COLORADO SCHOOL OF MINES
FACULTY SENATE MINUTES
September 08, 2009 - 2:00pm
Hill Hall 300

ATTENDEES: Davis, Drewes, Dorgan, Eberhart, Greivel, Griffiths, Hitzman, Martins, Miller, Sacks, Scales, Voorhees

APOLOGIES: Steele

GUESTS: Zach Aman – Representative, GSA
Tom Boyd – Dean of Graduate Studies
Wendy Harrison – Associate Provost
Rambert Nahm – Representative, ASCSM

Eberhart, Senate President, called the meeting to order and welcomed the guests.

COMMENTS FROM GUESTS:

A. Boyd reported that the Graduate Council had their first meeting recently and that three issues will soon be coming to the Senate:
    1. The Division of Economics and Business is requesting that the M.S. and Ph.D. degree programs currently titled "Mineral Economics" be changed to "Mineral and Energy Economics." (ATTACHMENT A) They feel that the new title better aligns their graduate programs with institutional priorities and enhances education and scholarship pertaining to energy. The title will also better describe the degrees as they already focus on energy.
    2. The Graduate Council is looking at implementing a time limit on the completion of graduate level degrees.
    3. The Undergraduate Council wants to eliminate the current audit option and replace it with a formal policy and a pass/fail option. This would allow for students to sit in with instructor approval. Instructors would not be obligated to offer any services other than the regular lectures to students opting for this option.
B. Boyd reported that the Vision Committee has met once. The Academic Standards and Faculty Affairs Committee chose this committee's members and charged them with drafting a concise vision statement with quality and size metrics.
C. Harrison reported that there is currently no process in place to award posthumous degrees and has submitted a policy for the Senate's review. (ATTACHMENT B) Scale will review the submitted policy and will report at the Senate's next meeting. The policy needs to be approved by the beginning of October to award degrees to two students meeting the proposed requirements.
D. Harrison reported that there are 5 vacant positions on the University Promotion and Tenure Committee this year. The Provost has solicited the Faculty Senate's nominations for this assignment. The Senate has been asked to provide a list of 10 individuals from a list of eligible faculty members from which the Provost will select 5 members to serve. Justifications for these nominations are also requested. It is requested that these nominations and justifications be submitted by September 30, 2009.
E. Harrison submitted CSM's Core Curriculum 2009 Proposal (ATTACHMENT C) for the Senate's review. The proposal's purpose is to decrease constraints on some of the requirements for the Academic Core Curriculum. A report on opinions on the suggested changes will be submitted to the Senate by mid-October.

F. Harrison will submit a report reviewing 2009-2010 faculty and administrative faculty salary increases at the next Senate meeting.
G. Harrison will be reporting on a policy for joint faculty appointments, new titles for various faculty members, critical evaluation of the readmissions process, and the effects of forgiving a grade of F at the next Senate meeting.

OLD BUSINESS:

A. American College and Universities President Climate Commitment (ACUPCC) – Davis submitted a proposal (ATTACHMENT D) generated by an EPICS team. They proposed 3 actions to be taken immediately to begin the process of joining ACUPCC. A plan needs to be developed to become carbon neutral as soon as possible, 2 specific tangible actions should be taken immediately, and this information needs to be available to the Association for the Advancement of Sustainability in Higher Education (AASHE) to be posted. President Scoggins is not opposed to this plan as long as it can be implemented without a high cost, and the report found that these initial actions could be achieved with essentially no cost. The Senate will get Scoggins input on this new report.
B. Committee Appointments – The following Senate liaisons have been appointed to represent divisions that currently have no members on the Senate: Athletics – Graham Davis, Geophysics – Murray Hitzman, Library – Arthur Sacks, Petroleum Engineering – John Dorgan
   Kent Voorhees will join the Academic Standards and Faculty Affairs Committee.
   It was decided that the Vice President will chair the Committee on Committees once elected.
   The Senate Executive Committee will consist of Sacks, Drew, Eberhart, and the Vice President, once elected.
C. Vice Presidential Election – Eberhart will send out an email to the Senate for nominations for the Vice President.
D. Informational Meetings – It was decided to have a guest provide information to the Senate at every other meeting. Hitzman will invite Anne Walker to a future meeting to discuss financial accountability and the policy regarding conflict of interest between the Board of Trustees and actions of the university. It was also decided to draft changes to the policy regarding intellectual property in the handbook and submit them to the Handbook Committee.
E. Subject for September 23 Faculty Forum – Eberhart will contact the new Provost, Steven Castillo, and the Vice President for Student Life, Dan Fox, to see if they are available to speak at the September 23 Faculty Forum.

COMMITTEE REPORTS:

A. Senate Councils
   1. Research Council – It was reported that there has been little interest in the Research Council since the implementation of the Research Management Cabinet. Eberhart will invite John Poate to a future Senate meeting to discuss his vision regarding what direction research should move on campus. It was also decided to review the role of the Research Management Cabinet as well as the role of the Research Council as stated in the handbook. The Senate will also ask for an update from President Scoggins regarding faculty development, new maintenance hires, and the Capital Campaign.
   2. Undergraduate Council – It was reported that there is inefficiency in class and laboratory sizes with some sessions only being partially full and is a problem as it increases the work load for faculty members. Other issues include enrollment management, accountability for capital expenditures, the core curriculum

proposed changes, and the need for more faculty, classrooms, and laboratories to handle the increase in the undergraduate population. The Senate will ask President Scoggins for a report on the quality of education for the undergraduate students.

NEW BUSINESS:

A. 20th Semi-Annual Report of the Faculty Oversight Committee on Sports and Athletics (FOCSA) – Due to time constraints this issue will be discussed at the next Senate meeting.
B. Volk Gym Access Survey Report – A recent survey polled faculty and staff members if they wanted off-hour access to Volk Gymnasium and Steinhauer Fieldhouse. Of the 251 responses, 131 said they would like off-hour access and 81 of them would be willing to pay for it. The results have been sent to Provost Castillo and the Senate requests to be present when the Provost and Dan Fox discuss these results. Davis will draft a letter to Eberhart detailing this request.
C. Recommendations to Handbook Committee – Due to time constraints this issue will be discussed at the next Senate meeting.
D. Informational Clusters – Due to time constraints this issue will be discussed at the next Senate meeting.

ANNOUNCEMENTS:

A. The next Senate meeting will take place on September 22, 2009 in Hill Hall room 300.

The meeting adjourned at 3:55 pm.

MEMORANDUM

Date: August 11, 2009
To: Tom Boyd, Dean of Graduate Studies
From: Rod Eggert, Director, Division of Economics and Business, on behalf of the Division Faculty
Re: Proposal to Change the Name of our M.S. and Ph.D. Programs in Mineral Economics

The Division of Economics and Business proposes to change the name of its M.S. and Ph.D. degree programs in Mineral Economics to Mineral and Energy Economics.

Justifications

(1) *To better align our graduate programs with institutional priorities and enhance our education and scholarship pertaining to energy*. Mines has identified education and scholarship in the field of energy as major priorities (Mines' *Strategic Plan 2004-2014*). Examples of recent and ongoing institutional initiatives include: the Colorado Energy Research Institute, Colorado Renewable Energy Collaboratory, Petroleum Exploration and Production Center, and Renewable Energy Materials Research Science and Engineering Center. Mines is a member of the Alliance for Sustainable Energy, LLC, which manages the National Renewable Energy Laboratory.

All energy issues have important economic dimensions. The graduate programs in the Division of Economics and Business should have a title that reflects and fully signals the priority Mines gives to energy education and scholarship.

(2) *To better signal what we do already*. Moreover, for many years, education and scholarship in the field of energy have been an important part of Mineral Economics at Mines. We historically have defined "mineral" to include "minerals and energy." Since 1995, we have offered a dual-degree program in Petroleum Economics and Management in collaboration with the IFP School in France, through which students earn a M.S. degree in Mineral Economics from Mines and a graduate diploma from the IFP School. Today, approximately half of our graduate students in Mineral Economics are primarily interested in energy issues. Over the period 2001-2008, 45% of the Mineral Economics graduates for whom we have information have found employment in the energy sector (see supporting information below).

Supporting Information

Brief History: Mines awarded its first M.S. degree in Mineral Economics in 1970 and its first Ph.D. degree in 1974. Since then, more than 1100 students have received graduate degrees in Mineral Economics.

Petroleum Economics and Management: Since 1995, Mines' program in Mineral Economics has offered a dual-degree program in Petroleum Economics and Management, in collaboration with IFP School, located in the suburbs of Paris, France. Approximately ten students enter this select program each August, half recruited by Mines and half by the IFP School. Students complete two semesters of courses at Mines and two academic terms at IFP School. Students receive the M.S. degree in Mineral Economics and a graduate diploma from the IFP School.

Placement of Mineral Economics Students in the Field of Energy: Over the period 2001-2008, 45% of the graduates from Mineral Economics for whom we have information have gone to work in the energy field after graduation. Representative companies include:

Bentek Energy
BP
Cambridge Energy Research Associates
Chevron
ConocoPhillips
Dongsheng Petroleum Group (China)
Ecopetrol (Colombia)
El Paso Corporation
Energy Charter (Belgium)
Halliburton
National Renewable Energy Laboratory
Peabody Energy
PFC Energy
Saudi Aramco (Saudi Arabia)
Schlumberger
Shell

StatoilHydro (Norway)
Total (France)
UNEP Risoe Centre on Energy, Climate and Sustainable Development (Denmark)
U.S. Department of Energy
Xcel Energy

TO: Faculty Senate

FROM: Wendy Harrison, Tom Boyd, Lara Medley

DATE: September 4, 2009

RE: Process and recommendation for the award of degrees posthumously.

On occasion, CSM has awarded undergraduate degrees posthumously. The award of such degrees has, in the past, been at the discretion of Harold Cheuvront Who used a broad guideline of whether the deceased student was within one year of graduation to make the determination as to whether the student was eligible for the degree. At least within the recent past there is no record of the award of graduate degrees posthumously.

Academic Affairs has received two requests this summer for posthumous degree awards: the first is for Derk Slottow, EG...;civil, who would have graduated in December 2009. The nomination was made by Dr. Mike Mooney, EG. The second request is for graduate student Nikki Hemmesch, who had completed her second year of a PhD program in Geology. The nomination was made by the GE Department.

Article 1-A3 of the Faculty byelaws clearly establishes the authority of the academic faculty in the matter of certifying candidates for degrees *("The Academic Faculty shall establish academic standards and regulations, degree requirements and qualifications, shall approve curricular changes; and shall certify all degree candidates* . ..) thus it is appropriate for the Faculty Senate to both aid in the development of a process for considering posthumous degree awards and to provide a recommendation regarding the two current nominations.

We have provided the template below for your consideration. We solicit your input in developing a proper process as well as your decision for the two current nominees.

1. The Registrar shall review the academic standing of all students for whom a posthumous undergraduate degree award may be considered. The Registrar will use the following guidelines in identifying those students who would be eligible
    a. Minimum GPA 2.0
    b. Has completed a minimum of 90 earned hours towards the BS degree

2. The Dean of Graduate Studies will review the academic standing of all graduate students for whom a posthumous graduate degree award may be considered. The Dean will use the following guidelines in identifying those students who would be eligible

a. MinimumGPA 3.0
b. Within 6 credit hours of degree completion for non-thesis degrees
c. For thesis-based degrees having submitted a departmentally approved admission to candidacy.

1. Once eligibility has been established, the Registrar and/or Dean will contact the students' department and the VP for Student Life will contact family members to confirm that such an award is desired.

2. Academic Affairs will forward the request(s) with supporting academic documents to the Faculty Senate for their recommendation.

3. Once a positive recommendation has been made, the Registrar will include the student in the upcoming semester graduation lists and the ordinary procedures of approval by the Senate and BOT will be followed.

Draft 8/24/09 WJH CSM's Core Curriculum -2009 Proposal

Background

In 1996 CSM articulated a new vision for the undergraduate education, designing a new common core, creating systems courses, and the distributed core courses. One of the motivations for the new core was to lay robust foundations in math and basic sciences for all degree programs, and to create vertical stems in engineering design, in systems, and in humanities and the social sciences progressing from the first year foundations into the senior year ofthe discipline programs.

Since 1996 very few changes have been implemented, speaking to the strength and validity ofthe core as an academic concept. However, the emergence of biosciences and bioengineering research at CSM and post baccalaureate opportunities for our graduates in these fields led to the approval ofthe new degree program in Chemical and Biochemical Engineering in 2007 with a foundation requirement in biology that could not be met without making core curriculum changes.

The motivation for requiring a common core remains the same today as it was 12 years ago, providing all CSM studel1ts with:

- a broad educational foundation-both content and experience-that is consistent with the educational objectives articulated in the *Profile ofthe Colorado School of Mines Graduate;*
- a requisite base ofknowledge upon which discipline-specific curricula can be built; and,
- the opportunity to explore the wide variety ofdisciplines offered at CSM in order to choose the appropriate discipline in a knowledgeable fashion without adversely impacting time-to-degree.

**From the Curriculum Committee, October 2005*

Work of the 2005-2006 and 2006-2007 Curriculum Committees

An initiative to critically evaluate the common core started in Fall 2005 at the urging ofthe DHDD, some ofwhom felt that core placed overly tight constraints on their ability to deliver discipline-based curricula and remain under 140 credit hours for the degree program. By the end ofthe 2005/06 AY the committee had defined a revised common core, proposed distributed science requirements, distributed HSS requirements, and solicited input from the DHDD. During 2006 the committee focused

on details of activity credit including CSMIOI and PA, LAIS clusters, and how to include a biology requirement for CE.

The final proposal was submitted to Undergraduate Council in December, 2006 and involved a common core reduction from 72.5 credit hours to about 69 credit hours, 1

Implementation of the American College and Universities President Climate Commitment Consultation

Colorado School of Mines

EPICS 251, Section G & H, Dr. McKinney

Team Green Solutions: Sadd Almotham, Ryan Foraker,

Steven Johnson, Patrick Kramer, Nicholas Moore and Karla Peabody

Professor Graham Davis

April, 29th 2009

Executive Summary

The purpose of this final design report is to detail the implementation plan team Green Solutions has completed to solve the problem presented to the team by the Colorado School of Mines Faculty Senate. The problem the team had to address was to determine the best course of action for the school to pursue in order to meet the sign-on requirements of the American College and Universities President's Climate Commitment.

The final design report presents an analysis of the seven requirements sign-on of the ACUPCC plan. This analysis presents a brief description of the research conducted for each of the requirements as well as a cost estimate for each option. It also contains a description for the decision making criteria the team used to choose the two best options of the six requirements analyzed. This criterion was utilized to choose the two best options for the Colorado School of Mines in the event it should sign the ACUPCC agreement.

The six requirements that the team researched were:

1. Begin Constructing Buildings to LEED Silver Standard
2. Begin Purchasing Energy Star Certified Products
3. Offset Carbon Emissions Due to Air Travel
4. Encourage the Use of and Make Available Public Transportation
5. Begin Purchasing or Producing 15% of the Energy Used by the School from Renewable Sources
6. Participate in the Recycle Mania Competition

Of these six requirements the team need decided on which two the school should initially implement when signing onto the ACUPCC's plan. Using the information given to the team by Dr. Graham Davis, the team developed criteria to weigh each of the options against one another in order to determine which two of the six would be the best choices. The criteria the team used to decide which two options to pursue was:

- Initial Cost of Implementation
- Ease of Implementation
- The Long Term Return

Based on this criteria and the resulting decision matrix, the team arrived at the conclusion that the school should begin constructing all new buildings to LEED standards and to begin purchasing Energy Star Certified Products whenever applicable. Both of these options have low initial costs, are very easy to implement and provide savings to the school in the long run.

Table of Contents

1.0 Introduction

The project given to team Green Solutions was to analyze how the Colorado School of Mines can best meet the requirements of the American College and University Presidents Climate Commitment. The analysis preformed by the team evaluated the school's best option for meeting these requirements. The main needs of the Mine's Faculty Senate requested the team to address are:

- To come up with the costs of signing onto the ACUPCC's commitment, both tangible and intangible, and to measure those costs.

- To find the most inexpensive way to meet these requirements. The school does not want to take money away from the students at the school or from scholarships in order to fund these requirements.

The Faculty Senate is also concerned with the fact that several other institutions in Colorado have already signed onto the commitment and that CSM could be seen as lagging behind those schools. The Senate feels signing onto the commitment would create an intrinsic value for the campus and feels it is necessary for CSM to "catch up" with the other institutions already signed onto the plan. Along with the CSM Faculty Senate's concerns there are also several requirements given by ACUPCC that must be met.

These requirements set up a time table for when certain actions need to be taken by the school. Without going into too much detail, the school must first come up with institutional structures to guide the development of the plan. The school must then take inventory of all its greenhouse emissions. Next the school must come up with a plan as to what they must do to reduce/eliminate their greenhouse gas production. There are seven courses of action that the school can take after signing onto ACUPCC in order to start reducing and eliminating their greenhouse gas production. Initially the school must commit to only two of these seven requirements. Based off the school's needs The Green Solutions team has chosen the two best options for them to undertake. Finally, the school will implement the plan.

This report provides an analysis of the seven options the school can potentially undertake to reduce their greenhouse gas emissions. Then using several decision making criteria, develop a decision matrix to choose which two of the seven options will be implemented. Lastly, give an in depth description of why the chosen two requirements are the best options for the school to pursue. The scope of work for this report does not focus on the establishment of institutional structures to further the plan, but instead to pass on the information gathered in the design report to school's sustainability committee. The team has focused on determining the best course of action that the school should undertake in order to sign onto the plan.

2.0 ACUPCC Requirements

As part of signing onto ACUPCC, while the comprehensive plan is developed and initiated, there are seven immediate actions that can be taken. At least two of these must be implemented by the school and because of the cost constraint of the project only two will be chosen. The seven actions are [1]:

1. Establish a policy that all new campus construction will be built to at least the U.S. Green Building Council's LEED Silver standard or equivalent.
2. Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist.
3. Establish a policy of offsetting all greenhouse gas emissions generated by air travel paid for by our institution.
4. Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution
5. Within one year of signing this document, begin purchasing or producing at least 15% of our institution's electricity consumption from renewable sources.
6. Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested.
7. Participate in the Waste Minimization component of the national RecycleMania competition, and adopt 3 or more associated measures to reduce waste.

The sixth course of action is not feasible for CSM because the school's money is not invested in private shareholders.

2.1 LEED Silver

The LEED guidelines were created by the USGBC, "The U.S. Green Building Council (USGBC) is a nonprofit organization that was formed in 1993. The USGBC consists of building industry stakeholders such as architects, building product manufacturers, owners, contractors and environmental groups who are interested in the promotion of green building in the U.S."[5]. They created LEED in 1998 after looking at similar programs from Canada and Britain. The organization created the LEED standard to define what a green building is, and to give a detailed plan to building green. There are six different committee's for different types of buildings and projects, "LEED for New Construction, LEED for Existing Buildings, LEED Commercial Interiors, LEED Residential, LEED Core and Shell, and LEED Multiple Buildings"[5].

A brief description of what LEED standards imply will be necessary to explain cost implications and the different benefits to constructing a building to the LEED silver standard. To become LEED certified, a building (ACUPCC only requires new structures to be built to LEED silver standards) must obtain points from the LEED rating system. The number of points you obtain determines the level of LEED you qualify for. Below are the major categories from which points can be collected [6]:

Table 1 - The Categories of LEED:

Category	Points Possible
Sustainable Sites:	14
Water Efficiency:	5
Energy and Atmosphere:	17
Materials and Resources:	13
Indoor Environmental Quality:	15
LEED Innovation Credits:	5
Total Maximum Possible Points:	69

And these are the certification levels of LEED [6]:

Table 2: The Levels of LEED

Level	Points Necessary
LEED Certified	26-32 points or >37% of max.
LEED Certified Silver Level:	33-38 points or >47% of max.
LEED Certified Gold Level:	39-51 points or >56% of max.
LEED Certified Platinum Level:	52-69 points or >75% of max.

There are also seven prerequisite points that are required for every level. These points deal mainly with where the building will be built (i.e. building on top of a previously demolished building), transportation to the building, and the environment around the building [2].

Many of these points are inherent in the buildings being built today because of the higher quality of construction, and many others go along with ACUPCC's other requirements (such as putting bicycle racks around the building to encourage environmental friendly transportation). David Langdon, a construction cost management firm has looked at the cost implications of building green. A detailed survey of the cost difference between LEED certified buildings and buildings without the certification was performed in 2004, and a follow up survey was done in 2007. The study compared cost per square foot of academic buildings, laboratory buildings, and library buildings along with a few non academic types of buildings across the nation. Langdon's study found:

> "There is no significant difference in average costs for green buildings as compared to non-green buildings. Many project teams are building green buildings with little or no added cost, and with budgets well within the cost range of non-green buildings with similar programs." [3].

The study looked at the cost between non-certified, LEED certified, LEED silver certified and LEED gold certified buildings (see Appendix A, Figure 1). The findings are very encouraging and show that the cost of a building does not fluctuate with whether it is built green, but more on the general needs and specifications of the owner.

Another cost implication for LEED comes from the extra work designers must do to build to LEED standards. The U.S. Green Building Council suggests that the easiest way to implement LEED standards into a building is to work with them from step one, while you are still planning and designing the building. If the building is designed in this manner you do not have to make costly changes. The School architect plans to build all School of Mines future buildings to LEED silver standards, so this potential cost does not apply to CSM.

Now that it has been shown that building to LEED standards does not necessarily entail extra costs, we can look at the benefits of building green. According to the U.S. Green Building Council website, LEED certified buildings can use up to 30% to 50% less energy, give off 35% less carbon dioxide, have 40% less water use, and produce 70% less solid waste [2]. Aside from the cost benefits of building green, green buildings also create less of an environmental impact.

Since the ACUPCC does not require CSM to actually get a LEED silver certification, but only to build to its standards, the team will not go into the costs of acquiring the actual certification. Also, according to the school architect, all future building projects for the school will be LEED certified even if CSM does not sign onto the ACUPCC. Because the Colorado School of Mines currently implements the policy of building campus structures to LEED standards, this policy should also be used to satisfy the ACUPCC requirements.

2.2 Energy Star

There have been no actions taken by Colorado School of Mines to implement a policy requiring the purchase of Energy Star products. Implementing such a policy would satisfy another sign-on requirement of the ACUPCC agreement. The criteria for making this decision are long-term savings and reduction of energy usage.

Last year, according to Robert Slavik [7], CSM spent $1,874,753.72 on electricity. In 2007, CSM spent $1,470,495.38 on electricity. If these current trends continue, CSM can expect to spend approximately $2,200,000.00 on electricity next year with a $200,000.00 increase every year. According to the Energy Star website, Energy Star certified products use approximately 45% less energy than their non-certified counterparts. The Energy Star website also proves that some Energy Star certified products (including computers) cost the same as their non-certified counterparts. If an Energy Star certified product does cost more, it is, on average, 30% more expensive, but the savings coming from purchasing Energy Star products will pay off the extra cost in approximately one year [8].

The best course of action would be to implement a policy requiring the purchase of Energy Star certified products, because the overall savings of purchasing Energy Star certified products are greater than if CSM did not purchase Energy Star Certified products.

2.3 Air Travel Emission Offsetting

Requirement option 2.3 of the (ACUPCC) agreement calls for the institution to purchase carbon emission offsets to compensate for all air travel flown by the Colorado School of Mines. The ACUPCC commitment requires establishing a policy for offsetting greenhouse gas emissions generated by air travel. Because no widely-used certification system is currently in effect for carbon offset products, the ACUPCC committee has not adopted any specification for type of offset products that are acceptable [1]. Even though there are no specifications involved for the type of offset, every institution uses a generally accepted procedure to complete this requirement.

The offset procedure involves giving a donation to a carbon offset company which will use the donation to remove a specific amount of carbon emissions from the atmosphere. The cost to offset

greenhouse gas emissions generated by air travel for any institution (including the Colorado School of Mines) is easily calculated using research from several different sources. The best approach requires a tracking system which monitors the exact number of miles flown by university staff. Because Mines does not have such a tracking system in place already, the ACUPCC implementation guide states (based on research from the University of California at Berkley) that a typical airplane flight costs approximately 25 cents per passenger per mile [9]. Based on this information and research gathered about the amount of funding used for air travel, the number of miles the school flies can be easily estimated. Carbonfund.org, a carbon offset company, states that, on average, each mile of air travel produces about 0.21 kilograms of carbon dioxide per passenger [10]. Using this information, Mines can calculate the total amount of carbon dioxide produced due to its amount of annual air travel. Once the total amount of greenhouse gas emissions is calculated, the institution must choose a specific company from whom to request the offset.

Major Carbon Offset Companies**:**

1. CarbonFund.org
    a. It partners with over 700 business and 17 educational institutions along with hundreds of non-profit companies
    b. It completes a strenuous examination of each field of carbon reduction and then only funds projects which are certified by a third party
    c. It also allows every donation to be put toward a particular area of interest for the company making the donation
    d. Price per ton varies based on company and other factors
    e. For more information, see the Carbonfund.org website. [10]
2. Climate Care
    a. $10 per metric ton
    b. Very fast at completing their promised offsets (within just a few years)
    c. Investment portfolio is based on projects which meet the Gold Standard (a very strongly encouraged standard for carbon offset certifications)
    d. Part of J.P. Morgan's Environmental Markets group
    e. For more information, see the Climate Care Website [11]
3. The Climate Trust
    a. Clear transparency of offset projects, each project is explained in detail
    b. Clear criteria of choosing offset projects
    c. Does not suggest a price per metric ton

d. For more information, see the The Climate Trust website [12]

According to a survey by the TUFTS institute taken in July of 2006, on average, offsetting carbon costs $12.35 per metric ton and can be as inexpensive as $5.50 per metric ton [13]. Please see Appendix A, Figure 2 for a complete graph of the TUFTS research. After several calculations, offsetting carbon emissions due to air travel will cost, on average, an additional 0.26 cents per mile or approximately one percent of the annual budget for air travel at Mines.

To obtain the air travel information particular to the Colorado School of Mines, the Green Solutions team contacted the Financial Data Manager for the Colorado School of Mines, Jim Blanchard on March 20th 2009. The school, for accounting reasons, does not track air travel expenses separately from other travel expenses. According to the information given to the team by Mr. Blanchard, the school's best estimate for the amount of money spent on air travel is approximately $1,478,000 per year. After using the averages mentioned earlier, Mines should donate an estimated $14,780 per year to a carbon offset company in order to offset its gashouse gas emissions due to air travel. This rate, though moderately low, does not create any additional revenue. It would not be considered an investment, because Carbon offsets create no return revenue. Greenhouse gas emission offsets have also been controversial because their efforts have not necessarily been proven to reduce carbon emissions nor have they been shown to remove any precisely measurable amounts of carbon from the atmosphere. The Colorado School of Mines sustainability committee also feels, because this process is so controversial, that Mines should not choose this option simply because no proof of effectiveness has been presented. Although a controversial process, further requirements of the ACUPCC contract state that all greenhouse gasses from all travel will eventually need to be offset along with greenhouse gas emissions from all other forms of transportation.

Along with the cost of offsetting greenhouse gas emissions, choosing the right company to make a donation with is also an important decision for the Colorado School of Mines. Any of the carbon offset companies mentioned above would fulfill the requirements of the ACUPCC and meet the needs of the Colorado School of Mines. They are all clear about which projects are funded by their donations. These portfolios also present results and allow any institution to track the progress of its donation. Carbonfund.org is the largest of the three; however it seems to be geared more toward businesses and for-profit companies rather than non-profit companies and educational institutions [10]. Both Climate Care [11] and The Climate Trust [12] provide a clearer and more transparent portfolio than Carbonfund.org. Climate Care provides a straight rate for their requested donation based on the amount of greenhouse gas emissions to offset. This flat rate keeps Climate Care's pricing more predictable and measurable which allows Mines to more accurately predict the exact amount of donation required. Because the price is more predictable, team Green Solutions recommends Climate Care to the Faulty Senate at Mines due to its transparency and predictability, along with a lower than average rate and measurable dependability.

2.4 Public Transportation

In regards to public transportation, CSM does not have to start from scratch. The area of CSM is approximately 0.5 mi^2, which is relatively small [14]. It takes a pedestrian an average of about 7 minutes to walk from one end of campus to the other end diagonally. It is faster to walk within campus than to wait for a bus that will drive for less than a minute to drop the passenger to his destination. Therefore, public transportation within campus is not realistic.

Bicycles are not a method of public transportation. However, schools that signed the ACUPCC have been given credit for encouraging the usage of bicycles as a method of transportation to or within campus. Bikes are a significantly greener way to come to school rather than using a car. Bike racks are available in front of almost every building on campus that students take classes in.

A way of encouraging the use of bicycles on campus is to start participating in the celebration of National Bike-to-Work-Day as well as Bike-to-Work-Week. Other universities across the nation were given credit for participating in such holidays [17]. Biking, though not officially considered public transportation, will help reduce greenhouse emissions. In many cases, people choose to drive their cars to school simply because no one ever suggested an alternative method of transit. If for one day, the university puts forth an initiative indicating that all cars are banned from entering CSM's campus, people will have no choice but to find another way to come to school. Because people are in the habit of driving to school, they are not aware of the other options they have of getting to school. If people try riding their bike or walking to school they might realize these actions present a viable option for them to get to school.

However, a problem arises with the use of bicycles in the Golden area. Golden has a very diverse topography [15]. When riding a bike to school from Mines Park, for example, it is not a problem since the biker is traveling downhill. However, when the biker wishes to return to Mines Park from campus, he or she will have to ride the bike uphill or just walk it back. Therefore, a lot of students prefer to walk or drive their cars to school even though it takes around five minutes for a student living in Golden to drive to campus. Therefore, we need to come up with another way for students to get to campus, besides driving their own car.

Students of the Colorado School of Mines have the ability to get a pre-paid pass for RTD. However, the RTD bus routes in Golden and to Golden are inadequate [16]. An RTD bus comes from Downtown Denver to Golden only three times a day during weekdays. This limitation creates a disincentive for students residing in Denver to take the bus to campus. Mines Park demonstrates another example of the inadequacy of bus routes within Golden; which is a complex that only students of CSM live in. No bus routes can be taken from Mines Park to campus. If a bus schedule was set up to transport students from Mines Park to campus and vice versa, this schedule would provide public transportation for a considerable percentage of CSM's students. This transportation could be a RTD bus or a bus operated by CSM and would also help solve the problem of congested parking on campus.

Appendix A, figure 3 demonstrates how inadequate the RTD routs in Golden are. Any student who lives north of 10^{th} Street does not benefit in any way from having an RTD bus pass for transportation to campus. Appendix A, Figure 4 demonstrates a suggested bus route that will help provide public transportation for every student who lives in Mines Park or north of 10^{th} street.

Currently, the faculty and staff do not have free access to a pre-paid pass for RTD. CSM needs to provide a public transportation method for them. However, CSM cannot afford to provide such a service for free. Selling pre-paid passes for a practical price to the faculty and staff of CSM seems like the most reasonable and responsible thing to do in this situation. A significant percentage of the faculty and staff have already volunteered to purchase the RTD bus passes. Giving a CSM discount will give more incentive for the rest of the faculty and staff to purchase a pass.

In conclusion, there are a number of things that could be done in regard to the forth tangible requirement. CSM could provide access to and encourage the use of public transportation. Also, it could participate in National Bike-to-Work-Day and Bike-to-Work-Week. Creating bus routs from places where a number of students live to campus and vice versa would also encourage students and faculty to use public transportation. Giving a discount on RTD bus passes also presents a good incentive for faculty and staff of CSM to get them involved in this program.

2.5 Purchasing/Producing Renewable Energy

Another ACUPCC requirement for the school signing onto the commitment states that within one year of signing the commitment, it needs to purchase or produce at least 15% of its electricity from renewable sources [9]. Therefore the school has two main options it can undertake in order to meet this requirement, either start purchasing renewable energy or come up with ways to produce the electricity on-site. After preliminary research, it was discovered that the major provider of energy in Colorado, Xcel Energy, offers two options for customers to purchase renewable energy. The first program they offer is their Solar Rewards program. Solar Rewards basically reimburses customers who install and maintain their own solar energy systems. In order for the school to qualify for the program it must install a system capable of producing 100.1 kW to 2MW of DC power [18]. With a system installed on campus that meets these requirements the school would be reimbursed up to $200,000 for the system [18]. Also, the school would receive monthly credits for the energy it produced with the system averaging to $115 per MWh of energy produced [18]. The second program that Xcel offers for its customers is its Windsource program. This program basically allows customers to purchase their energy from wind farms while still getting their energy from Xcel. The Colorado School of Mines would sign up for the correct number of 100 kWh "blocks" they wish to purchase [19]. Each block charges an additional $5 to $6 dollars to the customer's current energy bill [19]. So basically, all the school has to do is sign up for the program and pay the extra monthly costs.

In order to decide which of these options would be the best for the school, several factors need to be taken into consideration. First off, the cost of signing onto the commitment is the main concern of CSM's Faculty Senate and thus the cost of each item on the list carries considerable importance. Therefore, the inherent cost of each option needs to be looked at closely. The Solar Rewards program would require the school to construct a fairly large solar energy system. Considering that the maximum amount of reimbursement the school can receive from Xcel is $200,000 the school would possibly have to pay for most the costs for this system on its own. The school consumes, on average 73,770 kW/h of energy per month which, at a rate of 8.14 cents per kW/h, costs $6004.95 per month [23]. This means that the school's solar array must be able to produce 15% of this amount of energy which approximately equals 11,650 kW/h or 11.65 MW/h. It is difficult to calculate how much a solar array of this specification would cost, however DIA recently inaugurated its new 2 MW/h system which is the size of seven football fields. Therefore in order for the school to meet the 15% necessary it would have to implement six of the solar arrays at DIA to meet its needs, a system that would cover an area equal to 42 football fields. Clearly, this size of a system would not only be unfeasible to build but extremely expensive even with the discounts offered by Xcel Energy. The team believes this option should not be pursued further.

Table 3 - Solar Rewards Information Table:

	Small	**Medium**	**Large**

	Small	Medium	Large
System Size	0.5 kW–10.0 kW DC	10.1 kW–100.0 kW DC	100.1 kW–2 MW DC
Program Type	Standard Offer		Request for Proposals (RFP)
Who Qualifies	Locations Served by Xcel Energy in Colorado		Colorado Businesses
Building Types	Residential and Commercial		Commercial
Availability	Open		RFP
Rebate	$2.00 per Watt DC Capacity*		$200,000 Rebate Cap*
Renewable Energy Credit	$1.50 per Watt DC Capacity*	Monthly Payment of $115 per MWh of Energy Produced	Paid Monthly per MWh of Energy Produced
Contract Term	20-year contract		
* Paid on installation			

(As of Xcel Energy's Website [18])

The second option that Xcel offers is the Wind Source program. This option, unlike the Solar Rewards, would not require the school to construct anything or have to pay for the maintenance of a system. This option would simply allow the school to begin purchasing 15% of its energy in the form of renewable wind energy. As stated above this energy costs only an additional $5 to $6 for 100kWh of energy per month. Examining the same numbers that were worked with above, it can be determined that this alternative is a much more sensible option. Again, the average energy consumed by the school, each month, is 73,770 kW/h so the school would have to purchase 15% of that energy in the form of renewable energy from Xcel. According to requirement, the Colorado School of Mines would buy 11,560 kW/h worth of renewable energy per month. Currently the Xcel sells the renewable energy in the form of 100 kW/h blocks so the school would need to purchase about 111 of these renewable energy blocks per month at a price of $5.89 per block [19]. Therefore the school would be spending an additional $661.73 for energy each moth or a 9% increase on its current average monthly bill. This option is clearly much more affordable and would require substantially less work and planning.

Table 4 - Energy Usage Data Collected From the School:

Year: 2007-2008		Year: 2008-2009	
July	$3,111.83	July	$8,395.35
August	$8,896.90	August	$7,863.02
September	$3,817.30	September	$7,343.04
October	$10,539.50	October	$10,342.09
November	$4,232.70	November	$8,804.97
December	$8,455.85	December	$12,087.24
January	$7,526.50	January	$9,464.27
Febaruary	$5,673.85	Febaruary	N/A
March	$4,916.61	March	N/A
April	$7,693.74	April	N/A
May	$3,588.58	May	N/A
June	$3,605.99	June	N/A

Total	**$72,050.35**	**Total**	**64,299.98**
Average:	**$6,004.95**	**Average:**	**$9,185.71**

As an overview, given the two options, there are positive and negative qualities of both programs the school could undertake. The first option, Solar Rewards, would allow for the school to produce their own energy and stop paying the power company for it. It would also be produced in a manner that would be relatively easy and friendly to the environment. However, as explained above the system needed to meet these demands would have to enormous and most likely cost the school millions of dollars. For these reasons, this option would not be the best choice for the school considering its needs at the moment. The Wind Source option provides the school with a much more accessible means to move to using renewable energy. It would require the school the pay more for its monthly energy bill but the average monthly payment increase would only be 9%. The positive aspects for this option are its accessibility; the fact that the school would not have to construct anything and it is relatively inexpensive. Finally, stressing that the main need of the school is an inexpensive way for the school to sign onto the ACUPCC's requirements, the Wind Source option offered by Xcel Energy constitutes the best alternative for the school to meet the ACUPCC requirement of producing 15% of its energy from renewable energy.

2.6 RecycleMania

The final requirement option to be undertaken while the main plan of the ACUPCC is being carried out is to compete in the national RecycleMania Competition (www.recyclemania.org); specifically in the Waste Minimization Category [1]. In this category, schools will compete to see which campus produces the least amount of solid municipal waste (both recyclables and trash) per person. This competition emphasizes reuse and source reduction over recycling [24]. Also per this line of action, three or more steps must be taken by the institution to reduce waste. The school would not have to win the competition, but taking three or more steps to reduce waste would improve its chances to win and make it eligible to sign onto the ACUPCC [1].

As part of the Competition, a weekly report would need to be posted [24]. This report would be a simple calculation of that week. Total Waste and Total Recyclables would need to be measured. These two totals would be added together and then divided by the number of students and faculty at mines. The resulting number would be reported as pounds per person to the competition. In order to

accurately record waste and recycling weight, trash bags and recycling containers would need to be weighed before they are disposed of.

Steps that could be taken by the campus to reduce waste are as follows:

Option 1: Replace all paper towel receptacles in bathrooms with air-hand-driers. This option would eliminate the waste of throwing away used towels. Also a case of paper towels costs $28 and if the school uses approximately one case every 3 days, eliminating paper towels could save the school about $3,407 per year [25].

Option 2: Require printed documents used in classrooms to be printed front and back, this requirement includes handouts from teachers and assignments turned in by students. This alternative would reduce the amount of paper used up by professors and students in class.

Option 3: Change food carriers and drinking cups used by the i-club and other such campus dining accommodations from paper to composite washable plates and cups (Example: such as plates and cups used in the Slate Café at the present). A case of paper plates costs $18.45. If Mines uses one case every week and the use of these paper plates was eliminated, then a yearly cost of almost $1,000 would also be removed from the school's budget [4]. Instead of being thrown away, cups and plates could be washed and reused as they are in the Slate Café.

Option 4: Remove vending machines from the campus. This removal would greatly reduce the amount of plastic bottle and aluminum can waste produced by students.

Option 5: Require at least 75% of all homework and handouts for each class to be handed in and passed out via email. Paper costs approximately $.016 per sheet [27]. A college uses a large amount of paper on a daily basis for class handouts and this translates into a large cost as well. This cost could be cut by up to 75%. This requirement would reduce the amount of paper used by teachers and students.

Table 5 – Decision Matrix for RecycleMania

	Option 1	Option 2	Option 3	Option 4	Option 5
Cost	8	9	6	4	10
Feasibility	5	10	4	3	9
Benefit	7	8	5	1	5

The above Decision Matrix compares the five options enumerated above in terms of cost, feasibility, and benefit (to students). A higher cost score means a lower cost to the school, a higher feasibility score means more feasible, and a higher benefit score means more beneficial to students.

→ Option 1 - the large cost score is due to the savings of not having to purchase paper towels, the smaller feasibility score is because most people don't like to use air-hand-driers over paper towels, and the higher benefit score is because air-hand-driers help to make peoples hands even cleaner so students would benefit from a more sanitary restroom.

→ Option 2 - the high cost score comes from the savings of paper from printing front and back, the very high feasibility score is due to the fact that most handouts are already printed front and back and those that aren't could easily be adjusted, and the high benefit score is because students will have less paper to haul around.

→ Option 3 - the lower cost score is due to the fact that purchasing more washable composite plates and silverware will have a high initial cost but they will pay for themselves over time (assuming students don't throw them away), the low feasibility score comes from the fact that the new dishes would need to be washed by students or the employees, and the medium benefit score comes from the fact that the plates would be more cumbersome to students and couldn't just be thrown away.

→ Option 4 - the very low scores hinge upon the fact that vending machines are a source of revenue for the school and students use them for snacks and would surely complain if they were removed.

→ Option 5 - the high cost score comes from the 75% reduction in the amount of paper bought by the school, the high feasibility score is attributed to the ease of using the internet and email to distribute documentation. The lower benefit score comes from the fact that some students might not check their emails. They might prefer handouts in class because that is what they are used to. Based upon the decision matrix the best three choices for the school are options one, two, and five.

Below is a table of results or of the current 2009 RecycleMania competition. Mines would be competing in the Waste Minimization Category. Shown are weekly reported values that would need to be met if Mines wanted to win [1].

Table 6 – 2009 RecycleMania results

Week	Grand Champion		Per Capita Classic		Waste Minimization		Gorilla Prize		
		weekly recycling rate (%)		**lbs/ person**		lbs/ person		lbs	
		2009	2008	**2009**	**2008**	2009	2008	2009	2008
1	50.18%	46.69%	1.45	**0.00**	**2.90**	3.08	44,420.00	43,875.00	
2	51.71%	54.92%	1.30	**0.00**	**2.52**	2.62	39,830.00	43,863.00	
3	52.15%	45.71%	1.48	**0.00**	**2.83**	3.18	45,120.00	44,450.00	
4	59.73%	40.44%	1.75	**0.00**	**2.93**	3.03	53,405.00	37,485.00	
5	45.48%	55.95%	1.40	**0.00**	**3.08**	2.74	42,790.00	46,864.00	
6	54.81%	51.97%	1.47	**0.00**	**2.67**	3.11	44,760.00	49,340.00	
7	59.46%	51.77%	1.54	**0.00**	**2.59**	3.16	47,090.00	49,910.00	
8	51.53%	52.38%	1.62	**0.00**	**3.14**	2.31	49,440.00	36,955.00	
9	45.29%	58.43%	1.08	**0.00**	**2.39**	2.72	33,025.00	48,490.00	
10		57.85%		**0.00**		2.87		50,640.00	

3.0 Conclusion

After a thorough examination of all six options the Colorado School of Mines could implement in order to meet the requirements of the ACUPCC agreement, the Green Solutions team constructed the decision matrix seen in Table 7. All final point values are out of 90 total possible points.

Table 7 – Final Decision Matrix

Option	Cost	Ease of Implementation	Return on Investment	Total
Multiplier	5	1	3	9
LEED Silver Buildings	10	10	7	81
Energy Star Purchasing	7	8	7	64
Air Travel Emissions Offset	4	10	2	36
Public Transportation	3	3	3	27
Renewable Energy	6	10	2	46
RecycleMania	8	2	5	57

Table 7 shows that the LEED and Energy-Star requirements are the clear winners of all of options for several reasons. The advantages of implementing a plan to build to LEED Silver Standards are very clear. The campus is currently implementing this requirement so Mines will not need to invest any additional revenue to re-design any future building plans. Building to LEED Silver standard does not incur any additional cost and green buildings can save 30% to 50% of energy costs when compared to their non-green counterparts [2, 3].

Implementing a plan to purchase only Energy Star certified products also creates several clear advantages. First of all, most Energy Star appliances do not cost any more than non-certified appliances. [8] Second, implementation of such a purchasing policy would be easy to implement on campus because one department purchases all of the appliances used by CSM. Finally, any additional costs of purchasing Energy Star appliances should be offset by the energy savings within one year. [8]

Although the other four options will also completely fulfill ACUPCC requirements and could also present both tangible and intangible benefits for the Colorado School of Mines, the Green Solutions team believes that options 2a and 2b of the ACUPCC requirements [1] are the best options for the Colorado School of Mines to complete in order to fulfill the sign-on requirements of the ACUPCC agreement.

4.0 Appendix A

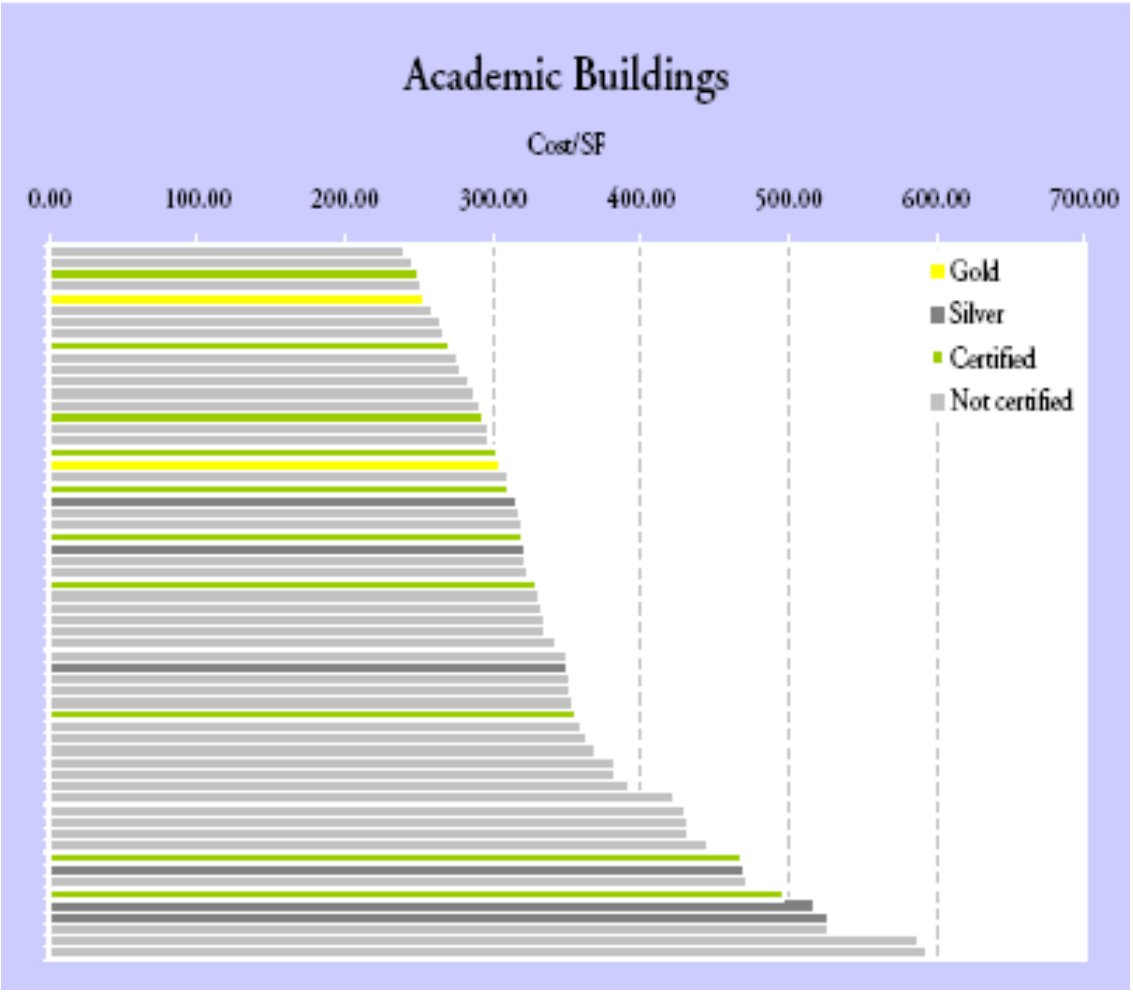

Figure 1 (Davis Langdon Study of LEED buildings)

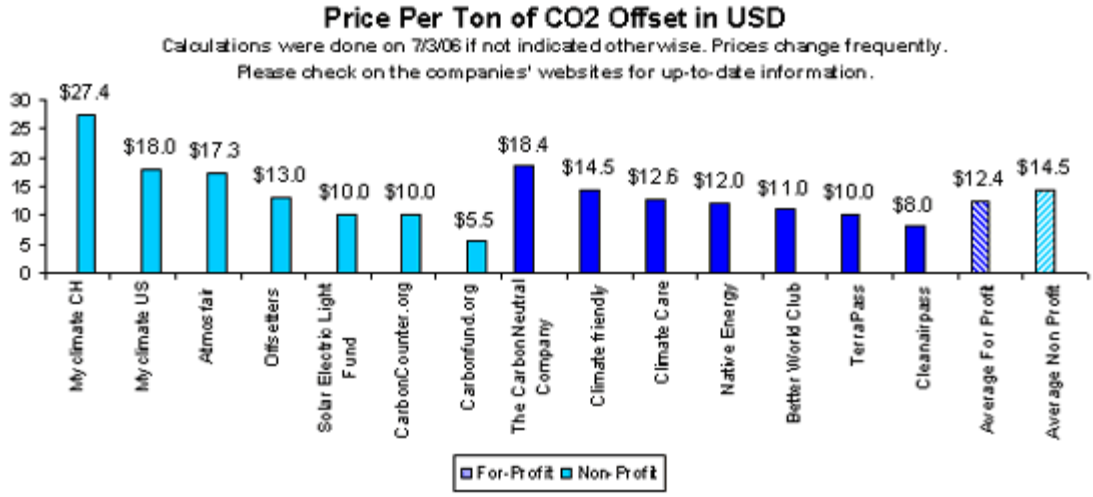

Figure 2 (TUFTS Study on Carbon Offset Costs)

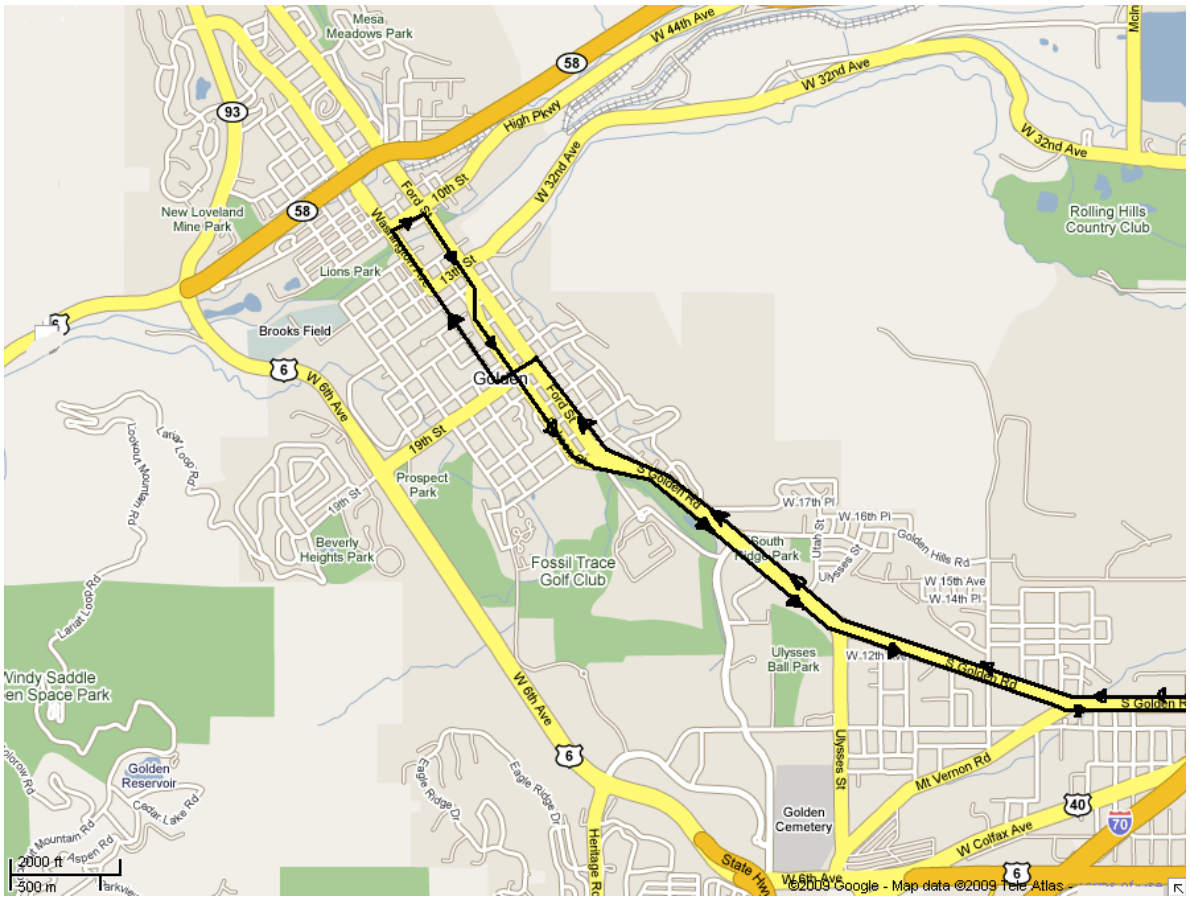

Figure 3 (Existing RTD City Bus Rout in Golden, Colorado, April 7, 2009)

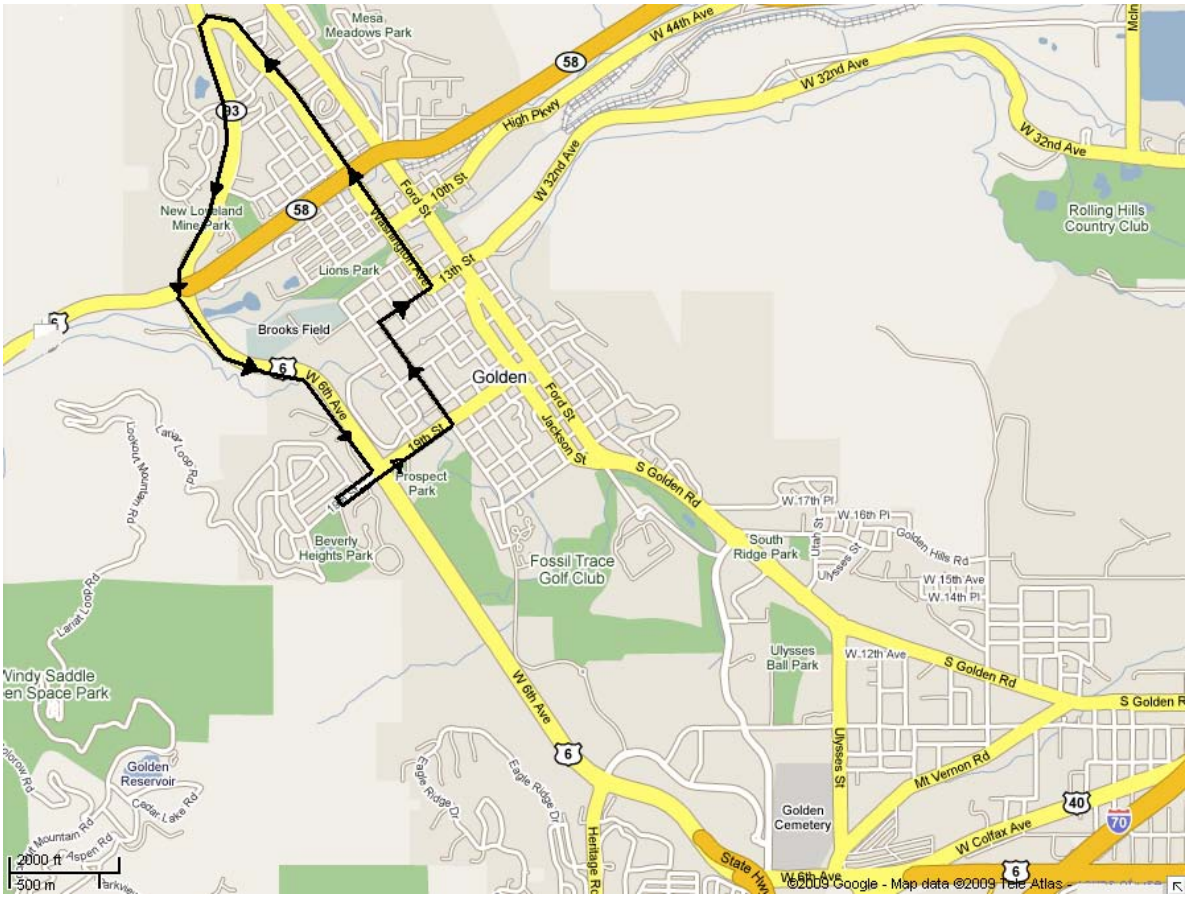

Figure 4 (Suggested City Bus Rout in Golden, April 7, 2009)

5.0 Citations

[1] American College & University Presidents Climate Commitment, “American Climate & University Presidents Climate Commitment”, *American College & University Presidents Climate Commitment*, 2007. [Online]. Available: http://www.presidentsclimatecommitment.org/html/commitment.php. [Accessed: Feb. 5, 2009].

[2] [Online]. Available: http://www.usgbc.org/ShowFile.aspx?DocumentID=3998. [Accessed: Feb. 7, 2009]

[3] Davis Langdon Cost evaluation, “Cost of Green Revisited”, 2007. [Online]. Available: http://www.davislangdon.com/upload/images/publications/USA/The%20Cost%20of%20Green%20Revisited.pdf , [Accessed: Feb. 7, 2009]

[4] Design Cost Data, “The Cost of LEED Certification”, *Design Cost Data*, 2009. [Online]. Available: http://www.dcd.com/insights/novdec_2005_22.html. [Accessed: Feb. 8, 2009]

[5] Building and Fire Research Laboratory, “Evaluation of LEED Using Life Cycle Assessment Methods”, *National Institute of Standards and Technology*, 2002. [Online]. Available: http://www.bfrl.nist.gov/oae/publications/gcrs/02836.pdf, [Accessed: Apr. 12, 2009]

[6] Dedicated Outdoor Systems, “LEED Green Building”, *Dedicated Outdoor Systems*. [Online]. Available: http://doas.psu.edu/leed.html, [Accessed: Apr. 12, 2009]

[7] Slavic, Robert, [Contacted: Feb. 25. 2009]

[8] Energy Star, “Purchasing and Procurement”, *Energy Star*. [Online]. Available: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing, [Accessed: Apr. 7, 2009]

[9] American College & University Presidents Climate Commitment, “Implementation Guide: Information and Resources for Participating Institutions,” *American College & University Presidents Climate Commitment*, p. 15, Sept. 2007. [Online]. Available: http://www.presidentsclimatecommitment.org/pdf/ACUPCC_IG_Final.pdf. [Accessed: Feb. 19, 2009].

[10] Carbonfund.org, “How We Calculate,” *Carbonfund.org*, 2008. [Online]. Available: http://www.carbonfund.org/site/pages/carbon_calculators/category/Assumptions/. [Accessed: Feb. 19, 2009].

[11] Climate Care, “our approach,” *ClimateCare*, 2008. [Online]. Available: http://www.jpmorganclimatecare.com/. [Accessed: April 4, 2009].

[12] The Climate Trust, “The Climate Trust’s Offset Portfolio,” *The Climate Trust*, 2007. [Online]. Available: http://www.climatetrust.org/offset_projects.php. [Accessed: April 4, 2009].

[13] Tufts Climate Initiative, “8. Price per ton of carbon offset,” *Tufts Climate Initiative*, revision 1.3, 2006. [Online]. Available: http://www.tufts.edu/tie/carbonoffsets/price.htm. [Accessed: Feb. 19, 2009].

[14] The Princeton Review, “Colorado School of Mines”, *The Princeton* Review. [Online]. Available: http://www.princetonreview.com/ColoradoSchoolofMines.aspx. [Accessed April 4, 2009]

[15] Introduction to Geophysical Exploration, “Regional and Local Topology”, *Colorado School of Mines*, 2003. [Online]. Available: http://galitzin.mines.edu/INTROGP/notes_template.jsp?url=INFO%2Ftopo.html&page=Other%20Information%3A%20Topography. [Accessed April 5, 2009]

[16] RTD: Regional Transportation District, “Golden City Bus Routes”, *RTD: Regional Transportation District*. [Online]. Available: http://www.rtd-denver.com/1284. [Accessed April 7, 2009]

[17] ACUPCC Reporting System, “Implementation Profile for University of Southern Maine”, *American College & University Presidents Climate Commitment*, 2007. [Online]. Available: http://acupcc.aashe.org/report.php?id=1913. [Accessed April 4, 2009]

[18] Xcel Energy, “Xcel Energy Solar Rewards”, *Xcel Energy*. [Online]. Available: http://www.xcelenergy.com/Business/RenewableEnergy/Windsource_/Pages/Windsource.aspx. [Accessed:

[19] Xcel Energy, “Xcel Energy Windsource”, *Xcel Energy*. [Online]. Available: http://www.xcelenergy.com/Business/RenewableEnergy/Windsource_/Pages/Windsource_Summary_of_Prices_Terms_and_Conditions.aspx. [Accessed:

[21] Organicpicks, “PART 1 - 10 THINGS TO KNOW BEFORE BUYING A SOLAR ELECTRIC SYSTEM”, *Orgainicpicks*, 2007. [Online]. Available: http://www.organicpicks.com/php2/solar_system. [Accessed: Mar. 3, 2009]

[22] Colorado Renewable Energy Society. “Denver International Airport Inaugurates 2-MW Solar Array”, *CRES*, 2008. [Online]. Available: http://www.cres-energy.org/clips/clips_08sep9dia.html. [Accessed: Mar. 3, 2009]

[23] Average Cost of Energy in Colorado, Available: http://michaelbluejay.com/electricity/cost.html , [Accessed: Mar. 3, 2009]

[24] Recyclemania, “Rules” *Recyclemania*, Available: http://www.recyclemania.org. [Accessed: Feb 15, 2009]

[25] ULINE, “Roll Towels and Dispensers” *Uline Shipping Supplies*, 2009. [Online]. Available: http://www.uline.com/BL_1110/?pricode=WO282. [Accessed: Feb 15, 2009]

[26] FoodServiceDirect.com, “Red Plaid Food Trays” *FoodServiceDirect.com*, 2009 [Online] Available: http://www.foodservicedirect.com/index.cfm/S/44/CLID/1533/N/91321/Red-Plaid-Food-Trays.htm. [Accessed: Mar 20, 2009]

[27] Office Depot, “HP- Copy and Multipurpose Paper White” *Office Depot*, 2009 [Online] Available: http://www.officedepot.com/a/browse/copy-and-multipurpose-paper-white/N=5+4224+302157&Ne=100/?cm_mmc=360i-_-Google-_-CTA_Campaign-HP_Paper-_-hp_paper. [Accessed; Mar 20, 2009]

Draft 8/24/09 WJH but embodied in the new core was increased

flexibility for the disciplines through the distributed science electives.

Table 1: *200617* Core Curriculum Proposal

Faculty Governance Actions

Curriculum Committee submitted its proposal to UGC December 2006 in three related sections: 1. Core Revisions and Distributed Science Proposal; (2) Activities Credit Proposal; 3. LAIS Cluster discontinuance proposal. The LAIS Cluster proposal was successful; the other two failed. A separate action by VP AA Nigel Middleton mandated substitution ofBELSI01 for SYGNIOl, thereby allowing CE to meet ABET accreditation requirements.

UGC and the Senate votes were split: UGC voted against and Senate voted for the proposed changes. Analysis of the proposal discussion and voting records shows no overwhelming consensus or opposition, nor identification of academic flaws; rather a myriad ofsmall issues that were department-specific. Without clear direction to voting faculty to consider the broader implications ofthe core, programmatic reasons controlled the outcome ofthe votes.

Work ofthe 2009·2010 Committee

Over the past year, the Curriculum Committee has re-visited the proposed changes to the Mines' core curriculum developed by this committee during 2005-2007. During that time-period, the Committee solicited input from a variety ofsources (e.g., academic departments, student life, athletics, etc.) through a variety ofdifferent mechanisms (e.g., surveys, interviews, directed inquiries, etc.) and the current committee wished to preserve much ofthat original work, merely updating to reflect new programs

and changed programmatic needs as appropriate. The current committee added a survey of core and distributed science requirements at several other science and technology institutions to support the development ofthe new proposal and also asked each DHDD to draft distributed science requirements (non-binding) for their programs to provide the committee with a sense for the impact of the current proposal.

The model presented below is one that attempts to retain many ofthe features of the core that faculty have reported as being of academic value, retain sufficient academic breadth across all disciplines and allow for increased flexibility of core Requirements for our various undergraduate degree programs, including the ABET -mandated Biology requirement for Chemical and Biochemical Engineering programs without increasing overall credit hours from the current totals. The revised core also removes the EPCIS II requirement for the non-accredited degree programs in Chemistry, Economics and Business and Mathematical and Computer Sciences. *Academic CQre Curriculum*

Course ID	Name	Credit Hours
MACSlll	Calculus I	4
MACSl12	Calculus II	4
MACS213	Calculus III	4
MACS315	Differential Equations	3
CHGN121	Principles of Chemistry I	4
PHGNlOO	Physics I	4.5
EBGN201	Principles of Economics	3
EPICS151	Design I	3
LAISI00	Nature and Human Values	4
SYGN200	Human Systems	3
Distributed HSS requirements		9
Distributed Science requirements		11-12.5