

# Swarthmore College Climate Action Plan



This plan is the product of deliberations of the Climate Action Plan Committee of Swarthmore College in consultation with the Sustainability Committee, the Crum Stewardship Committee and the Environmental Studies Committee, members of EcoSphere as well as other interested members of the College. We appreciate the interesting ideas and thoughtful responses that were offered from the Swarthmore Community and the hospitality provided by the Lang Center for Civic and Social Responsibility.

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## **A Climate Action Plan for Swarthmore College**

### **Summary**

As one aspect of Swarthmore College's efforts to be environmentally responsible and in order to meet the American College and University Presidents' Climate Commitment signed by President Chopp in 2010 the Climate Action Plan Committee has, in consultation with the Administration, the Sustainability Committee, the program in Environmental Studies, and the Crum Woods Stewardship Committee designed a plan to make Swarthmore College carbon neutral by 2035. This date was chosen as a balance between the urgency of the situation and the time necessary to make meaningful long-term changes in the College's physical plant. Based on the 2011 greenhouse gas survey, the College currently emits about 16,000 metric tons of carbon dioxide per year. Approximately half of that total is now being compensated for by renewable energy credits. To further reduce emissions it will be necessary to evaluate the efficiency of the century old steam heating infrastructure. The first stage of this process will be to meter individual buildings and to commission an external energy audit of the physical plant. Information from these steps will inform the long-term campus master plan and guide the design of new and renovated buildings. Simultaneously, the Sustainability Committee and the Facilities Department will continually suggest, evaluate and recommend energy saving/ carbon reduction policies as part of their annual activities in addition to their biennial review of greenhouse gas emissions including recommending policies for renewable energy credits and carbon offsets.

A critical part of reducing carbon dioxide emissions is developing and using

best practices on an individual basis. To encourage those best practices and to meet the ACUPCC's requirement that all students be educated about climate change, the College will continue the ongoing expansion of the Environmental Studies Program (currently funded by grants received from the Mellon Foundation) and will, as funds become available, further support the Green Advisors program (Green Advisors are students who are leaders and guides in sustainable living within individual dorms). With the addition of faculty and staff volunteers, the GA program will be expanded beyond the dorms into the academic and administrative buildings and the GAs will serve as resident experts to educate and facilitate sustainable living including energy conservation, waste reduction, recycling and composting practices.

Central to developing all these activities is the position of a Sustainability Director. A person in this position would help develop and coordinate educational opportunities, community-based service and learning, and support the Sustainability Committee in its efforts to find ways to conserve resources and develop best sustainability practices. The Sustainability Director would be critical in training, supporting and organizing the GAs. In addition, the Sustainability Director would be responsible for the biennial greenhouse gas survey and report required by the ACUPCC and in writing the annual AASHE Sustainability Tracking and Assessment Report. The college community would benefit by better coordination and dispersal of information provided by a Sustainability Director about the wide variety of sustainability activities on campus and opportunities to join with surrounding municipalities and schools in sustainability activities.

## **Introduction**

As Swarthmore College approaches the 150<sup>th</sup> anniversary of its founding, it has made a comprehensive review of its values and goals and has developed a plan to meet the challenges of the 21<sup>st</sup> century. Within the Strategic Directions published in 2011 the College recognized that, “Climate change will shape our society in the decades ahead and brings with it the responsibility to educate our students and campus community in its causes and consequences, to model best practices, and to provide leadership in the wider community.” and that the College should, “invest in sustainable environmental practices, including minimizing greenhouse gas emissions from the College’s own operation and preserving the Crum Woods.” In addition, “The College should also appoint a professional sustainability director to guide progress, coordinate communications, facilitate alumni outreach, and collaborate with sustainability efforts beyond the campus.”

In conformity with these sentiments, President Rebecca Chopp signed the American College and University Presidents’ Climate Commitment in 2010 and initiated the formation of the Climate Action Plan Committee in the fall of 2011, which was charged with developing a comprehensive plan for the College to achieve climate neutrality. In particular, CAPCom was instructed to develop:

1. a target date for achieving climate neutrality as soon as possible
2. interim targets for goals and actions that will lead to climate neutrality
3. a plan to make climate neutrality and sustainability a part of the curriculum and overall educational experience for all students

4. a plan of action to expand research or other efforts necessary to achieve climate neutrality
5. mechanisms for tracking progress on goals and actions.

This document describes the College's initial plan to meet these goals. As such, it is primarily focused on mitigating climate change by the reduction of carbon emissions. It does not, however, describe all the current or future efforts of the College or its community to be environmentally responsible.

### **Recent History of Swarthmore's Greenhouse Gas Emissions**

As a basis for understanding the magnitude and sources of the College's greenhouse gas emissions an audit was initiated in the fall of 2011. This survey was based on data from 2010 and was completed using the Clean-Air Cool-Planet Campus Carbon Calculator version 6.7 in accordance with the greenhouse gas protocol developed by the World Business Council for Sustainable Development and the World Resources Institute and built upon the information gained by a 2010 report on Swarthmore and its surrounding communities compiled by the Center for Sustainable Communities of Temple University.

In this calculation, greenhouse gas (GHG) emissions are organized into three categories (Figure 1). The first (Scope 1) describes those that arise directly from the burning of fossil fuels (oil, natural gas and gasoline) and the release of refrigerants on campus. This accounts for about 36% of our emissions (in CO<sub>2</sub> equivalents). Scope 2 encompasses the indirect emissions associated with the purchase of electricity and comprises 43% of our total emissions. Scope 3 accounts for indirect



emissions associated with employee and study abroad air travel and employee commuting, which in total represent 22% of the College's greenhouse gas emissions. Emissions data associated with Scopes 1 and 2 are relatively easy to quantify because the College buys the fossil fuels and electricity. Scope 3 data are estimated based on surveys of the College community and reports from various offices across campus.

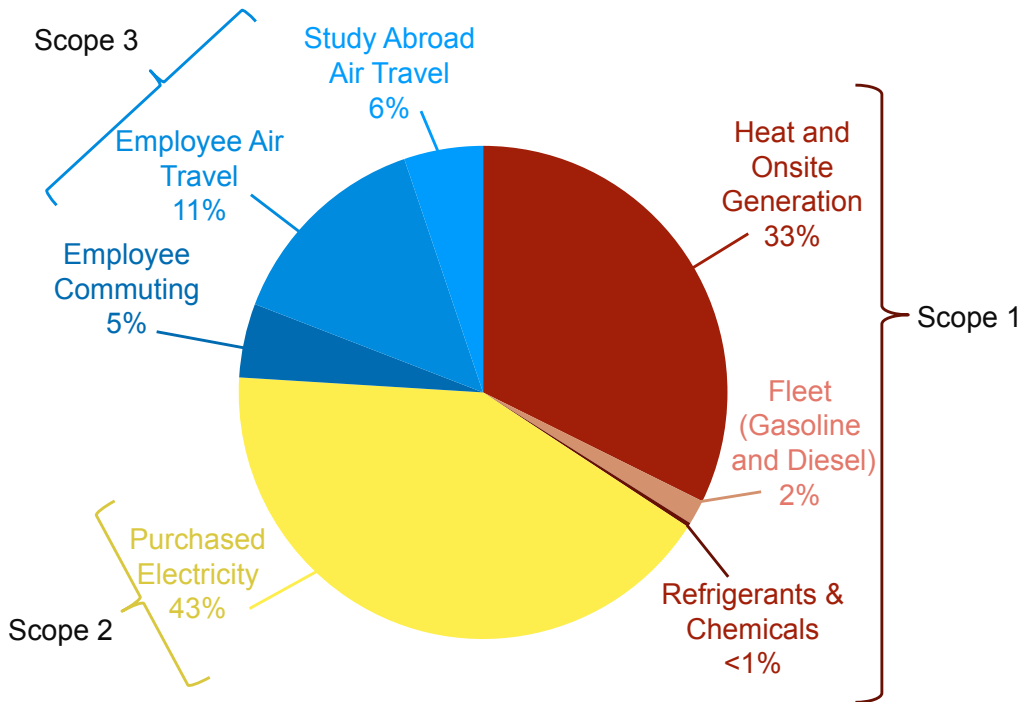


Figure 1. The proportion of greenhouse gases that came from different aspects of Swarthmore College's operations in 2010.

Table 1. Breakdown of Swarthmore College’s greenhouse gas emissions, renewable energy credits and carbon offsets for 2010.

Scope	Source	Metric Tons CO <sub>2</sub> e
1	Heat and onsite generation	5,166.4
1	Fleet (Gasoline and Diesel)	259.4
1	Refrigerants and Chemicals	46.3
2	Purchased Electricity	6,689.2
3	Employee Air Travel	1,768.6
3	Study Abroad Air Travel	857.8
3	Employee Commuting	777.1
Gross Emissions		15,564.8
	Renewable Energy Credits	- 3,101.7
	Composting	-70.4
Net Emissions (Gross-Offsets)		12,392.7

In conjunction with previous data collected by Swarthmore’s Facilities Department, the current survey extends the record of the College’s greenhouse gas emissions associated with Scopes 1 and 2 (Figure 2). Following a historical high in 2005, Scope 1 and 2 emissions have been regularly dropping, even though the campus community (students and employees) has grown by 3.6% and building space has increased by 3.4% during these years. This decrease has been due to campus-wide conservation efforts including rigorous monitoring of heating, ventilation and air conditioning (HVAC) schedules, lighting retrofits to more efficient lamps and an increased concentration on preventative maintenance. The historical peak coincided with the opening of the Science Center and the new energy-intensive operations associated with running laboratories equipped with abundant fume hoods. In response, the college consulted and followed the advice of a commissioning agent who recommended specific measures to limit energy use. In



addition, since 2011 the College has elected to use natural gas as its primary fuel, reducing the use of fuel oil to generate heat for the campus (Figure 3). For equivalent heat production, natural gas releases about one third less greenhouse gas during combustion than does fuel oil. This does not, however, account for the GHG emissions that may result due to methane leakage during extraction of natural gas from shale nor from other sources of pollution associated with obtaining natural gas (in fact nothing in this analysis accounts for the environmental extraction costs of the relevant fossil fuels).

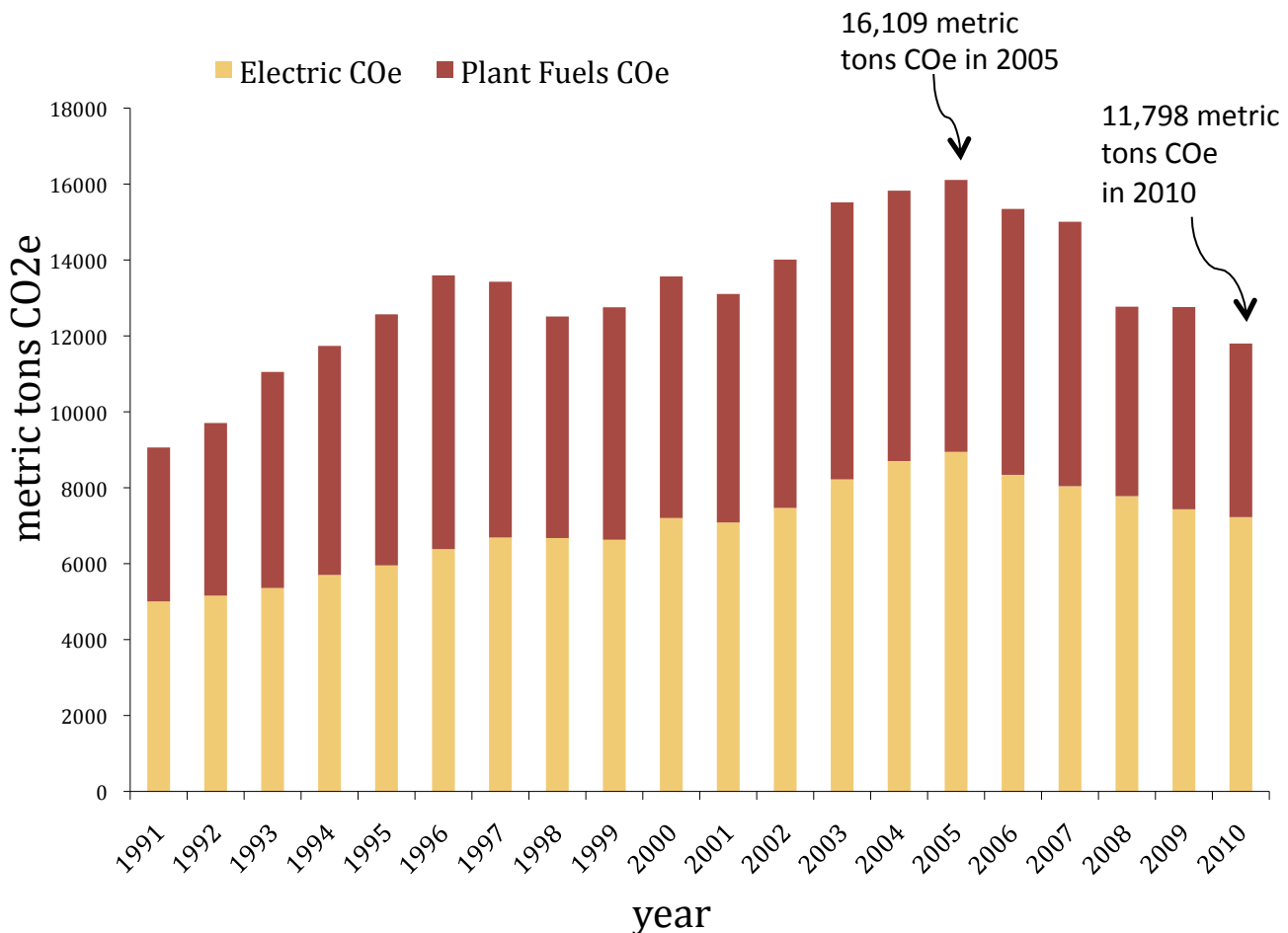


Figure 2. Pattern of CO2e emissions from Scope 1 (red bars, combination of fuel oil and natural gas combustion) and Scope 2 (yellow bars, electricity associated with the College’s heat plant). The drop in emissions since 2005 is due to a combination of conservation efforts and burning natural gas as the primary fuel rather than #6 fuel oil. CO2e values were calculated using the US EPA eGrid value of 0.94742.

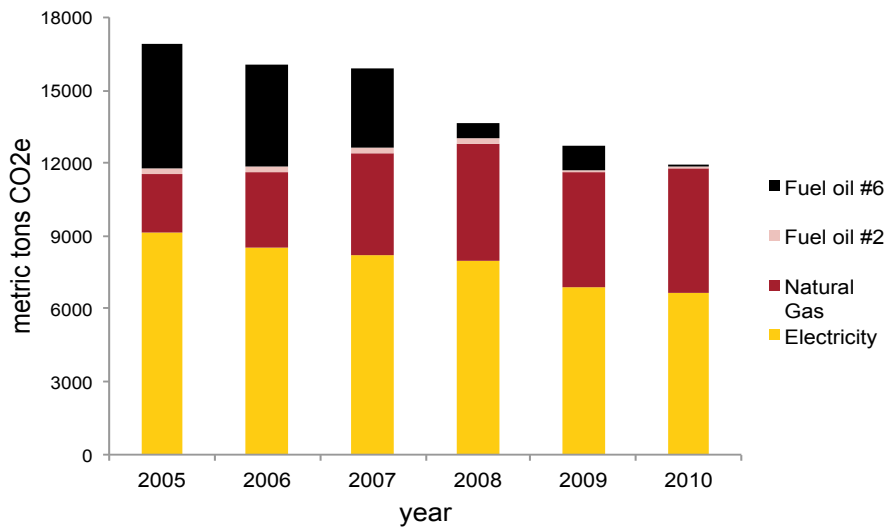


Figure 3. Change in emissions from electricity and fossil fuels since 2005 (these data include fuels used by dorms not connected to the heat plant). By 2010 the College had largely replaced fuel oils with natural gas.

### Mitigation of Swarthmore’s Greenhouse Gas Emissions

In terms of gross emissions, approximately 9,000 metric tons of CO<sub>2</sub>e per year currently separate Swarthmore College from its goal of climate neutrality by 2035 (a target date selected as a balance between the urgency of the situation and the time necessary to make meaningful long-term changes in the College’s physical plant). This figure is based on the 2010 Green House Gas Survey (Table 1) and includes emissions from the burning of fossil fuels, the release of refrigerants on campus, and travel (professional, study abroad and commuting), but not those associated with electricity that are now being fully compensated for by renewable energy certificates. Realistically some fraction of those 9,000 metric tons of carbon dioxide comes from activities and practices that we can modify to directly diminish

the release of greenhouse gases. The rest comes from activities that are fundamental to our educational mission and cannot reasonably be reduced or modified with current technology and so must be ultimately compensated for by the purchase of Renewable Energy Credits or Carbon Offsets (both Renewable Energy Credits and Carbon Offsets are ways to diminish our net greenhouse gas footprint, as discussed below).

Based on the 2010 greenhouse gas survey, approximately three quarters of our greenhouse gas output comes from the use of electricity and the direct consumption of fossil fuels on campus (Figure 1). We can diminish both of these categories by changes in our physical facilities, our institutional policies and practices, and by the individual behavior of members of the community, but even after such efforts there will be a residual amount of emissions that will need to be covered by Renewable Energy Credits and Carbon Offsets (Figure 4). The remaining quarter of our energy use and greenhouse gas production comes from transportation, including air travel associated with students studying abroad, the professional obligations of faculty and staff, and employee commuting. All of these sub-categories of transportation come from critical activities, and without worldwide technological advances they are unlikely targets for significant reduction. In addition, they primarily occur in vehicles that are not under the control of the College. Therefore, it is likely that this area will need to be addressed primarily by Carbon Offsets (Figure 4).

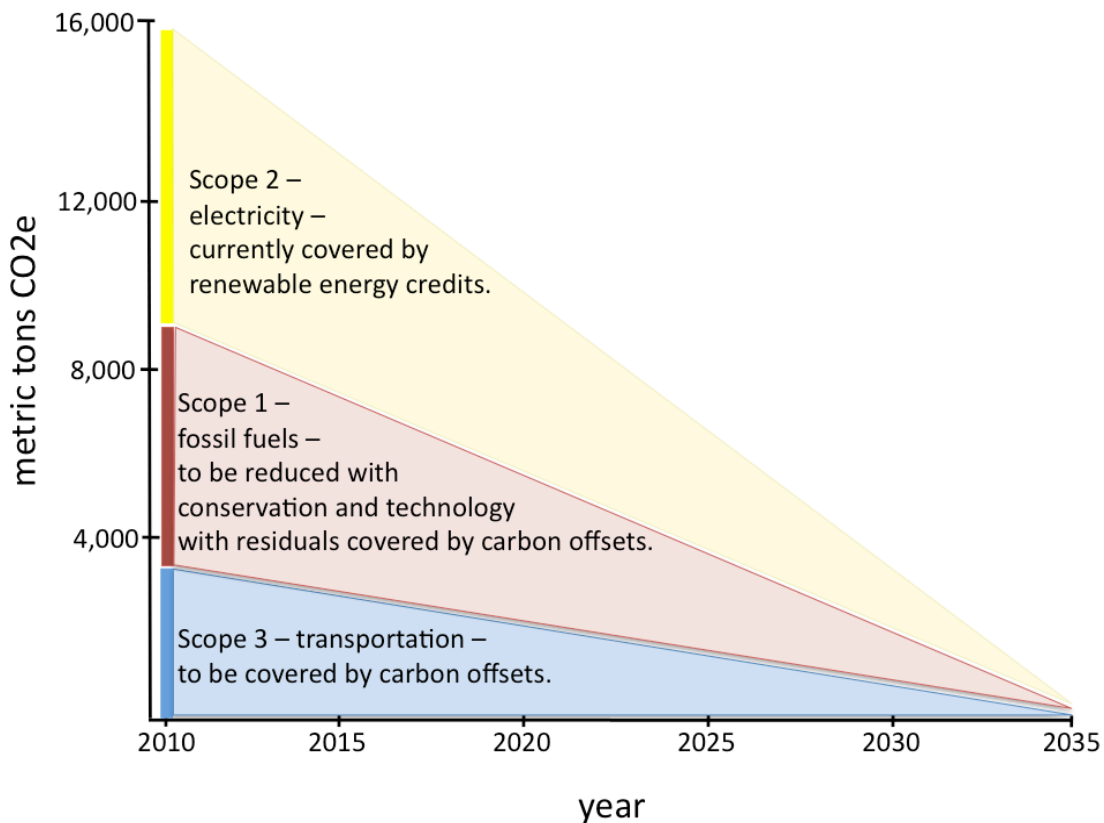


Figure 4. Linear model of the sources of greenhouse gases and the general mechanisms that could be used to diminish them. Scope 2 is currently being compensated for by the purchase of renewable energy credits, but should still be subject to conservation efforts and technological improvements so as to reduce the number of renewable energy credits purchased by the college.

### Plans for Modifications of the Physical Plant, Policies and Practices

Our steam heating infrastructure was designed more than 100 years ago and continues to work using some functioning elements from that era (thanks to the hard work and frugality on the part of the facilities staff and the original quality of the elements). This system, however, is based on century-old technologies and the College needs to have a thorough evaluation of the entire system in order to determine (1) whether, from an efficiency standpoint, it should be decentralized, and if so what alternate new technologies are most appropriate, and (2) what the cost of such undertakings would be. To ultimately control and evaluate the function of the system, individual buildings will need to be metered, which is not currently

done. It is also likely that these changes will mandate additional staffing and staff training. Until the College has an overview of the current system, it is impossible to determine the most important areas to target (in terms of which changes are likely to have the biggest impact on greenhouse gas emissions, which will be the easiest to install or modify, and what the associated costs of these changes would be).

Likewise, as the College goes forward with its longer-range plans for the campus, it is important to make those plans with regard to a physical plant designed for the 21<sup>st</sup> rather than the 19<sup>th</sup> century. Thus, the first major steps in greenhouse gas reduction are for the College to upgrade the system so that each building is monitored for energy use and then to undertake an external energy/technology audit of the physical plant. This audit should include:

1. Evaluation of existing utility data and building metering so that we can compare loads from buildings with different occupancies and construction types.
2. Assessment of the system and facilities associated with the central heating and cooling plants that includes a review of systems, efficiencies and control strategies. This would include an examination of the daily operations as well as the age and flexibility of the existing systems for the purpose of developing a list of operational, maintenance and capital improvements
3. A high level review of all primary buildings on campus.
4. A detailed assessment of representative buildings to inventory all energy using and energy related systems including lighting, office equipment, building envelope, hvac, and controls.

5. Development of a list of energy conservation measures including (a) conservation opportunities for staff, faculty and students (b) operational improvements (c) efficiency opportunities through capital upgrades.

It is also clear that technology is changing rapidly. The college must explore high capital cost items such as decentralizing the heat plant, adapting cogeneration or conversion to a hot water system in place of the steam plant to take advantage of the efficiencies found in modern systems. Coupled with the need to review existing systems, Facilities Management has recognized the advantages of building to LEED standards, particularly in terms of the building life cycle cost, building performance and the health of the occupants. In accordance with the ACUPCC guidelines, the college will meet the LEED Silver standard for new construction. Because of its focus on energy savings, the EPA's Energy Star system may provide a useful additional metric by which to evaluate new construction.

Apart from the confines and capabilities dictated by the physical plant, our energy usage is also determined by our policies and practices. Policies that affect energy use on campus and that should be modified include (1) expanding the comfort zone from the current building targets of 74-76°F in the summer and 68-72°F in the winter to 76-78°F in the summer and 66-70°F in the winter, (2) installing automatic movement sensors to turn off lights in classrooms, and (3) increasing the use of window and task lighting where possible and appropriate.

In addition, the Sustainability Committee of the College and the Facilities Department should continually suggest, evaluate and recommend energy saving and sustainability policies as part of their annual activities. While the physical plant,

technology and college policies set a baseline for energy use, individual activity and choices on top of that baseline can make large differences in actual energy consumption, and to that end the college community must continually educate itself so that its members make thoughtful choices (please see the section on educating the College community for details).

### **Plans for the Use of Renewable Energy Credits and Offsets**

Regardless of the gains achieved in greenhouse gas reduction, the College will still be using energy in the form of electricity and fossil fuels. Therefore to achieve carbon neutrality it will need to invest in Renewable Energy Credits (RECs) and Carbon Offsets. Renewable Energy Credits are a verifiable means to compensate for the use of fuels that produce electricity by supporting the production of electrical power using non-fossil fuel generators. The long-term goal of the REC industry is to limit the need to construct additional fossil fuel generation facilities. Each kilowatt-hour of electricity bought through a REC compensates for a kilowatt-hour of electricity used on campus by injecting power into the grid from one of those alternate generation sources.

Renewable energy credits can come from the support of a variety of renewable energy sources including solar, wind turbines, geothermal, small scale hydropower (those that generate “run-of-the-river” hydroelectricity with minimal water storage), biofuel and recovered gas from landfills (generated by the decomposition of solid waste). The burning of biofuel and gas from landfill does result in carbon dioxide emissions; however, in the case of burning landfill methane the process removes a gas that has a global warming potential approximately 20



times higher than carbon dioxide and that can potentially contaminate underground water sources. In 2002, in coordination with the Borough of Swarthmore, the College began purchasing RECs (Figure 5). That practice has increased, and as a result the College and Borough have been designated by the EPA as a Green Power Community. Renewable energy certificates purchased by the college are based on a mixture of wind, small hydroelectric and geothermal, in accordance with the ACUPCC’s guidelines. Since 2011 (Figure 5), the College’s purchase of RECs has compensated for the greenhouse gas associated with 100% of our Scope 2 emissions (those associated with electricity use). This practice should continue and the choice of the specific kind of renewable energy credits should be guided by the Sustainability Committee’s recommendations to the Administration.

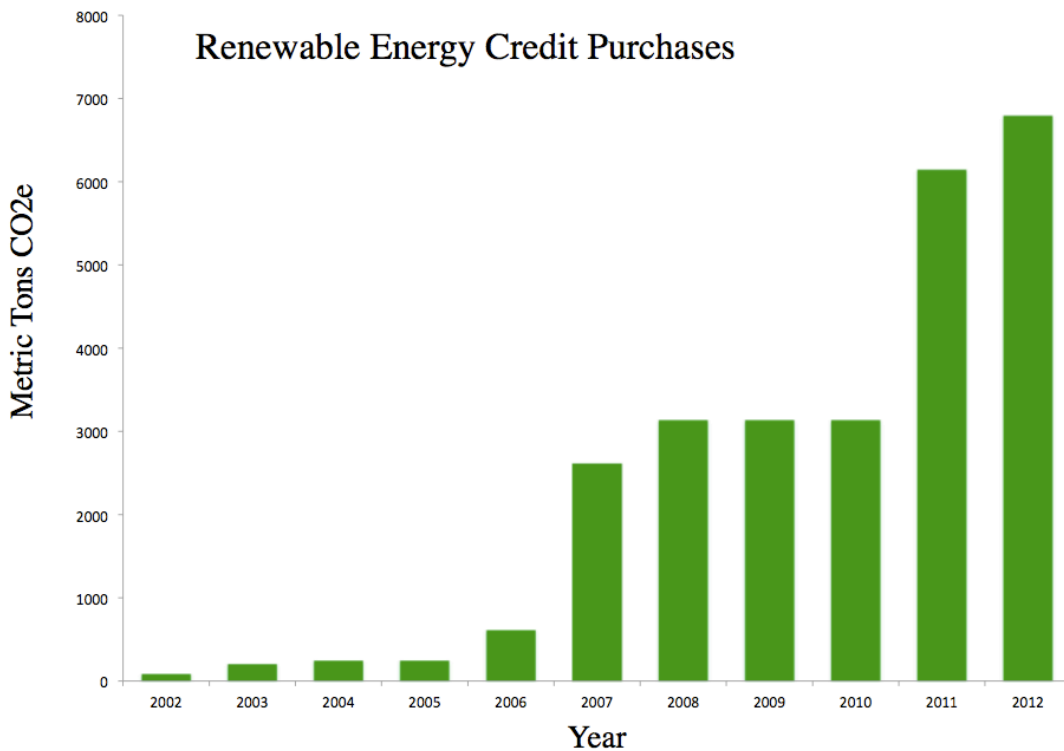


Figure 5. Increase in Renewable Energy Credits purchased since 2002. Starting in 2011 the amount purchased was equivalent to the Scope 2 emissions and thus “covered” or “neutralized” that portion of our greenhouse gas emissions.

To compensate for the greenhouse gases associated with Scope 1 (fossil fuel use) and Scope 3 (travel) we will need to turn to other Carbon Offset strategies. Carbon Offsets differ from RECs in that fuels burned on-site cannot be compensated for by an alternative non-burning technology off-site. Carbon dioxide and other gases are a measurable output from the combustion of fuels. In order to compensate for and neutralize the effect of the release of those gases to the atmosphere, an equal amount must be captured and sequestered. The simplest example of a capture/sequester mechanism is a growing plant that absorbs CO<sub>2</sub> from the air and uses it to build its cellular structure. On campus we currently have a composting project that provides a small local Carbon Offset, slightly reducing the College's overall emissions (Table 1). The magnitude of our emissions will, however, require that we expand our use of offsets. The choices here are varied in price, ideology, tangibility and practicality. In addition, the ACUPCC protocol specifies that the offsets must be additional (being beyond any usual or required activities: e.g., the Crum Woods as they now exist cannot be counted as an offset because it is a usual part of our carbon footprint), transparent (known and reported to the College in a way that can also be used for educational goals), measurable (the GHG reduction must be quantifiable), permanent, verifiable (by a third party auditor using specified criteria), synchronous (reasonably close in time to the generation of the GHG), accountable for leakage (take into account any direct or indirect GHG emissions from the offset activity itself), registered (with a well regarded registry), counted only once (credits cannot be double-counted, i.e. claimed by another party) and retired (they can only be used once). Given the complexity of these criteria and

the fact that the cost of offsets will vary temporally with larger economic concerns outside the control of the College, we should first establish our own guidelines for offset purchases. The Sustainability Committee is an appropriate body to research these issues and to provide advice in developing these guidelines.

One interesting possibility suggested by the Crum Woods Stewardship Committee and supported by the Scott Arboretum is to increase the number of trees on campus by engaging students in an annual tree-planting event associated with first year orientation. The carbon sequestration provided by these trees could be measured and evaluated as a part of the ecology curriculum. The Sustainability Committee could evaluate whether this plan would meet the carbon offset requirements of the ACUPCC.

As required by the ACUPCC, the College must make a greenhouse gas survey every other year. It would be appropriate to evaluate the purchase of offsets at the same time. In accordance with the philosophy shared by the College and the ACUPCC, offsets should not be used as a way to avoid making changes in our policies, behavior or physical plant – rather they should be used in situations where further direct reduction of greenhouse gases is very difficult, costly or impossible to achieve, and as a way to reduce greenhouse gases while a longer term plan is developed and enacted (e.g. major changes in the physical plant).

Until the buildings are monitored and the campus-wide energy/technology survey is completed and evaluated it is impossible to predict the savings that might be gained from changes in the physical plant. Consequently, it is difficult to predict or specify the proportion of GHGs that will be left to be addressed after changes in

the physical plant, policy and behavior have been made. Nonetheless it is useful to have some sense of the progress needed if the campus is to achieve climate neutrality by 2035. Although a linear model (Figure 4) in emissions reduction is not realistic, it provides a benchmark against which future emissions can be measured. Assuming that the College continues to buy Renewable Energy Certificates to cover the emissions associated with electrical use (Scope 2), the reduction in CO<sub>2</sub> emissions from Scopes 1 and 3 should be on the order of 360 metric tons per year. Changes in fuel prices that would tempt the College into reverting to the use of fuel oil, increases in the size of the student body or the number of employees, or the addition of new buildings should not be excuses to backtrack in our reduction of greenhouse gas emissions.

### **Educating the College Community about Climate Change and Sustainability**

Learning at Swarthmore College takes place both in the formal curriculum and through the community's practices, traditions and opportunities. In 1992 students and faculty established an Environmental Studies Program that supports an interdisciplinary minor and also offers courses to students at large. In 2011 Swarthmore College received two Andrew W. Mellon Foundation grants to support deepening and expanding the Environmental Studies Program. These resources have allowed the development of a single Tri-College Environmental Studies Program, amalgamating the educational resources of Bryn Mawr, Haverford and Swarthmore Colleges. On Swarthmore's campus, the Program annually presents an Environmental Studies Foundation Course and the Environmental Studies Capstone

Seminar in addition to Directed Readings and Research. It also draws from related courses in Biology, Chemistry, Physics, Engineering, Mathematics and Statistics, Religion, Economics, English Literature, History, Sociology and Anthropology, and Political Science. Through Bryn Mawr and Haverford, students may also take Environmental Studies courses in the fields of Education, Philosophy, City Planning, and Geology. Lastly, there are extensive opportunities for students to incorporate courses from their study abroad experiences, including two specific Swarthmore sponsored programs: the Brno-Krakov Sustainability Studies Programs in the Czech Republic and Poland, and the Cape Town South Africa Program on Globalization and the Natural Environment.

We anticipate that course offerings related to sustainability will only increase over time due to the recent Mellon awards. These awards have enabled Swarthmore to augment the Environmental Studies Program by hiring a visiting professor to introduce GIS technology to faculty and students, providing Tri-Co faculty with workshops to develop and enrich environmental studies courses, and establishing a course-development fund. In addition, the Andrew W. Mellon Foundation issued Swarthmore a \$1 million challenge, to be matched two-to-one within three years, to support a new tenure track position in Environmental Economics at Swarthmore. That position has been filled and starts in the fall of 2013. Interdisciplinary studies are also being highlighted in the Strategic Plan at Swarthmore and this is also likely to foster future hires that can help support the Environmental Studies Program. With enrichment of the program and continued student interest it is possible that a regularized special major will be developed.

Currently, without any formal requirement to do so, approximately 53% of students in each graduating class take at least one or more Environmental Studies courses. We anticipate that with new faculty hires and with the course development supported by the Mellon funding this number will naturally increase without a “sustainability requirement.” The initiation of a graduation requirement for a course on sustainability is one way to ensure that sustainability becomes a part of the curriculum for all students, but there are many reasons, both practical and philosophical, that argue against this option. Nonetheless when the Committee on Educational Policy next reviews the curriculum as a whole, this option should be evaluated.

Apart from the formal curriculum, Swarthmore students also learn about sustainability through the example the College community presents about living sustainably, and/or by doing research, community-based learning, or service projects associated with sustainability. By being more conscious about the educational value of these experiences for students, even those who have never taken a sustainability-related course may learn about it in meaningful ways. For students who have had formal training, these extracurricular opportunities will provide further insight through practical experience.

To support extracurricular sustainability education, the College will further develop its Green Advisors Program. Currently Green Advisors are students who have volunteered to be leaders and guides in sustainable living within individual dorms. To strengthen this program Green Advisors should have more support – both in training (ultimately by a Sustainability Director) and in receiving a stipend

for their work (as funds become available). Each hall should have one or more Green Advisors. Their duties would include communicating with incoming students about ongoing sustainability efforts on campus, introducing sustainability practices during orientation for first year students, and throughout the year initiating and coordinating efforts in sustainable living in the dorms (including energy conservation practices, waste reduction, recycling and composting). The Green Advisors would work in coordination with the Sustainability Director, developing appropriate activities for students to learn about sustainability.

The faculty and staff of the College also need ongoing education and training about climate change and sustainable living. To that end, a second group of Green Advisors will be developed from their ranks. The goal is to have one staff/faculty volunteer GA per building. Together they will serve as resident experts to support sustainable living while working within their immediate community. In conjunction with the Sustainability Director the GAs will be a reservoir of information about best practices, generate ideas and field questions about sustainability and help develop orientation materials on the community's sustainability efforts for new employees.

Community-based service is also a powerful way to learn about sustainability. This happens for students in a number of venues. Within the College, students contribute to the community's sustainability discourse by serving on committees that have sustainability as part of their mandate, including the College Sustainability Committee and the Crum Woods Stewardship Committee. Students will also serve in the hiring process of new Environmental Studies-related faculty and in the new Sustainability Director. Students also participate in a variety of



community-based projects that are connected to research programs (see section on sustainability research) and opportunities available through the Lang Center (see section on community outreach). The Swarthmore community includes a number of environmentally active student groups (e.g. Earthlust, Good Food Project, Environmental Justice, Swat Frack Action, Mountain Justice, Think Climate, EcoSphere) and the office of the Sustainability Director will serve as an important source for coordinating efforts, exchanging information and providing resources for these groups.

### **College Support of Research Related to the Achievement of Climate Neutrality and Sustainability**

It has not been the policy of Swarthmore College to direct the research of its faculty in any particular direction. Rather, the emphasis has been on supporting research as a way to vitalize the careers of faculty members. The College has recognized that this engagement enriches courses and seminars and provides research, educational and employment opportunities for students both directly and indirectly through mentors' connections with the professional field. In 2011 the Sustainability Committee began a survey to determine the amount of sustainability-related research being done by faculty at the College. Relatively few faculty members identify their research as sustainability-related, and for the most part, those who do are in the divisions of the Natural Sciences and Engineering and the Social Sciences. This research is supported both by College funds and external sources. It is likely, however, that other faculty actually do conduct research that is

related to sustainability but for whatever reason do not typically categorize their work in that way. Apart from research funding that is available to all faculty, one of the ways to support sustainability research at the College is to connect faculty whose interests complement one another. This is now being fostered by the various Mellon-related activities coordinated through Environmental Studies. The planned hires (as previously described) in related fields are likely to have research interests that will further expand the pool of faculty on campus whose research is broadly engaged in ways to achieve climate neutrality and sustainability.

Research in these fields also happens through student projects in related courses and seminars (e.g., Ecology, Marine Biology, Microbiology, Urban Water Quality Management, Environmental Studies Capstone Seminar, Topics in Environmental Chemistry, etc.). In addition students may also be engaged via independent or directed research during the semester or over the summer. Funding to support student summer research and internships comes from many sources in the College including the Division of Natural Sciences, the Biology Department, Environmental Studies, Sigma Xi and the Lang Center. There is a current plan to modify the way the College evaluates the teaching loads of faculty with the intent of further supporting the development of these high-impact learning experiences for students.

### **Swarthmore's Community Outreach to Help Achieve Climate Neutrality**

Within Swarthmore, a variety of committees, groups and administrative structures, although distinct in their specific focus, share broad environmental

concerns and seek to communicate with and educate the community about addressing the myriad challenges associated with the anthropogenic changes in the ecosphere. Coordination among these entities has been haphazard rather than intentional. An important role of a Sustainability Director will be to increase communication among such groups, reducing redundancy and helping the sustainability community to operate as a coordinated critical mass.

Different entities within Swarthmore's sustainability community have forged relationships with governments and working groups in nearby communities and have also joined professional groups and attended local and national meetings to learn about our common problems and to share solutions. The College has a strong partnership with the Borough of Swarthmore, and from that has come coordinated efforts to support renewable energy, composting and landscaping. These achievements were recognized by the EPA, which named the College and Borough as a Green Power Community in October of 2007. The Lang Center of Swarthmore College supports the work of Afewsteps.org, an energy awareness group that represents the four communities of Nether Providence, Rose Valley, Rutledge, and Swarthmore, to provide local residents, schools, businesses, and governments with information on conserving energy and saving money. Swarthmore also works with the Chester-Ridley-Crum Watersheds Association to monitor water quality and protect the local waterways. Professors and students at Swarthmore College have also collaborated with the Wallingford and Swarthmore School District Sustainability Committees on initiatives in the local schools and municipalities. In addition, Swarthmore College partners with the Southeastern Pennsylvania

Transportation Authority to lower the cost of public transit for Swarthmore employees and with the Pennsylvania Department of Environmental Protection to improve recycling and waste reduction.

Swarthmore has a long relationship with the nearby community of Chester. Many of the Lang Center's community outreach programs were created to benefit low-income Chester residents. Swarthmore students worked with residents to establish the Ruth L. Bennett Homes Food Garden in Chester, increasing the residents' access to healthy, organic, local food. In the summer of 2010, the Lang Center's nine Chester Community Fellows worked on Greener Partners' organic farm in Media/Elwyn while exploring issues of food access. Another project supported by the Lang Center through a prior student internship is The Food Trust in Philadelphia, which works to ensure greater access to affordable and nutritious food in the city.

Swarthmore is a member of several associations working to promote sustainability in higher education. These include the Association for the Advancement of Sustainability in Higher Education, the Pennsylvania Environmental Resource Consortium, and the Northeast Campus Sustainability Consortium. Swarthmore participates in the AASHE Sustainability Tracking and Assessment Report System that shares Swarthmore's sustainability practices with AASHE's network of participating institutions. We are also in regular conversation with our peers locally and nationally to share best practices and advance sustainability. A further responsibility of the Sustainability Director would be to support and extend these relationships.

## **Conclusions**

Achieving carbon neutrality for Swarthmore College will result in eliminating approximately 9,000 tons of carbon dioxide from the atmosphere every year. While that is a significant contribution in its own right, the greater legacy of meeting the ACUPCC commitment is in educating our community about why we need to meet this goal and in consciously and visibly demonstrating how to achieve it. The plan developed here describes the mechanistic steps to further the College's progress in energy conservation. It outlines what we need to do in order to be informed about modifying the physical plant. It draws on the expertise and creativity of the Sustainability Committee to help continually review the College's progress toward carbon neutrality, to make recommendations that will guide the College's purchase of renewable energy certificates and carbon offsets, and to continue to recommend and enact conservation and sustainability practices. Swarthmore students will be educated about climate change and sustainability through formal course work currently overseen by the Environmental Studies Program. Sustainability practices will be taught and supported by the further development of the Green Advisors program. A Sustainability Director who will help to integrate sustainability into all aspects of the College's educational mission, operations, community life and culture will oversee the coordination of these activities. This plan is focused on mitigating climate change by the reduction of carbon emissions and is only a part of the College's and its community's efforts to be environmentally responsible.