 6). The success of that experience gives us confidence in future performance contracting efforts. This type of contracting is financed via a bond issue and our total current debt load would likely preclude any additional debt service. We recommend that Centre pursue energy services contracts as a means to identify and pursue the best and most effective energy efficiency improvements.

6.3 Stakeholder Financing

The challenge of achieving climate neutrality is shared by all segments of the College. Students, all employees, and alumni will be involved in identifying the important goals and steps toward climate neutrality. Therefore it is fully appropriate that everyone be given an opportunity to share in supporting this work financially.

Our students took a dramatic first step in spring 2007 with the overwhelming support of the student green initiative [16]. This program adds 20 dollars per student per year to each tuition bill. That vote was supported with over 80% approval and the highest student voter turnout in recent memory. Faculty members responded almost immediately, asking that a special payroll

donation system be established and voluntary participation in that program has been gratifying. In August 2009, the College signed a contract to purchase 162 blocks per month at \$13 per block for a total cost of \$25,272 for FY 09/10. The environmental attributes purchased will support production of a significant fraction of the College's needs through low impact hydro generation.

We have not made appeals to our alumni for support of sustainability and environmental projects on campus. The experiences of other private colleges and surveys of the interests and values of the general public, suggest that when appropriate projects can be identified, this will be an area of interest. These appeals are useful both for the direct financial support provided and for the way in which they engage our alumni in the life of the college. We recommend that all stakeholders be given an opportunity to support sustainability programs.

6.4 External Support

Corporations, private foundations, and government organizations have interest in supporting sustainability and environmental concerns. The experience of sister institutions has been uneven, and certainly in the current financial situation, the prognosis for private support is not good. We should not abandon these opportunities but in the short run focus on identifying opportunities for future requests.

In a visit to Centre in spring 2009, Mr. William Keator of Arthur Vining Davis expressed openness of that organization to a proposal from Centre. Mellon Foundation has supported sustainability initiatives at other ACS colleges.

In light of the current situation, a better short-term opportunity may lie with federal and state programs. The American Recovery and Reinvestment Act of 2009 (ARRA) provided a large amount of funding through the U.S. Dept of Energy in the form of Energy Efficiency & Conservation Block Grants (EECBG) and through the State Fiscal Stabilization Fund (SSFS) through the U.S. Dept. of Education. These programs bring about 55 billion dollars to Kentucky for a variety of purposes, and at least some of these dollars must be directed to modernization, renovation and repair of facilities for energy efficiency. These funds must be under contract by September, 2011.

7.0. Education and Outreach

7.1 Education

There are currently twenty courses offered regularly in which sustainability and environmental concerns are the primary focus. These courses are in the programs of environmental studies, government, economics, history, biology, psychobiology, religion, anthropology, English, and natural science. Sustainability and environmental issues are included as part of many more courses.

By the structure of our curriculum, our general education courses in the sciences "include discussion of some of the social, political, and ethical implications of scientific achievements and research." Programs and instructors determine the specific examples, but by casual survey we understand that in many cases environmental issues are discussed.

In 2003, Centre added an academic minor program in Environmental Studies. The ENS minor is designed with a balanced core of three courses and an additional four courses in which students may focus on the scientific/technological analysis or social/political analysis dimensions of the field. The core courses are very popular and two to four students complete the minor each year.

The environmental studies program committee is currently discussing extending the program to offer a major. The committee feels that addition of one or two permanent faculty with principle training in the field will be essential to the success of an expanded program. The campus-wide Global Citizenship committee is currently discussing developing a track of Global Environment and Sustainability which may be structured under the existing Environmental Studies minor.

In addition to the obvious settings in which teaching and learning occurs, there are other powerful but less structured and formal teaching and learning venues. Informal learning occurs through a variety of means: living in an energy efficient dormitory, using water conserving restroom facilities, participating in recycling programs, biking and walking to and from campus, etc. The informal education also includes signage promoting recycling in our classrooms and frequent convocations on the scientific, technical, and public policy dimensions of sustainability. The learning which occurs at off-campus sites where different cultures employ different approaches to conservation is an excellent opportunity to develop a deeper understanding. In recent years, the new student orientation has been conducted as a “green” event.

The Presidents Climate Commitment calls upon member institutions “to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.” In our mind, the curricular offerings described above, the informal learning opportunities, and the many co-curricular activities, meet this requirement satisfactorily at present, but must be continued and expanded if we hope to shift the campus culture to a sustainable use of energy and resources.

7.2 Outreach

Centre will maintain contact with sister institutions through a variety of strategies. The Associated Colleges of the South, our academic consortium, held a conference on sustainability in September, 2009. This gave us the opportunity to compare progress with similar institutions and share strategies for success. Representation at national and regional conferences is important and we should take steps to assure that Centre staff and students have the opportunity to benefit from these events.

We recommend the Advisory Committee include a member from the local community and also a representative of our alumni. This will give us connections and access to advice that will extend work beyond campus.

Many students and staff have been involved in projects in the community. These include Central Kentucky Wildlife Refuge, Clarks Run Environmental Education Corporation, the local trails committee, Dix River Watershed Council, the local cycling group (BIKE), and many other civic organizations that address environmental needs of our community.

For many years, as part of new student orientation, all of our first year students are given the opportunity to participate in a half-day Service Plunge. The activity has been going on since the late ‘80’s and for most of those years has included clean-up projects along one of the waterways

in the area. The Office of Volunteer Services helps students make contacts for service learning and the Career Services Office assists with internship opportunities that focus on environmental projects.

8. Other Resource Conservation Efforts

While reduction of greenhouse gas emissions toward a goal of GHG neutrality is our immediate target (and the primary concern of the ACUPCC), Centre ultimately hopes to approach true climate neutrality. This involves reducing environmental impact through resource consumption and other negative impacts beyond our campus that arise from how we do business.

8.1 Solid Waste Reduction

Solid waste reduction is motivated more by the sustainability perspective than climate change perspective. The Clean Air/Cool Planet Carbon Calculator that we have adopted considers the environmental impact of solid waste only through the impact of methane emitted from landfill sites as waste materials decompose. Beyond that consideration, Centre also strives to reduce solid waste as much as possible. (Table 8.1) At first one might think that increases in recycling would lead directly to decreases in solid waste disposal. In our experience the connection is more complex. A waste stream inventory conducted by ECCO in November, 2008, showed that of the sampled waste; about 40% was bottles and cans, 40% was paper and cardboard, 10% was compostable, and only 10% was trash appropriate for landfill disposal.

Year	2003	2004	2005	2006	2009
Total Waste, tons	391.8	376.7	364.0	367.2	311.4

Table 8.1 Solid Waste Records

8.2 Recycling

The primary strategy for reducing solid waste will be increasing our recycling. Centre began a systematic recycling program in the mid-90's, led by faculty and the Student Life Office and staffed by volunteers and work-study students. Centre established a full time recycling coordinator in 2003, based in the Facilities Management department.

For several years, we enjoyed a steady increase in recycling tonnage (Table 8.2). In 2009, recycling participation plateaued. Renewed attention will be given to promoting the importance of recycling. An important strategy will be participation in the RecycleMania competition.

Year	2004	2005	2006	2007	2008	2009
Amount Recycled, tons	8.5	31.0	46.1	52.2	62.4	62.6

Table 8.2 Recycling Records

Through our Student Life Office, Centre participates in a move-out day donation program. Students may leave, or simply tag, items they would like to donate. The Danville Presbyterian Church sponsors a Multiple Sclerosis Yard Sale the next week and offers all those items to the public with the proceeds going to the named charity. Neither Centre nor the church keeps quantitative records, but both are confident this is a service to the community and keeps many tons of material from the landfill.

8.3 Campus Landscaping

A safe and attractive campus is important. Achieving this goal involves costs for lawn maintenance, chemicals and fertilizers, manpower and gasoline, and replacement of plant materials. The direct contribution to greenhouse gas emissions of these activities is small – primarily the gasoline for lawn machinery and nitrous oxide emissions from metabolism of applied ammonia. The calculator program we are using (CA/CP) includes nitrogen applied to landscape but does not consider any mitigation from urban landscape.

Our campus landscaping has environmental implications beyond GHG emissions. Herbicides, fertilizers, and pesticides if used improperly or in excess can run off and be carried into local waterways. The storm water runoff from building roofs, walkways, and other impermeable surfaces has a “flashing” effect on local waterways. In 2008, the city of Danville established Storm water Management Plan and instituted a fee to finance improvements in storm water infrastructure and protect local waterways. By city records, our campus has 1,321,623 sq ft of impervious surface (475,018 from buildings, 846,605 from driveways, sidewalks, etc) and our fee is slightly over \$14,000 per year. Actions that reduce the amount of impervious surface would lead to a reduction in this fee.

The only areas on Centre’s campus that have permanently installed irrigation systems are the playing fields (soccer, intramural, baseball, football practice) and small areas in front of Crouse and Sutcliffe Halls and the campus entrance at Maple and Walnut. A portable irrigation “gun” is occasionally used on the Old Centre lawn or Crouse Hall lawn. One aspect of the design of Pearl Hall that supported the LEED certification was the omission of a permanent irrigation system.

At the present time our lawn maintenance is contracted privately (Pratt Lawn Service). That contract is negotiated on a performance basis and Pratt does not divulge the amounts of chemicals and fertilizers used.

Neat lawns and attractive plantings are immediately obvious to visitors and become part of our workplace. Tree replacements or additions should be selected and placed to maximize their effect on building energy usage. Even small natural areas acknowledge our connection to the environment and serve the aesthetic dimension of our sustainability goals.

8.4 Purchased Materials and Refrigerant Gases

There are many areas in which our purchasing decisions have environmental implications. Realistically, the supply trains for many purchased materials are so complex that it is often difficult to distinguish between advertised claims and legitimate benefits. Our GHG inventory does not include any estimates of contributions from purchased materials.

Centre currently uses recycled content copier paper and 100% recycled content service paper. As one of the tangible actions taken in fall 2008, we committed to purchase Energy Star appliances in all areas where they are available. The computing equipment we purchase all performs at Energy Star level. Almost all CRT's on campus have been replaced with flat panel screens.

In the past several years, advances have been made in developing "greener" cleaning products. These are cleaners, polishes, etc, that are less hazardous to use and reduce risk to housekeeping staff. In some cases these products are compounded with lower phosphate and are less caustic and thus have reduced impact on the general environment. Green Seal is the most widely recognized organization that certifies products in this area. Centre has evaluated these products, including both price and performance, and now uses some Green Seal products in our housekeeping operation. We will continue to monitor the quality of these products and include both employee and environmental hazard as part of the selection process for all cleaning products.

The college prepares a large quantity of printed materials. Recycled content paper stock and low impact inks are used in situations where quality and price considerations are appropriate. But we do not mention this fact on our printed materials. We recommend continued consideration of the environmental impact of all purchased materials and appropriate acknowledgment of use.

We are at the mercy of developing technology in the area of refrigerant gas; our only approach is to reduce leakage from HVAC equipment as much as possible. Whenever HVAC equipment is replaced, preference will be given to designs that do not use GHG refrigerant gases.

8.5 Food Service

One of the most visible ways in which our activities impact the local and national economy is through food selection and preparation and how food waste is handled. Additionally, on a college campus, the food choices that are offered help our students develop good or poor life-time nutritional habits.

Sodexo has taken leadership in this area. In 2008, we implemented tray-less dining to reduce food waste. The change met with relatively little resistance. In spring 2009, all of our take-out ware was changed to compostable products (bagasse and spudware), though unfortunately we do not have a composting facility on campus. In fall 2009 a take-back procedure was added with reusable dishware and the disposable ware was changed back to Styrofoam. At this point we do not know how our students will accept the modest fee for reusable takeout and how the amount of waste will be affected.

Using locally grown fruits and vegetables can reduce GHG impact associated with transportation and has the added benefit of stimulating the regional farm economy. There are four obstacles to developing a strong "farm to cafeteria" program: food producer liability (insurance), the length of the local growing season, developing a strong network of local farmers to provide adequate volume and reliability, and cost. A regional broker (Grasshoppers, Louisville) is in the process of developing a network of farmers and logistical system to address these difficulties. Other schools in our region (U of L, Berea, Georgetown, and Bella mine) are also interested in local foods. Centre should continue investigating this and other possibilities for local produce.

Currently, Sodexo purchases milk products, bottled water, and soft drinks from regional firms. Our primary produce supplier, Papania's, works to include locally-sourced vegetables and seasonable fruits as much as currently possible. In a cafeteria situation, the taste and variety preferences of the dining patrons are the primary issue to acceptance of local food.

Food waste composting is an attractive possibility that should be investigated. Some schools have begun this practice. Washington & Lee and Evergreen State College are good models. The benefits include: reduction in water use, reduced sewage impact, the educational and public relations benefits, and the soil amendment value of the finished compost. The reservations are sanitation and pest management, labor costs, local codes and regulations, and the limited demand for compost.

Evaluating the impact of food service on an institution's GHG emissions is extremely difficult. The Clean Air / Cool Planet organization is attempting to develop an extension to their software that will include food service, but at the present time we have not made any attempt to track the impacts of food service.

8.6 Water Use

Since purification and distribution of water makes only an insignificant contribution to GHG emissions, water consumption is not considered in emissions calculations. In central Kentucky, rainfall averages are good and water treatment capacity in Danville is excellent. But from a resource conservation standpoint and certainly in terms of reducing operating costs, minimizing water use is important, especially hot water. Over the past several years, we have installed low-flow shower heads in most of the facilities on campus. New construction has included dual flow toilets. We will continue to follow all developments in this area and adopt new technologies as appropriate.

9. Tracking Progress and Next Steps

A vision with a generational dimension must include methods to accommodate changing environment and opportunities. We acknowledge that this plan lacks important details of implementation. We suggest this plan be reviewed and adjusted on a cycle complementary to the College's Strategic Planning process.

9.1 Responsibility for implementation

The vision described here will not be realized unless everyone on campus – students, staff, and faculty – recognizes the magnitude of the challenge and the necessity of consistent dedication to address the challenge. Truly, we are all responsible for implementation. Unless we all become more aware of the small decisions we make (a half-full load of laundry, a computer left on overnight, or a recycling opportunity missed), we will not be successful in reaching our ultimate goal of climate neutrality. All members of the college community must make behavioral changes to enhance conservation.

The work of implementing this plan will fall on several departments. The Facilities Management department will have the greatest responsibility for implementing the Climate Action Plan. Facilities Management must lead us in identifying the most attractive energy efficiency

opportunities and oversee the execution of these projects. Facilities Management will continue to direct our recycling program.

The Finance Office will have responsibility for evaluating the priorities among projects and assuring the College realizes the projected efficiency improvements and financial returns.

Student Life office and Human Resources department will help communicate our shared institutional values to the approximately 350 people who join our community each year. This is a combined annual turnover of over 20% of our campus population.

Our Communications department must continuously reinforce goals and recognize accomplishments. Continued visibility is important to reinforce the importance that Centre places on sustainability and resource conservation.

Our Faculty must integrate sustainability into their courses as appropriate, serve as mentors for internships, and advise student clubs and organizations about our sustainability goals.

Many colleges and universities have found that a key individual is useful to maintaining the vision and enthusiasm necessary for success in a multi-year venture. We recognize the challenges of our current budget situation and refrain from recommending a new position to coordinate this work. This decision should be re-visited in the future. Though there are advantages to “putting someone in charge”, there are also good arguments for empowering a group with responsibility. A campus-wide committee has the obvious advantage of wide representation. The interchange between dedicated members at regular meetings assures consideration of multiple viewpoints and can lead to greater involvement and “buy-in”. Recommendations that develop after considering multiple perspectives will enjoy greater acceptance. Since the membership of the group will change over time, a cadre of veterans develops who are informed on the issues.

To assure successful implementation under a committee guidance approach will require that the director of each major functional area accept new responsibilities and accountabilities. The Advisory Committee can then receive updates and periodic progress reports from the functional units.

The Climate Action Plan should be reviewed and revised at appropriate intervals. The Advisory Committee will collaborate with the Planning and Priorities Committee and senior staff to adjust targets, to adopt new approaches, and impose penalties for failure to meet targets.

9.2 Looking Forward

The next few years are critical to our success in achieving our goal. We must translate our enthusiasm into programs and investments.

Detailed, yet flexible, plans will guide our implementation of: increased efficiency in operation of our facilities, examination of all of our programs with attention to balancing environmental impact with those programs benefits, exploration of renewable energy sources, conservation, and the enrichment of curricular and co-curricular programs that increase understanding of climate impacts.

And ultimately we must incorporate sustainability as a guiding principle in all our decisions.

10. Summary of Recommendations and Conclusions

Centre commits to have no net emissions of greenhouse gases.

We plan a 25% reduction by 2020, 50% reduction by 2030, and no net GHG emissions by 2040. Using 2008 as our base year.

Since the largest portion of our emissions comes from the electricity and natural gas used for operation of our buildings, we recommend addressing these sources initially, followed by action on the significant emission contributions from air and ground travel

Meeting our first milestone will require aggressive investment of capital and other resources, and we recommend the College begin strategically planning to acquire new or redirect existing financial resources to meet this goal. As a first step, a careful energy analysis of the campus will be needed. New approaches to capital project selection and performance contracting are possible strategies.

Simultaneous with attention to facilities, we need continuing educational efforts to all members of the Centre community. An understanding of climate change and the importance of energy and resource conservation is vital to this process. This education should take place within the curriculum as well as through co-curricular and extra-curricular programs. Our recycling efforts should receive continual support and our internal and external communication programs extended.

In order to meet these challenges, we will have to devote increased attention to capacities in Facilities Management, to development of curriculum, and to coordination of sustainability efforts.

While we do not recommend new policy or restrictions regarding travel, we must each be more conscientious of the environmental impact of our travel decisions and continue to seek opportunities for important reductions in this area.

Carbon offsets, on-campus alternative energy, and renewable energy credits will be part of our efforts, but secondary to efficiency and conservation. Should we not meet targets for GHG emissions, we will purchase high-quality carbon offsets.

The resources to accomplish all of these important goals must come from: reconsideration of institutional priorities for capital investment, the support of all segments within the College community, and external funding opportunities.

Everyone on campus must contribute to this important goal by making the changes in practices that cumulatively have a significant environmental impact.