

Achieving Carbon Neutrality



2010

Central Washington University

CLIMATE COMMITMENT ACTION PLAN

Prepared by the Central Washington University
Carbon Reduction Task Force

In compliance with the
American College and University Presidents Climate
Commitment

EXECUTIVE SUMMARY

Central Washington University signed the American College and University Presidents Climate Commitment as a way of announcing their commitment to stewardship of the earth, energy conservation, and sustainability. The intent of the commitment is to guide this university towards a goal of carbon neutrality in all aspects of campus operations and educational pursuits. The Commitment joins CWU with over 550 other universities in realizing the importance of mitigating the impact of humans on their surrounding environment. The mission of The Climate Commitment Action Plan is to unify the efforts of all aspects of university operations to better the lives of our students, staff, and faculty, while reducing our impact upon the environment.

This document outlines the steps needed in order to reach our goal of becoming carbon neutral. The report introduces the problem associated with climate change and the basis for pursuing carbon neutrality. Methods to reach carbon net zero by 2030 are then detailed and recommendations are given towards each action/initiative initially presented by the American College and University Presidents Climate Commitment. Each action takes on an aspect of campus operations to be addressed. The relative importance or background of the topic has been discussed and is framed with discussion points, goals, recommended strategies, predicted timeline, and projected costs and expected savings. The report concludes with the process for plan implementation and tracking carbon reduction efforts.

Included with the report is the Greenhouse Gas Inventory for Central Washington University, serving as a supporting document to the Climate Commitment Action Plan. Together, these two documents reinforce the potential means for Central Washington University to continue their trajectory in being as transparent, sustainable, and carbon neutral as possible. By establishing a baseline review of emission sources through the development of a Greenhouse Gas Inventory, Central is now prepared to address each emission source with thoroughly researched and established solutions. The recommendations put forth in the plan, though not all inclusive, identify solutions that can remedy the effects of anthropogenically created carbon and carbon-equivalent emissions through physical and cultural changes to the campus structure.

Carbon reduction is not a quick-fix solution. The discussion and implementation of plans towards a carbon-free campus is a long-term commitment. Careful discussions and research has been undergoing review by our on-campus Carbon Reduction Task Force, a committee comprised of individuals from the CWU Presidents Office, faculty, facility managers, and students. An external advisory committee has been formed, incorporating members from Washington State legislature, Central Washington University Alumni, Ellensburg community, and public sector resource managers. The Carbon Reduction Task Force and the External Advisory Committee were created to ensure the solutions will meet the needs of the campus community and the public at large. The task force has recommended that a Sustainability Council be formed to accomplish the myriad tasks listed in this report. The concern for the Task Force is that the most effective system of internal reporting is used which ultimately reports to high enough level to be effective. Since climate neutrality actions may cause uncomfortable change to the status quo, the authority of the president will be likely necessary to implement change.

Questions and requests for more information regarding this report should be addressed to Pat Nahan (Manager, Engineering Services and Resource Conservation) at naahanp@cwu.edu or (509) 963 3335.

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INTRODUCTION

WHAT IS CLIMATE CHANGE?

Scientific theory and empirical data shows that human activities can dramatically alter and degrade the environment. Some of this damage, such as species extinction, is irreversible. Other changes, including habitat destruction and global warming, are likely to have serious, cascading effects that will persist for centuries, even millennia. Modern technology has supported a human population explosion: at the same time it has greatly multiplied the per-capita environmental impact. The evidence that global warming is underway, and that it is primarily caused by human emissions of “greenhouse gasses,” is overwhelmingly and essentially indisputable (IPCC, 2007). Concentrations of the primary atmospheric warming gas, carbon dioxide, are increasing rapidly. Humans burn carbon-based fossil fuels several million times faster than the rate at which these fuels can accumulate. The entire carbon content of fossil fuels is dumped into the atmosphere.

“Climate change” has been used as a euphemism for global warming, but in a sense it may be a more accurate description, because the effects of a general warming will not be distributed uniformly, and some regions might even experience lower temperatures. However, any significant climate change is likely to be harmful, if only because ecosystems, as well as civilizations, have optimized to live under current average conditions rather than for some other set of conditions. In order to slow the rate of increasing temperatures, it is estimated that 80% of the current global emission of greenhouse gases need to be curbed by 2050.

There are many steps that need to be taken in order to reduce our impact to the environment. Pursuing carbon neutrality is thought to be an effective way to mitigate climate change.

WHY CARBON NEUTRALITY?

The global challenge of reducing climate change cannot be solved through voluntary individual or community action. This document is not the place to discuss the methods for accomplishing that, but we can say that it will require national policies and international treaties as well as collaborative efforts between business and consumer entities.

However, a program such as the one outlined in this document could have effects far beyond the measurable emissions reduction that it achieves. This program is likely to be valuable as a pilot project, as a demonstration economically practical steps that are available immediately, and as an educational vehicle for students, staff, and the community. To the extent that CWU falls short of its ambitious goal of full carbon neutrality, the project could serve to illuminate areas where national action is required to provide incentives and research support. Even an “unsuccessful” effort to monitor and verify carbon offsets could serve as a valuable step toward an effective and meaningful carbon trading system.

The commitment that Central made to pursue carbon neutrality provides a cooperative moral imperative for CWU to do its part to solve one of the most serious problems of our age. As a

publicly supported institution, the university also strives to produce, as its graduates, responsible, thoughtful citizens who contribute more to the world than they take from it. The carbon neutrality initiative must be based on sound scientific and economic reasoning; it should utilize the best available technological knowledge from on and off campus; and it will need to learn and adapt as it goes along. With that approach as a foundation, this project will not only reduce the environmental impact of the university. Its successes will also serve as an inspiration for citizens and institutions everywhere.

ACUPCC AGREEMENT

In September of 2007, Central Washington University (CWU) President Jerilyn McIntyre signed a notable public statement along with a coalition of other higher education institutions: The American College & University Presidents Climate Commitment (ACUPCC). CWU has committed to becoming carbon neutral. The ACUPCC supports this commitment with a platform of actions to be undertaken by each individual collegiate entity, with ongoing carbon monitoring and reporting providing the basis for keeping track.

To achieve carbon neutrality, the campus commits to actions that eventually bring the campus to having no net carbon emissions, either through actions that reduce emissions to de minimis emissions (5% of institution's total emissions) and through carbon offsets.

This agreement binds CWU to finding means and standards in the pursuit of climate neutrality and to have a plan in place to do so by the summer of 2009. Central Washington University is committed to reaching this goal by identifying areas of energy conservation and efficiency, including finding alternative means to power the campus, while integrating all aspects of the commitment into the curriculum. ACUPCC is not the total answer to designing a comprehensively sustainable campus, but it is a significant move in the right direction.

With funding from the President's Spheres of Distinction program, the Carbon Reduction Task Force was created to develop a method for CWU to become carbon neutral. A Carbon Reduction Coordinator position was created to head up this task. Spheres funding was also allocated for a Sustainability Coordinator and development of an energy studies program, which gave backing to the carbon neutrality effort.

PURPOSE AND INTENT

The idea of carbon neutrality is not without controversy. To promote carbon-free enterprises, businesses and institutions have to shift their paradigm to embrace initiatives that may not coincide with current consumer demand. Central Washington University, though an educational institution, depends upon strong business foundations to meet the needs of their students. ACUPCC provides a series of actions to be undertaken by the university to invest in solutions that are environmentally responsible while potentially providing long-term financial returns on investments.

Higher education institutions have historically been testing grounds for revolutionary economical, societal, and environmental ideas. Universities are leaders when it comes to fostering new ways to approach fiscally responsible environmental awareness. By promoting carbon neutrality on campuses nationwide, it gears up our next generation for the issues that

they will face, and shows that pursuing carbon neutrality has benefits. This positive and engaging interaction between students, faculty, and staff encourages our communities, governments, and businesses to follow suit.

It is the intent of the ACUPCC to move forward in addressing the issues that cause climate change. Central Washington University needs to take an adaptive management approach towards implementing carbon neutrality on campus. Adaptive management offers institutions the flexibility to react to the rapidly changing technology and solutions to mitigate climate change as they move towards acceptable outcomes. Rather than locking Central Washington University into potentially unforeseeable impacts from implemented actions that may negatively impact our society and the environment, we want to allow ourselves to improve over time by using improving and new technology and developing a greater understanding in order to take financially secure steps toward climate mitigation.

NEUTRALITY DATE

ACUPCC suggests carbon neutrality as soon as possible. Carbon neutrality is considered 0% carbon emissions, with an exclusionary clause for *de minimus* emissions. *De minimus* emissions are cumulated carbon emissions from all sources equaling less than 5% of original inventory levels.

The carbon reduction committee believes that Central Washington University can be carbon neutral by 2030. This carbon neutrality date allows for current and projected technological, environmental, and economical developments steps towards the mitigation of carbon based emissions.

This date for carbon neutrality allows Central Washington University to establish solid efforts that realistically help reduce the overall climate footprint. Carbon neutrality requires us to manage our efforts to reward life cycle payback instead of focusing on one-time economic payback or lowest first cost solutions. By 2030, we hope to have a system in place that does not rely on carbon trade-off or offset programs to mitigate our remaining footprint.

The task force has decided the best mode of operation for reducing carbon emissions is to target each tangible action and follow the recommendations through until complete carbon neutrality is met. Please be advised that the ACUPCC attempts to address all carbon emissions generated by Central Washington University but is not all inclusive. The ACUPCC attempts to address related state and federal policies that may apply to carbon emissions. Carbon emissions-based State and Federal statutes are expected to become a key part of American political and social structures.

INSTITUTIONAL STRUCTURE

CARBON REDUCTION TASK FORCE CHARGE

CWU is a comprehensive university with several departments related to carbon reduction activities. CWU's interdisciplinary Carbon Reduction Task Force members consist of faculty from Chemistry, Industrial and Engineering Technology, Geology and Environmental Studies, and Geography and Energy Studies, and staff from Facilities Management. Graduate and undergraduate students play an integral part of the work performed by this group in research and ideas for the action plan. This group also has a liaison to the President's Office, and works with an external advisory committee comprised of knowledgeable representatives of the community, the Board of Trustees, and the Alumni Board.

INTERNAL COMMITTEE AND PRIMARY TASKS

Roger Beardsley, IET Professor/**Bill Bender**, IET Chair and Professor:

- analysis of current situation with alternatives recommendations, with a special focus on engineering technologies
- feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one graduate or undergraduate student in technology development and continuous energy improvements
- inclusion of carbon and energy information into engineering and construction management curriculum

Karen Bicchieri, Sustainability Coordinator:

- Chair of Carbon Reduction Task Force
- feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- inclusion of carbon and energy information into engineering and construction management curriculum

Carey Gazis, Geology Professor, Environmental Studies Program Coordinator:

- contributions to the feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities, with a special focus on environmental issues

- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one graduate or undergraduate student in environmental analysis and curriculum development
- inclusion of carbon and energy information into geology and environmental studies curriculum

Peter Gray, Economics Professor, College of Business:

- economic feasibility study on energies, methodologies, and policies which will reduce carbon creation from campus operations and activities
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- inclusion of carbon and energy information into economics curriculum

Jim Huckabay, Geography Professor/ **Holly English**, Energy Studies Program Director:

- contributions to the feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities, with a special focus on energy issues
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one graduate or undergraduate student in alternative energy analysis and curriculum development
- inclusion of carbon and energy information into geography and energy studies curriculum
- update the Energy Studies Program:
- organize interdisciplinary meetings to discuss and promote energy policies, education, and research at CWU
- complete the update of the existing Energy Studies Program
- develop a new 300-level general education studies class designed to increase enrollment in the Energy Studies Program, and determine the best method of offering this class.
- develop 2-credit internship possibilities within the university and community dealing with regional and community energy issues
- expand opportunities for collaborative discussions among CWU, educators, the agricultural community, entrepreneurs, and government officials about the future of regional energy resources and sustainability
- promote Science, Technology, Engineering, and Mathematics (STEM) fields in support of national initiatives set forth by NSF and other government agencies

Anne Johansen, Atmospheric Chemistry Professor:

- equipment research and eventual purchasing for baseline carbon monitoring
- analysis of data for a baseline of CWU's atmospheric greenhouse gas contributions
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one graduate or undergraduate student in monitoring and analysis
- inclusion of carbon and energy information into chemistry curriculum

Pat Nahan, Senior Engineer:

- development of a monitoring plan, with special focus on mechanical engineering, monitoring regulations, and existing emissions compliance
- liaison between operational staff (FMD) and the task force
- integration between task force proposed activities and FMD operations
- feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one administrative assistant and service learning students
- inclusion of carbon and energy information into engineering and construction management curriculum

Bill Vertrees, Vice President: Office of Business and Financial Affairs

- budget responsibilities as an active contracting and financing officer
- inclusion of capital and operating budget items for carbon reduction activities
- integration between task force proposed activities and FMD operations
- feasibility study on energies, methodologies, and policies which will reduce and eventually eliminate carbon creation from campus operations and activities
- contributions to the development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- guidance and mentoring for one administrative assistant and service learning students

Gretchen Volker, Carbon Reduction Coordinator:

- coordinating logistics of the task force: working with various stakeholders, scheduling and leading meetings, recording minutes, disseminating correspondence to and within the task force, and collaborating various ideas into a streamlined product
- liaison between Climate Commitment organizations and the task force
- research, review, and develop information for the public
- development of a comprehensive plan, with goals, objectives and initiatives, to create a zero-carbon campus
- completion of the Climate Report, Greenhouse Gas Inventory and necessary record keeping for future inventories

Gary Baldevia, graduate IET student

Lura Bradford, undergraduate Environmental Studies student

Casey Dombert, graduate Resource Management student

Maria Lucas, liaison to President's Office

Kurt McCanless, undergraduate Environmental Studies student

Stephen Morton, undergraduate IET student

Jeff Perkins, undergraduate Environmental Studies student

Sarah Rybka, undergraduate Chemistry student

Allison Shriner, undergraduate Geography student

EXTERNAL ADVISORY COMMITTEE

EXPECTED ROLE

Due to their involvement in the local and regional community, these members provide valuable insight to various aspects of the ACUPCC recommendations. This group reviewed, commented, and offered changes as appropriate to this Climate Commitment Action Plan.

MEMBER QUALIFICATIONS

Craig George is the owner of Foothill Farms, Thorp, WA and serves on the Board of Directors for the Ellensburg Chamber of Commerce. His knowledge and commitment to Ellensburg and Kittitas valley is valuable in ascertaining the connection of the community to Central Washington University.

Brian Lenz works for Puget Sound Energy as Central Washington's community relations manager. He serves Kittitas, Chelan, Columbia, and Douglas County. His involvement with the Wild Horse Wind Farm project provides valuable knowledge for Central's accurate assessment of renewable power feasibility on campus.

Bob Moco graduated from Central Washington in 1973 with a B.A. in Business, 1976 with a B.A. in Education, and in 1980 with a Masters. He retired from Goldendale School District as the Vocational Director and high school Vice-Principal in Kennewick, WA. He pioneered the school-to-work program and would be beneficial in verifying educational curriculum goals. Bob Moco is a member of the CWU board of Alumni and currently resides in Goldendale, WA.

David Reeploeg is a congressional support staffer to Senator Maria Cantwell who is serving on the Washington State Senate Board for the Democratic Party. David Reeploeg serves out of District four, based in the Tri-Cities. Senator Maria Cantwell serves on the Senate Commerce for Oceans, Atmosphere, Fisheries and Coast Guard as the Chairman, for the Science, Technology, and Innovation Sector, and on the Senate Energy Natural Resources Assignment with emphasis on Energy, Water, and Power.

Bob Titus serves as the Energy Services Director for the City of Ellensburg. He also serves as the secretary/treasurer for the Northwest Public Power Association and would be able to determine whether the path we are going down is feasible economically and technologically.

EXISTING SITUATION

GREENHOUSE GAS INVENTORY

Central Washington University is using the Clean Air, Cool Planet calculator in order to inventory carbon emissions from various current campus operated sources. This calculator is the primary calculator used by higher education institutions across the nation, and is the recommended reporting tool for campuses when declaring emission numbers through Association for the Advancement of Sustainability in Higher Education (AASHE). By using a standardized inventory method, it provides a basis for comparison between colleges with similar demographics. The inventory is comprised of:

1. **Emissions from the central boiler plant and minor boilers** – current emissions calculations for the Central Plant are derived from fuel consumption monitoring and reporting. Current emissions calculations for Wahle, SURC, and Student Village minor boilers are derived from fuel consumption monitoring and reporting. (12,156 Metric Tonnes CO₂ emitted)
2. **Electricity consumption** – carbon dioxide emission calculation for campus-wide purchased electricity purchased from the City of Ellensburg. The City of Ellensburg is a customer of BPA, with 85.56% of the electricity fuel mix consisting of carbon emission free hydropower and 10.91% consisting of carbon emission free nuclear power. (1,262 Metric Tonnes CO₂ emitted)
3. **Transportation** – (5,599 Metric Tonnes CO₂ equivalent emitted)
 - Air travel** – calculated by utilizing financial information provided by the in-house CWU PeopleSoft program. A policy is being reviewed to incorporate the actual number of miles flown into the PeopleSoft program in order to ensure accurate tracking of information. (3107 Metric Tonnes CO₂ equivalent)
 - University sponsored vehicle travel** – current emissions calculations are monitored by tracking bi-weekly purchases of diesel and unleaded gasoline, for both the on-campus and off-campus fleet travel. Further tracking of university fuel use for official business is monitored through travel records which reimburse university-related vehicle travel. (Motorpool, 575 Metric Tonnes CO₂ equivalent for gasoline fleet, 55 Metric Tonnes for diesel fleet)
 - Personnel/student related vehicle travel** – commuter related travel is considered by determining parking passes sold during the fiscal year. An overall aggregation of zip codes and “normal” work week is superimposed onto the total amount of parking passes. This method is a fairly conservative method of determining overall campus commuting statistic. (Faculty Commuters, 240 Metric Tonnes; Student Commuters, 1621 Metric Tonnes)
4. **Refrigerants and Chemical use** – The use of HFC-404A and HCFC-22 in Central Washington University’s cooling system are included in the inventory report due to the highly intensive greenhouse gas potential of these chemical agents. (211 Metric Tonnes CO₂ equivalent emitted)

5. **Agricultural uses** –Nitrogen based fertilizers are used on CWU’s campus and is included in the inventory report as CO2 equivalent. Since CWU sponsors the CHCI, the maintenance upkeep of 3 chimpanzees is included in the footprint as well. (Combined 16 Metric Tonnes CO2 equivalent emitted, not depicted on pie chart)

6. **Solid Wastes** – Central Washington University waste management is operated by three different entities on campus, however all three entities waste end up in the same landfill. The waste is ultimately sent to the Wenatchee Landfill, which has no current utilization method for CH4 Flaring or electricity conversion. It is estimated that Central Washington University sends a cumulative 900 short tons of waste annually. (890 Metric Tonnes CO2 equivalent emitted)

7. **Offsets** – Three types of carbon emissions offsets are accepted in the Clean Air Cool Planet inventory, green electric credits, composting, and forest preservation. Currently, CWU qualify for composting credits through the passive lawn waste compost pile. We could also claim electricity credits, but the current fuel portfolio mix contains less than .001% ‘green’ energy. (-14 Metric Tonnes of CO2 offset)

The inventory has been completed for the 2006-2007 fiscal year. The 2007 fiscal year runs from June 2006 to June 2007. The data was predominantly collected from Central Washington University Institutional Research, Facilities Management, Parking Services, and financial information within the on-campus PeopleSoft program. Some of the information was analyzed based on statistical averages and act as a best-guess value until a more precise survey system is put into place.

Overall CO2 (equivalent) emissions for CWU (20,120 Metric Tonnes)

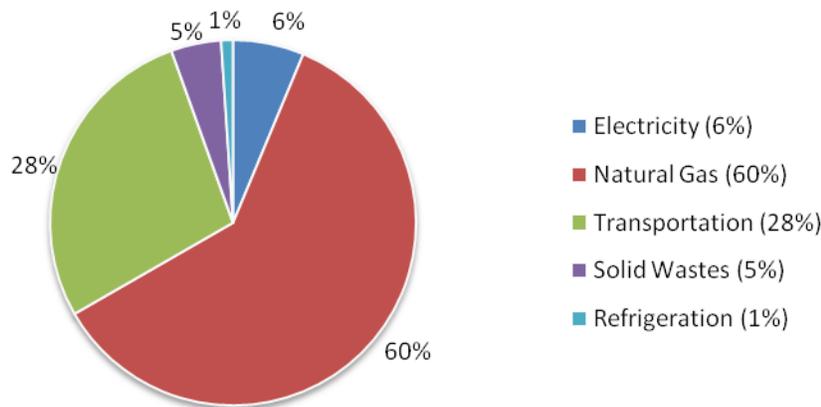


Figure 1.1 – Pie Chart of 2007 Greenhouse Gas emissions source for Central Washington University.

The inventory is comprised of 3 different scopes of emissions: scope 1, direct emissions; scope 2, partially direct emissions; and scope 3, indirect emissions. Direct emissions are

considered emissions that are a direct result facility operation for Central Washington University (on-site fuel combustion, university owned vehicle travel). Partially direct emissions are emissions that supplement operation standards for Central Washington University (purchased electricity). Indirect emissions are emissions yielded from university sponsored use (employee travel, product use, waste disposal). The differentiation of scopes is important when identifying tangible results. Direct emissions are the easiest to identify, and yet the most expensive to remediate.

CAMPUS BOILER EMISSIONS MONITORING

For our initial carbon footprint calculations, boiler emissions are estimated from fuel consumption. In the future, it is expected that gaseous and particulate monitoring of emissions from the boilers will be performed to estimate (a) the concentrations of gasses, and (b) the amount of particulate emissions and concentrations of selected chemical components within the particles. As part of the educational component of this project, the monitoring, data analysis, and interpretation will be performed by undergraduate and graduate students under the supervision of a chemistry faculty. Future plans include exposure of this monitoring system to students in environmental chemistry (CHEM 345) and instrumental analysis (CHEM 452) classes, as well as in industrial engineering technology MET 411 (Energy Systems) and MET 495.

The intellectual motivation of this part of the project stems from the fact that CO₂ is not the only greenhouse gas emitted during the burning of fuels, and that other, toxic and atmospherically reactive, components are emitted that may be playing a significant role as well. Unburned hydrocarbons (currently, methane, CH₄; but potentially longer chained), oxidized atmospheric Nitrogen, N₂ (i.e., NO_x and N₂O), and other minor components contained in fuel (e.g., sulfur and trace metals) are contributing to heating of the atmosphere as well as to producing acidic and toxic aerosol particles. Thus, in order for us to obtain a complete picture of emissions in the context of climate change, it is imperative that we do not limit ourselves to CO₂ emissions estimates, but that we accurately determine the release of other greenhouse gases and components that affect public health.

As Central researches alternative fuel boiler systems, there will be a need for emissions monitoring on these new fuel source boilers. Monitoring equipment will be purchased when new boiler systems are put in place to test for the presence of other potentially atmospheric reactive compounds that may be emitted by new, unknown fuel sources.

STRATEGIES TO ACHIEVE CARBON NEUTRALITY

This section reviews, as comprehensively as possible, actions that CWU can implement to reduce carbon and other greenhouse gas emissions. Taken together, the actions can bring the university to net-zero in the long-term. The actions fall into major categories: sustainable consumption, green building, transportation, climate and sustainability shareholder investment, waste minimization and recycling, and education. Further recommendations are made to develop a permanent in-house Sustainability Council comprised of key members within each branch of university operations.

Some of these actions are already part of campus operations. Recommendations stated in this report may increase the commitment level of an already implemented action in order to improve the effectiveness of the selected action. For example, while a carpool program does exist, the university should ramp up efforts to increase commuter and university-related carpool travel through unique programming and incentives.

Other actions may be implemented immediately as general policy, such as green building standards or recycled content product purchasing. This is not to imply that there won't be possible delay time in incorporating these new standards into future operating standards. Capital projects are initiated with a lead time of sometimes up to a decade, and all actions are impacted by unforeseeable funding constraints as well as rapidly changing technological standards.

There are some activities listed in this report which have serious funding implications. One example of this is switching fuel sources in the current central boiler to a combined bio-fuel boiler. At a minimum, the boiler would need to be retrofitted and a fuel storage area would need to be created. The expected timeframe for this action is contingent upon securing funding, or when a boiler needs replacement due to its normal expected lifespan.

Each recommended action is broken up into sections. Discussion and goals of the actions are followed by recommended strategies, predicted time-line and projected costs. Though we try to be as comprehensive as possible in analyzing each action and its anticipated effects, we also realize the changing dynamics of technology and environments.

One common goal is evident throughout all the tangible actions: to incorporate carbon reduction measures in capital budget and planning programs as soon as possible. CWU has the opportunity to break away from the traditional operating standards. There is potential to restructure academic schedule in order to reduce overall goal of energy conservation.

SUSTAINABLE ENERGY CONSUMPTION

DISCUSSION

Central Washington University's 2007 inventory indicate that approximately 66% of the campus's carbon emissions come from burning natural gas (60%) and purchased electricity (6%). This is approximately 13,418 metric tonnes of carbon dioxide emitted into the atmosphere annually.

The dominant source of greenhouse gas emissions from CWU's operation is from combustion of natural gas in the central steam boiler plant for campus space heating and production of domestic hot water. Since natural gas is a fossil fuel, all carbon dioxide emissions from this fuel add to the global warming phenomenon. Renewable biofuels from agricultural wastes and/or forest thinning wastes represent possible sources of adequate fuel stock to significantly offset our natural gas consumption.

While bio-mass boilers are a viable solution for net zero carbon emissions, they will remain problematic until specific fuels availability process and shipping is resolved. Once the technology for refining and the continual cycling process is confirmed, a large scale bio-mass boiler can be constructed. Creating or buying alternative energy will reduce the climate impact of the campus energy use. It will also serve to promote the newer industries and growth of technologies. CWU should strive to incorporate renewable energy sources into buildings or a centralized production area to offset energy production emissions from fossil fuel operations.

The current fuel mix for electricity in central Washington is predominantly generated from large scale hydropower (85%). All electricity utilized by Central Washington University is imported from the City of Ellensburg Municipal Utilities. Electricity prices for the university are significantly lower than the national average. CWU pays approximately \$.05/kwh, making on-site renewable energy a difficult fiscal choice.

Central Washington University's first priority is to invest in conservation measures that directly impact the university's energy consumption and would like to avoid cap and trade schemes that may not resolve unmitigated on-campus energy consumption. For example, with state limited funding, CWU could reach their cap and trade budget cap without being able to fully heat or cool all buildings, making it economically mandatory to shut buildings during peak use (fall and winter).

There is an additional opportunity in the buildings not connected to the centralized plant for heating and cooling, where changes to the central plant would not affect the emissions associated with those buildings. These minor boilers may be a good place to experiment the viability of burning alternative fuels.

The CWU Campus Facilities Master Plan includes a section on resource use. It is stated that conservation is of high priority in campus development and operations for environmental, economic, and infrastructure capacity reasons. CWU has led an aggressive and award-winning program in energy efficiency and conservation, and plans to continue this effort.

CWU's current method for electricity and gas conservation is the "Trilogy Program" aimed at reducing resource use and subsequently avoiding costs. This program is a three point plan to: 1) implement facility energy projects to reduce energy use; 2) completely meter electricity and gas usage of buildings and central plants; and 3) implement managerial changes using metered data to maintain energy savings, identify new energy-conserving projects, and use a continuous improvement process.

GOALS

Reduce the carbon footprint of the university by pursuing green-power alternatives, promoting conservation, and reducing the reliance of the university upon fossil fuels.

RECOMMENDED STRATEGIES

- 1. Conserve energy as much as possible.**
 - a. Use best-available technologies to maximize and improve energy efficiency on new and existing buildings.
 - b. Create a list of buildings in order of need for energy retrofits.
 - c. Continue energy conservation strategies such as the monitoring and adjustments made by the Performance Operations Task Force.
 - d. Implement automatic devices that regulate energy output or shutdown unit when not in use (vending machines, computers on network, etc.).
 - e. Restructuring academic calendars to utilize seasonal climate patterns.
- 2. Continue conservation and continuous improvement strategies for existing buildings.**
- 3. Purchase fossil fuel independent light-duty maintenance equipment.**
- 4. Purchase or procure renewable, emissions-free energy.**
 - a. Central plant fuel adaptation
 - 1) Biomass burning for boiler fuel
 - 2) Combined (heat and power) using biofuels (agricultural wastes)
 - 3) Combined (heat and power) using natural gas (current fuel use)
 - b. Renewable energy purchasing
 - c. On-site or local renewable energy production

PREDICTED TIMELINE

Central Washington University has a strong energy conservation ethos. Continuing with this mindset increases the potential for CWU to follow the curve of success towards carbon neutrality. The current electrical carbon footprint is artificially low due to the regional dependence on hydropower and most likely will continue to be so. Depending on state funding, boiler life-cycle, improving

technology, and rising energy costs, the timeline potential for this action is highly variable.

This action can be implemented quickly if:

Central Washington University had complete funding, university agreement and resources. This action is not recommended for immediate implementation because of the rapidly improving technology and the un-tested nature of alternative energy forms.

This action could be implemented within 5 – 10 years if:

Central Washington University had complete funding, university agreement, enough partial funding to borrow the remainder of costs to keep a neutral cash flow in utility costs, and a committed long term supplier of biofuels. This action is likely to be initiated within the next 10 years but most likely will not come to fruition within 10 years, due to the lengthy proposal, bidding, and building process of project implementation. It is likely that technology will have stabilized to a few established and tested forms of alternative energy. Central Washington University wants to utilize equipment that has proven track records and long life spans.

This action could be implemented within 20 years if:

Central Washington University had complete funding, university agreement, and resources. It is possible for Central Washington University to have a fully operational boiler plant in place by 2028, contingent upon funding and technology.

PROJECTED COSTS AND EXPECTED SAVINGS

The boilers are aging (now over 30 years old) and are in need of a sequenced replacement to maintain reliability of the critical demand to heat the campus. CWU will continually evaluate the feasibility of modifying the central steam plant to be compatible with biofuels. Issues such as capital funding, long term availability, fuel transportation, processing requirements, stack emissions, and availability of fuel handling and boiler technology must be addressed satisfactorily before realizing this alternative. Building a new boiler plant requires a major source of capital funding, a competent bidder, and established technology. It is unlikely that financial commitments will be made for technologically untested alternative energy systems. The benefits of renewable energy are plentiful, after initial start-up costs.

Since the costs and savings of any form of renewable power is highly variable due to regional influences, geographical location, and knowledge of future commodity costs, it is difficult to fully ascertain the most appropriate choice of renewable energy production for Central. Currently, the least costly form of renewable resource is wind power (Wolfson, 2008). However, the effectiveness and potential for photovoltaics make it an eventual potentially viable solution. Kittitas County has both abundant wind and solar resources and CWU is constantly reviewing the potential for bringing on improving renewable technology into their energy portfolio.

GREEN BUILDING

DISCUSSION

Buildings constitute 39% of total energy consumption and carbon dioxide emissions in the United States. The United States accounts for over 25% of global greenhouse gas emissions. The materials chosen for construction play their part in climate change by the amount of energy required to manufacture, apply, renew, or dispose of them. Worldwide, buildings account for 40% of material energy use.

Current and projected future energy prices are also an important factor to consider in the construction or remodel of buildings. In the last decade, we have watched the price of natural gas rise over 211%. The price of electricity has risen over 123%. Energy conservation and increased efficiency is a proven result on CWU's campus, saving the budget over \$2 million in annual costs. Statistics show that building green typically adds 1-5% on average to the construction costs, but can save 8-9% on operations annually. Designing buildings to the most efficient systems and keeping the focus on conservation is important for both the economics and the carbon footprint of the university.

Central Washington University recognizes that the type of buildings we choose to build and operate will have a significant impact on climate change, either positively or negatively, for their expected life cycle. CWU is committed to energy efficient design and environmental best practices for all new buildings and major remodels as part of its mission of a sustainable campus.

GOALS

Implement sustainable and environmentally-sound construction practices. Minimize energy use during construction phase, by implementing energy conservation into structural and electrical core of building plans, and create buildings that produce net-zero emissions.

RECOMMENDED STRATEGIES

- 1. Reduce climate change/greenhouse gas emissions coming from on-campus development.**
 - a. Use best-available technologies to maximize energy efficiency on new buildings.
 - b. Use passive energy as much as possible.
 - c. Incorporate energy saving technology such as ground source heat pumps and solar water heating into major capital projects.
 - d. Produce renewable, emissions-free energy on site.
 - e. Experiment with net-energy producing buildings.
 - f. Avoid using refrigerants with high ozone depletion or greenhouse gas potential.

- 2. Continue conservation and continuous improvement strategies for existing buildings.**
 - a. Minimize energy use by incorporating energy efficient design features and by installing energy efficient equipment in new buildings and major remodels.
 - b. Incorporate life cycle cost analysis into the planning process to enable comparisons in utility, servicing, maintenance and decommissioning costs between different building designs.
 - c. Continue aggressive conservation and efficiency upgrade programs for existing buildings.
 - d. Develop mixed-use design features that enable easy re-use, remodeling and expansion of buildings to meet the changing needs of the university.
- 3. Consider full life cycle (including total operation costs) costs when budgeting new capital projects and major renovations.**
 - a. Utilize cost/benefit analysis matrices, use lifecycle cost analysis (LCCA) and total cost/conservation operations in the design development and bidding process.
- 4. In products and materials used in construction and operation, consider both the impact from use and the embodied energy within the product.**
 - a. Minimize the impact of materials procurement by reusing materials wherever appropriate, and encourage preference for low embodied energy materials, recycled products and products from renewable sources.
 - b. Minimize waste during construction through the reuse and recycle of materials.
 - c. Minimize waste during operation through the provision of internal space for recycling facilities.
 - d. Incorporate a construction waste management policy for all major capital projects.
- 5. Consider the holistic environment of the building.**
 - a. Minimize the change to land use by protecting the local area during construction and reinstating the site with appropriate native plants beneficial to wildlife.
 - b. Minimize water consumption by incorporating grey water reuse and by installing no flush/low flow water plumbing fixtures.
 - c. Minimize pollution with particular attention to light and the avoidance of refrigerants
 - d. Promote a built environment with attention to the culture, history and access to the local community.
 - e. Develop buildings within ¼ mile of public transport options or adjacent to pedestrian routes that incorporate bicycle facilities and limit the provision of car parking.
- 6. Create educational materials for all on-campus green development to showcase and teach.**
 - a. Promote education in sustainable design and engage students from multiple disciplines to work on campus projects.
 - b. Research and experiment with net-zero carbon producing fuel sources.

7. Capital budget requests for all buildings should keep carbon emission reduction in mind.

PREDICTED TIMELINE

This action could be implemented immediately if: a policy were written and funding prioritized in all new capital projects.

This action could be implemented within 5 – 10 years if: Savings from other capital projects utilities were put into a fund for investment in highest energy efficiency in mechanical, HVAC, refrigeration systems, and building envelopes.

This action could be implemented within 20 years if: The market trend toward highly energy efficient technology and are employed in all major capital projects.

This action would never be implemented if: Lowest initial costs are always given priority.

PROJECTED COSTS AND EXPECTED SAVINGS

The financial benefits of building green are multi-fold. The initial costs may be offset by the type of green building measures implemented. Investment in the best technology for building energy envelopes, renewable energy sources, and mechanical systems can have the highest first costs with long term payoff.

Some green building elements can be implemented with no additional cost, by proper planning from the start. Examples include building orientation or the use of xeriscaping.

PRODUCT CONSUMPTION

DISCUSSION

The waste stream at CWU is already reduced by several programs in place. Energy Star purchasing, product retention, and surplus sales all lead towards the reduction of the overall campus carbon footprint.

Energy star purchasing is addressed by adding the following statement to bids/quotes/RFPs relating to energy products and consumption:

The University prefers to buy products that are Energy Star Compliant whenever possible. Please provide all pertinent and verifiable information with regard to Energy Star Compliance. The bidder is responsible to clearly and specifically indicate the product being offered and to provide adequate information to enable the university to determine if the product offered meets the requirements of this solicitation. Verification from the manufacturer of Energy Star Compliance must be provided.

On-campus product retention is practiced in order to reduce the expenses of buying new replacement parts for newer appliances, to maximize the life-span of any given product, and to establish uniformity throughout campus appliances and equipment.

The university is required by law to maximize use of all campus assets and, when there is no further use for them on campus, to maximize returns on their sale, as state agencies are not allowed to give surplus property away. The Surplus and Asset Management Department is the only CWU department authorized to dispose of surplus property. Their primary role is to ensure the excess property generated by CWU will be handled in a method that both maximizes the return to the University and meets the disposal requirements of the State and Federal governments.

Furthermore, CWU has been involved with recycling and purchasing recycled products since the late 1980s.

GOALS

Integrate conservation ethos towards product consumption and procurement. Support local or regional vendors if possible and minimize indirectly caused emissions by packaging various orders to Central Washington University together.

RECOMMENDED STRATEGIES

- 1. Purchase Energy Star rated electronic products and appliances.**
 - a. Add or keep “energy efficiency” as a value on product bid forms.
 - b. Encourage individual/personal and departmental purchases of appliances that are energy efficient or Energy Star.

- 2. Purchase environmentally friendly products and consider both the impact from use and the embodied energy within the product.**
 - a. Give priority to environmentally-friendly choices in purchasing.
 - b. Ensure order forms have alternative environmental product choices at equal costs to purchaser.
 - c. Prevent or charge for large-scale printing projects, promote on-screen computer review.
 - d. Initiate department competition to see who can purchase the least amount of product.
 - e. Funnel money saved from budget into conservation or carbon reduction projects.
 - f. Purchase locally made products where possible, especially locally grown produce.
 - g. Purchase products with minimal packaging through bulk orders and innovative packaging solutions.

- 3. Continue product retention and recycling.**
 - a. Retain difficult to find parts for re-use in dorm and housing equipment.
 - b. Consider extending the acceptable “expected life” range of university owned vehicles and purchase re-manufactured repair parts.

- 4. Promote campus surplus sale.**
 - a. Have lawn sales during the first week of quarter for students.
 - b. End of quarter advertising drive encouraging students to donate their unwanted usable stuff.
 - 1) Provide donation area for students to use.

PREDICTED TIMELINE

This action is already being implemented, and can be increased on a regular basis.

PROJECTED COSTS AND EXPECTED SAVINGS

Economic savings are based on durable products that don’t need replacement or disposal and are difficult to quantify. They are also in the form of intangibles with our current accounting and product tracking systems.

CAMPUS VEHICLE USE

DISCUSSION

Central Washington University's geographic location allows for easy commuting from four major metropolitan cores less than three hours away (Wenatchee, Spokane, Seattle, Yakima). Central Washington University educational curriculum boasts of strong geology and geography programs, primarily due to their close proximity to educationally-rewarding areas (Okanagon Plateau, 4 different biomes within 4 hours of Ellensburg, etc.).

Transportation CO₂ equivalent emissions

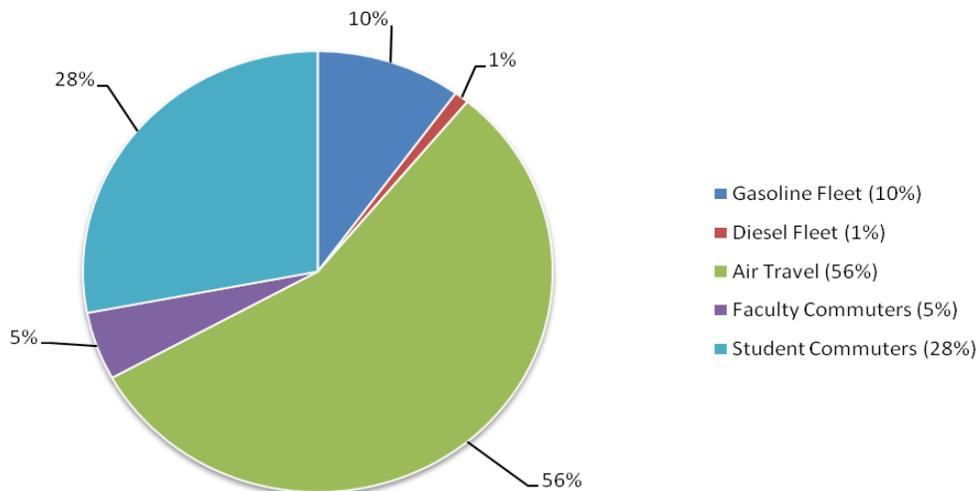


Figure 1.2 – Pie Chart of 2007 Transportation emissions source for Central Washington University. Please review Greenhouse Gas Inventory for more in-depth review.

There are three separate Campus-Sponsored Vehicle Transportation units: the motorpool fleet, the mechanical fleet, and a public transportation unit. “Motorpool” consists of both mechanical vehicles and rental cars and vans. Emissions are calculated for all motorpool, as separate record tracking has not yet been established.

The motorpool rental fleet is operated out of Facilities Management and is available to anyone associated with Central Washington University. Vehicles for the motorpool fleet are generally cycled out at around 110,000 – 115,000 miles (approximately 5 ½ - 6 years). Once the lifespan of the vehicle has exceeded the cost of value for repair and maintenance, they are sent to surplus to be sold. Approximately 75% of the surplus vehicle sale is used to help offset the purchase of new vehicles. Central Washington University is legally bound to buy vehicles from the State of Washington contract system, unless a better price is available. The State of Washington has a changing annual contract listing of types of vehicles that meets the baseline requirements for specific criterion (including fuel economy). The motorpool fleet consists of heavy-duty utility vehicles, 15 and 12 passenger vans, sedans, and station wagons.

In the past few years, the State of Washington has incorporated more environmentally-friendly options onto the list and all sedans and minivans in the fleet are flex-fuel at this point. Unfortunately, the geographical location of Central Washington University requires trips beyond the range for currently produced electrical vehicles.

The mechanical fleet is utilized for on-campus operations, buildings, and repair, and is operated by Facilities Management Department (Grounds). The vehicles are a combination of new and used vehicles consisting primarily of trucks and vans. The vehicles are run until upkeep and/ or maintenance exceeds the value of the vehicle. Currently, Facilities Management owns two electric vehicles. The vehicles have had some positive and negative feedback and are undergoing review for feasibility of future purchases of electric vehicles.

Central Washington University contracts Central Transit out to Hope Source and is operated by Public Safety and Police Services. Central Transit is provided mostly free of charge to students (paid from Student and Affair fees) and members of the Ellensburg community. The continuation of this service and its improvement and expansion of this transportation plan has the potential to reduce carbon emissions, depending on funding. The scope of public transportation also includes improved pedestrian and bicycling connectivity on campus and into the surrounding community, increased ride-share and carpooling efforts between surrounding communities to campus, and student information about cost-effective and alternative means of reliable transportation. Some further action could be taken to encourage student and staff to enjoy the connectivity of Central's campus to the Ellensburg community. The current non-motorized transportation plan for Central Washington University is under review. Ellensburg just completed an extensive review process for further development and connection of main pathways and corridors for bicyclists and pedestrians. Efforts should be undertaken to ensure that campus transportation plans do not interfere or conflict with city plans.

GOAL

Improve university sponsored vehicle travel and initiate actions that eliminate greenhouse gas emissions produced through various means of transportation.

RECOMMENDED STRATEGIES

1. **Work with CWU administration, staff and students plus Ellensburg community members towards developing improvements to Central Transit.**
 - a. Research economic incentives of increasing the cost of parking passes in order to expand the Central Transit route and/or purchase more buses.
 - b. Acquire financing from private companies to offset the costs (Suncadia, Yakima Business Bureau, etc.).
 - c. Initiate discussion regarding developing a regional transit system with the viable entities looking to expand their links with surrounding communities.
2. **Work with CWU administration, staff and students plus Ellensburg community members towards developing improvements to pedestrian and bicycle transportation for safety and ease of use.**

- a. Continue to expand bicycling preference through programs such as Cycling is Central and Bike Share.
 - b. Improve and expand bike paths.
 - c. Sign and mark city cross walks.
- 3. Reinforce technology for distance conferencing and education.**
- a. Improve webcam offerings on campus.
 - b. Install capable systems in conference rooms and suggest these as meeting alternatives.
- 4. Improve Campus and State Ride Share website.**
- 5. Utilize mass transportation when possible.**
- a. Encourage maximizing passengers to vehicles, including the use of chartered buses instead of several vans.
 - b. Develop economic incentives to promote greyhound tickets.
 - c. Recommend all employees partaking in university sponsored travel to utilize AirTransporter to SeaTac Airport.
 - d. Consider the Zipcar or other car-share model as a part of an inter-university program.
- 6. Support efforts that develop cross-state passenger rail travel serving Ellensburg.**
- 7. Replace on- and off-campus fleets with electric, fuel efficient, biodiesel, or flex fuel vehicles while still maintaining other criteria such as performance, durability, or economics.**
- a. Consider flex fuel vehicles as a viable option for our motor pool fleet.
 - b. Consider electric vehicles as a viable option for our motor pool fleet.
 - c. Investigate and support more vehicle options on their list of allowable vehicles for purchase from state procurement.
 - d. Consider separating data to track maintenance and rental fleets independently.
- 8. Encourage the use of biodiesel in heavy equipment fueling.**

PREDICTED TIMELINE

Motorpool Fleet

This action could be implemented immediately if: there was technology available to address the long range commuting needs of the campus. The electric vehicles on the market do not have the range needed for distance commuting. Ellensburg's location makes it challenging to pursue hybrid or electric technology at this time. The biggest factor when purchasing a new vehicle for the fleet is fuel efficiency; checks and balances are already placed on Central Washington University's vehicle purchase by the State of Washington. Already there are systems in place to utilize distance conferencing and education; these systems can be advertised more readily.

This action could be implemented within 5 – 10 years if: As a result of HB-2185, the State of Washington will probably become much more adamant about the fuel range, type, and vehicle use public institutions may purchase. This will enhance our ability to convert over to a more fuel efficient and/or electric fleet. Electrical vehicle technology is slated to improve in the next decade, addressing range, charge, and safety, all factors needed in Central Washington University's motorpool fleet.

Technology is revolutionizing the distance conferencing method and decreasing in costs. CISCO has a viable system that may be appropriate to install within a few years, if costs come down.

Operations Fleet

This action could be implemented immediately if: Electric cars are suitable for on-campus operations. Already, 2 electric vehicles have been incorporated into the grounds fleet with the intent to replace the grounds fleet with safe and durable electric vehicles. The turn around for vehicles is relatively slow and so CWU will not have a fully fossil fuel independent fleet until the vans and trucks have been replaced.

This action could be implemented within 5 – 10 years if: We replace our vehicles after 110,000 miles. As each car reaches this mileage we would replace them with a more fuel efficient vehicle that meets the options of the original vehicle. The technology for the electric vehicles is in place and with the increase in oil prices; it is likely that these vehicles will become more available on the market with in the next five years.

Public Transportation

This action could be implemented immediately if: ‘Cycling is Central’ has recently been initiated into the CWU foundation. This program is a test pilot of offering alternative forms of transportation to students on campus. It is expected that this program can succeed if operated in conjunction with Central Transit and Ride Share. Ride Share is a CWU intranet posting board for commuters and one-time travelers to post potential car-pooling opportunities. This forum should be made more accessible to the community and publicized.

This action could be implemented within 5 – 10 years if: If we were to raise the price of parking passes, utilize a tiered parking system (as mentioned above), and ask local companies and the city for funding. We could purchase 1 or 2 buses per year and have a good size bus fleet within 5 years at which point we could begin rotating them out as they reach 110,000 miles.

This action could be implemented within 20 years if: Technologies are advancing at a rapid rate for electric and hybrid vehicles. It is expected that there will be a viable electric alternative by our second fleet rotation (12 years and beyond) and should be investigated at that time.

PROJECTED COSTS AND EXPECTED SAVINGS

Operations Fleet

The Ford Focus is on the State Vehicle list and has an average cost of 13,600 dollars and gets 24 miles/gallon cities, 33 miles/gallon highway. The current Ford Taurus has an average cost of 22,000 dollars and gets 18 mile/gallon city, 28 miles/gallon highway. For each vehicle replaced by the Focus the college will save \$8,600 and get

an additional five miles/gallon on average, with a fleet of nearly 15 sedans within 10 years the university's overall savings would be about \$129,000 and a mileage gain of nearly 5 miles/ gallon. These numbers show that the market is responding to consumer demand for more fuel/ energy efficient vehicles and will become more common place in the future.

Public Transportation

The public transportation should be supplemented through parking passes and city assistance; this avenue should cost the college very little upfront capital. Backing by local businesses could further offset these costs. Central Transit is operated with funds allocated by the state, grants, and private businesses. There is interest to link Yakima and Cle Elum to Ellensburg with a public transit system. Central Transit is already discussing sponsorship opportunities with Suncadia and Yakima Businesses.

PERSONAL VEHICLE USE

DISCUSSION

Central Washington University's centrally based location in Washington State make it attractive for students and faculty alike. Whether commuting, seeking recreational opportunities, or going home for the weekend, local parking, fuel costs, and insurance premiums are consistently lower than regional/ metropolitan areas and provide students an incentive to bring their vehicles with them while attending college.

Public Transportation was one of the tasks chosen as a Tangible Action on the 2-month ACUPCC reporting document. A strong public transportation method is already implemented on campus, and has great potential to be expanded. Central Transit is a public transportation service provided to the students of Central Washington University and members of the Ellensburg community. Central Washington University opened their bus services to the public in 2006 as part of a financial agreement between Central Washington University, Central Washington Disability Resources and Elmview Living Community, with services contracted out to Hope Source. The continuation of this service and its improvement and expansion is a main focus in working towards climate neutrality. Central Washington University recently received a grant from Washington State Department of Transportation to expand public transportation services in Kittitas County. Future efforts to greater improve public transportation are currently being discussed among the Ellensburg community and Central Washington University, implemented through Central Transit.

The scope of this task is being broadened beyond public vehicle transportation to include improved pedestrian and bicycling connectivity on campus and into the surrounding community, increased ride-share and carpooling efforts between surrounding communities to campus, and student information about cost-effective and alternative means of reliable transportation. The scope of public transportation also includes improved pedestrian and bicycling connectivity on campus and into the surrounding community, increased ride-share and carpooling efforts between surrounding communities to campus, and student information about cost-effective and alternative means of reliable transportation.

A significant majority of CWU students live on or very near campus. Ellensburg is a small city (~15,000), approximately 3 miles in diameter, without nearby residential suburbs. Most student, staff, and faculty live within the city limits. There are a number of faculty (and relatively few students) who may commute from as far away as Yakima, Wenatchee, and Moses Lake on a weekly or daily basis. Due to the geography of Central Washington University's Ellensburg campus, there should be efforts to better link Ellensburg to Yakima and Seattle. Students and staff are able to carpool if they utilize the rideshare website. Further studies are needed to see how effective the ride-share website is.

GOAL

Initiate actions that eliminate greenhouse gas emissions from personal transportation.

RECOMMENDED STRATEGIES

- 1. Work with CWU administration, staff and students plus Ellensburg community members towards developing better commuting solutions.**
- 2. Research feasibility of incentive or dis-incentive based programs to encourage less dependency upon vehicles.**
 - a. Offer incentives to those who carpool or drive fossil fuel independent vehicles
 - b. Restructure the on-campus parking system.
 - 1) Make parking a tiered fee system: those who want better parking pay more. Increase parking to reflect cost of regional parking fees.
 - 2) Explore alternatives that do not increase the parking lot space already installed on campus.
 - 3) Create a one-lot-only permit system.
- 3. Work with CWU administration, staff, students and Ellensburg community members towards developing improvements to pedestrian and bicycle transportation.**
 - a. Implementation of programs such as Bike Share, Cycling is Central, and additional pedestrian and bike paths/ routes.
- 4. Provide incentives to utilize ride-share and mass-transportation solutions.**
 - a. Cycling is Central.
 - b. Greyhound tickets.
 - c. Request review for cross-state rail access.
- 5. Reinforce technology for distance conferencing and education.**
 - a. Improve webcam offerings on campus.
 - b. Install capable systems in conference rooms and suggest these as meeting alternatives.
- 6. Encourage and reward off-campus vehicles (electric, fuel efficient, or flex fuel vehicles) with incentives.**
 - a. Investigate economic incentives of free parking passes.
 - b. Investigate economic incentives of prime parking location.
 - c. Investigate feasibility of installing electrical recharge stations.

PREDICTED TIMELINE

This action is already being implemented, and efforts can be increased if funding for resources and personnel were put towards these programs. It is expected that personal vehicle travel will decrease as a result of rising costs of fuel and alternatives to personal travel becomes more attractive. Improvements in telecommunications help link communication across distances.

PROJECTED COSTS AND EXPECTED SAVINGS

Personal vehicle use is considered a scope 3 emission for this report, a difficult sector to quantify and to remedy (ACUPCC, 2008). Personal vehicle use is assumed by the operator and does not reflect directly upon Central Washington University. Savings from discouraging vehicle use can be accrued through tangible and intangible benefits. These include: lack of funds spent on building or maintaining parking lots, increased local revenue from mass-transportation options, healthier campus community (from exercising and cleaner air). When providing electrical recharging outlets for vehicles, kiosks can be designed to be used on pay-per-charge basis.

There are distance conferencing centers established on campus for group conferencing capabilities. The library, Student Union and Recreation Center, and the educational technology center have conference rooms that are setup with video conferencing capabilities and are open to the campus community through a request form. Setting up a distance conferencing center requires a computer with high-speed internet access and a webcam or conference console.

The ride-share intranet link site could be improved to allow for easier access to resources. Promotion of the website should occur on a more consistent basis, especially during times of high commuting (holidays and extended weekends). It costs approximately 70 dollars for advertising efforts through the SURC publishing and advertising office.

Currently, Central Transit is supported by S&A fees and is offered free of charge when boarding the bus. Central Transit is subsidized by grants and is currently operating at a loss.

AIR TRAVEL TRANSPORTATION

DISCUSSION

Central Washington University recognizes and supports faculty and student travel to educational conferences and research areas. National conferences provide a caliber of networking and prestige beyond regional and locally based events. The contacts made in conference capacity open Central up to outside opportunities and potential students/staff.

Due to the data collection systems presently in use on campus, no data file directly reports the miles traveled on CWU business. We do have an account category that summarizes total airfare expenditures. Air miles can be calculated from accounting data for air travel expenses, per AASHE guidelines on air travel. By correlating the average air fare revenue per passenger-mile (using data from the Air Transport Association – ATA) with the total spending on air fares, we can estimate total air miles with reasonable accuracy.

The total spending on air fares is available from the Director of Business Services and Contracts (Bruce Porter). There are three related accounts: in-state air transportation, out-of-state air transportation, and recruiting air travel. The average cost per passenger-mile is a moving target (fully declared in the adjacent Greenhouse Gas Inventory report) that needs to be determined statistically applying ATA data to determine air miles traveled. Energy intensity of air travel (BTU/mile) should be updated annually. The expense accounts used for this calculation should also only include air fare costs to preserve data integrity. Additionally, to plan for a cap and trade future, CWU should begin accurate mileage tracking, so as to not pay excessive fees should we need to purchase carbon offsets for necessary air travel.

Central Washington University has a flight program offering a B.S. in Flight Technology. As a requirement for graduation, flight time is required. The miles have been calculated and are also included in the declaration of air travel carbon emissions. Please review the Greenhouse Gas Inventory for more information.

GOAL

Initiate actions that reduce air travel, reduce or eliminate greenhouse gas emissions produced from university sponsored air-travel, and implement measures that utilize more environmentally friendly airlines.

RECOMMENDED STRATEGIES

1. **Implement in-house tracking of actual air miles flown for university sponsored travel.**
2. **Do not provide funding for in-state airline travel. The university's location in relation to the rest of Washington State and the nearest airport make intra-state air travel redundant and unnecessary.**

3. **Utilize airlines that have a proven track record to reducing their carbon footprint.**
4. **Reinforce technology for distance conferencing and education.**
5. **After reducing air miles demand as much as is reasonable, the greenhouse gas effect may be brought to neutral with the purchase of carbon credits.**

PREDICTED TIMELINE

It is expected that air travel reductions have already occurred due to university-wide budget cuts. Education could commence immediately to utilize alternative methods of communication including distance conferencing.

PROJECTED COSTS AND EXPECTED SAVINGS

Reducing air travel will save money and reduce greenhouse gas emissions. If every department were to cut their overall air travel by 20%, we could expect to save approximately \$100,000 at today's travel rate. The \$100,000 saved from curbing travel can be funneled into alternative travel methods or purchasing of carbon offsets. Purchase of retail carbon credits to offset greenhouse gas emissions is estimated to cost approximately 3-16% of the airfare expense, or about \$0.40-\$2.00 per credit hour on campus.

GREEN SHAREHOLDER INVESTMENT

DISCUSSION

The university manages some endowment funds, but most are held and managed through the CWU Foundation, a separate 501(C)3 entity that operates through a memorandum of understanding with the university. The policies and restrictions on shareholder proposals of institutions where funds are invested are currently being evaluated for investment parameters that could be modified or improved to meet the environmental, social, and fiscal responsibilities that Central Washington University strives to promote. Currently, CWU is tied to a shareholder portfolio that promotes 9 different options for socially responsible investment. Requests to the 501(C)3 are being made to pursue green portfolio, and opportunities for improvement are continually monitored.

GOALS

Initiate actions that ensure Central Washington University's fiscal and environmental responsibility in its shareholders portfolio.

RECOMMENDED STRATEGIES

1. **When potential modification of the shareholder investment parameters are reviewed, seek environmentally responsible options without jeopardizing the fiscal needs of CWU portfolio.**
2. **Ensure CWU foundation (separate 501(C)3 investment entity from CWU) memorandum meets CWU needs and follows in accordance with existing financial policies and procedures.**
3. **Remain flexible in the continually changing nature of investments as well as the development and increased awareness of carbon neutrality marketability.**

PREDICTED TIMELINE

This action could be implemented immediately if:

Green investment parameters were secure and ensured a return on principal funding. Since the 501(C)3 is not controlled by Central Washington University, it is highly unlikely the board will entrust endowment funds into an unknown and relatively new investment portfolio.

This action could be implemented within 5 – 10 years if:

The marketability of sustainable and environmental investment becomes profitable over the long term needs of a diversified portfolio.

This action could be implemented within 20 years if: Alternative energy became a viable commodity for investment portfolio packages. It is expected that alternative energy will become a competitive player among investing firms.

PROJECTED COSTS AND EXPECTED SAVINGS

The volatile nature of investments lend to the cautious nature of shareholder responsibility when choosing portfolio packages. CWU already pursue socially responsible investment parameters and have maintained stable investment earnings. It is expected that investments in the alternative energy sector will only improve with the increasing awareness of energy independence from fossil fuels. There should be no additional costs on savings associated with green shareholdings.

WASTE MINIMIZATION AND RECYCLING

DISCUSSION

The university has been involved with recycling and purchasing recycled products since the 1980s. At present, all of the following items can be recycled on campus: mixed paper, corrugated cardboard, #1 plastic (pop bottles), aluminum and tin cans, glass, batteries, cell phones, toner cartridges, and clothing. Standards set for purchasing recycled paper products were exceeded for a number of years.

Additional waste minimization practices are: recycling of lawn wastes back into soils (with exception for athletic fields waste, which are recycled via passive compost in a separate area of campus), recycling campus-associated hazardous materials (florescent light bulbs, computer monitors, batteries, etc.), and redistribution and sale of items discarded by the university through the Surplus Department.

Solid waste issues are being addressed by three different interests on campus: Facilities Management, self-support 573 fund entities (Housing, Dining, and Conferencing), and Environmental Health and Safety. A committee with representatives from all three of these areas has been formed to streamline waste reduction, recycling, and education.

Recycle Mania has been initiated with four different student organizations on campus. The three associated measures of waste minimization are already in place and the program has the potential to be expanded beyond current practices. Recycling programs are regularly created and updated for residence halls to increase total recycling volumes. Since freshmen are required to live on campus, these programs are visible to the majority of students over time.

GOALS

Initiate actions that reduce waste to landfills through reuse, waste reduction, and recycling, and remain proactive in recycling amounts and product types.

RECOMMENDED STRATEGIES

1. **Continue to participate in the surplus for redistribution and sale of items discarded by the campus.**
2. **Participate annually in the *Recycle Mania* competition and events. Make this a program completely directed by students.**
3. **Recycle hazardous waste materials (batteries, computer monitors, florescent light-bulbs, etc.) as per EPA and DOE standards.**
4. **Continue passive composting of lawn and yard waste, as well as recycling of lawn waste back into soils.**
5. **Continue to unify separate waste management entities on campus to stream line financial affairs, programmatic efforts, and management**

levels through the Conservation, Waste Minimization, and Recycling Committee. Incorporate this committee with the Sustainability Council to collaborate on waste and recycling programs across the campus.

PREDICTED TIMELINE

This action is already being implemented, and can be increased and improved on a regular basis.

PROJECTED COSTS AND EXPECTED SAVINGS

For every ton that is kept out of the landfill (either by recycling, swapping, or re-use), it is projected that \$71 dollars is saved (by negating the tipping costs associated with waste disposal) per ton of waste. Recent numbers from Surplus indicate that approximately 160 tons of assorted materials were diverted from landfill. This is an annual costs saving of approximately \$11,360. However, labor, transportation, and facilities needs for recycling and resale, while not known to exactitude, are expected to be higher than any savings incurred through avoided tipping costs.

REFRIGERANTS

DISCUSSION

Central Washington University utilizes commonly-used refrigerants in their cooling system. It is expected that the US will start replacing HFC and HCFC compounds with alternatives by 2010 (EPA, 2008). Since 1% of CWU's 2007 carbon inventory is comprised of HFC and HCFC based emissions, it is expected that the university will pursue a suitable alternative compound for use in the campus's chiller and refrigerator sources or implement greater measures to reduce refrigerant leakage.

GOAL

Minimize the utilization of refrigerants and maximize monitoring and environmental monitoring protocols for refrigerant leak detection.

RECOMMENDED STRATEGIES

- 1. Phase out existing refrigerants with climate impacting properties**
 - a. When purchasing new equipment, ensure equipment is designed for alternative refrigerants.
 - b. When topping off or changing refrigerants, replace refrigerants with alternatives.
 - c. Encourage individual/personal and departmental purchases of appliances with low global warming potential and low ozone depletion potential.
- 2. Specify refrigerants with low ozone depleting potential and global warming potential in all new equipment and appliances.**

PREDICTED TIMELINE

Alternative refrigerant technology is already in place to be utilized. It is important to use refrigerants that are the least environmentally degrading compound available. Refrigerator source maintenance upkeep is on a scheduled basis and it is expected that cycling out old carbon based refrigerants to newer alternative refrigerants will commence in the next few years for all appliances on campus. If refrigerant needs to be cycled out, follow proper protocols to recycle the refrigerants.

PROJECTED COSTS AND EXPECTED SAVINGS

The cost of alternative refrigerants is the same as carbon based refrigerants and should not exceed normal operating, mechanical upkeep, and replacement costs for campus cooling sources.

CARBON OFFSETS

DISCUSSION

As a university, we believe in the overall reduction of our carbon footprint by implementation of measures that will directly address carbon emissions. The university will be best served by conserving energy and reducing the dependence upon carbon based energy. It is our intent not to purchase carbon offsets, except as a last resort, due to the impermanent nature of carbon offsetting, carbon sequestration, and insecure nature of the carbon market. However, carbon offsets are likely to become mandatory or may be replaced by a cap and trade system.

GOAL

Offset remaining carbon responsibility from unavoidable carbon emissions in the operations of Central Washington University.

RECOMMENDED STRATEGIES

1. **Create a list of suitable carbon offset measures to pursue (based on criteria decided by the Sustainability Council).**
 - a. Decide whether:
 - 1) implemented offset strategies will be local, regional, or global.
 - 2) to purchase offsets or invest money towards campus emission offsets.
 - 3) to become a part of the Chicago Climate Exchange and trade emissions generated on campus, or purchase offset tags.
 - b. Establish funding for annual offset purchasing for remainder of carbon emissions not mitigated (implemented in 2030).
2. **Create local opportunities for carbon offset measures.**
 - a. Form partnerships with the U.S. Forest Service, Washington State Department of Natural Resources, and the U.S. Bureau of Land Management for land use and trades.
 - b. Form partnership with City of Ellensburg for developing strategies to reduce carbon emissions (thus counting towards offsets).

PREDICTED TIMELINE

Carbon offsets are available for purchase at this time. It is likely that the State of Washington and/or Federal Government will implement a cap and trade system for carbon emissions by 2012. Offsets are considered a last resort measure and not implemented until 2030 carbon neutrality date.

PROJECTED COSTS AND EXPECTED SAVINGS

Carbon offsets purchased through the Chicago Climate Exchange can be purchased at a low of \$1.70 (at initiation) or high of \$4.80 (current pricing) per metric ton of emission. Taking worst cost analysis, in order to offset our current emissions; it would cost us approximately \$100,000 - \$280,000 annually. This is not including the cost of startup for carbon emission trading, fee for trading, and hidden costs. These offsets are not directly controlled for disbursement by the purchaser.

EDUCATION/BEHAVIORAL CHANGES

DISCUSSION

Integration of climate and sustainability issues in the curriculum is a key opportunity for facilitating awareness and understanding on campus. These opportunities include general coverage of related topics, as well as direct involvement of campus ACUPCC activities (as an example or as participation in the program). Possibilities exist in related programs, as well as individual classes, or as research projects. This has already taken place with the restructuring of the energy studies minor and the creation of the environmental studies major, both of which took place with ACUPCC in mind. Also, in this first year after inception of the carbon reduction task force, several classes have been involved in ACUPCC, such as the Geography department's Environmental Policy class, in which a member of the Carbon Reduction Task Force made a visit to the class to describe the function, goals, and operation of ACUPCC endeavors on campus, and the significance of these issues. University 101, the freshman orientation class, has been identified as another promising forum in which to address sustainability issues. Curriculum has been developed with presentations made to several classes. The pursuit of classes to involve ACUPCC in should be an ongoing process in order to spread awareness and garner participation.

In detail, the faculty of Central Washington University has recently approved revisions to our Energy Studies Program. Atmospheric carbon issues are a major consideration for energy use, and the curriculum emphasizes these issues in the context of energy use and planning. This minor now requires 20% more academic credits for completion. Among the changes which have strengthened the program's focus on carbon reduction are the development of a new Environmental Studies course (ENST 310—Energy and Society). This course will cover an assortment of broad issues pertaining to energy use in our modern society, including climate change. In addition to ENST 310, several more choices among elective courses (SCED 301—Interdisciplinary Science Inquiry; CMGT 452—LEED Sustainable Construction; and ECON 462—Economics of Energy and Resources) have been added. An introductory economics or engineering class which address carbon issues from other perspectives is now also required curriculum for the major. All students electing the minor will now perform a two-credit internship working with energy and carbon reduction issues in the community.

A great deal of educational opportunity in the field of energy and related carbon issues is available beyond the university, in the local and regional community. Cooperation with various energy-related organizations provides students insight on real-world operations and activities. Visitors, legislators and students are regularly led on tours of our city's solar energy facility and the Wild Horse Wind and Solar Energy Facility 15 miles east of our campus. City experts often speak on energy use and carbon footprints of specific buildings, such as our community swimming pool. Additionally, campus personnel have been speaking with diverse groups on behalf of our campus and its "most efficient energy use in the state" status for years. Academic course sessions which enable students to study the workings of our exceptionally-

energy-efficient physical plant have been created and are continuously improved to coordinate the physical side of our campus and its academic mission.

Energy and climate consciousness programs are actively planned for students in the dormitories on campus. Several faculty and graduate students, most notably those involved with the Energy Studies Program, are available to visit environmental studies, geography, geology, philosophy and biological education classes for special presentations and discussions of carbon and energy issues. In order to integrate these curricular and extracurricular activities, the campus at large, and the outer communities, the development of a consolidated entity that serves as a liaison should be investigated. This would link student extracurricular (i.e. club) activities, academic and curricular activities, administrative activities and organizations, and local or regional organizations and activities (i.e. City of Ellensburg, Pacific Northwest Climate Reduction Consortium), as they relate to sustainability or ACUPCC.

GOAL

Neutralize the university's carbon footprint through research, curriculum, and cultural change. Spread awareness of the issues related to climate change to stimulate participation throughout the campus, local community, and beyond, utilizing fully integrated community approach.

RECOMMENDED STRATEGIES

1. Develop outreach through curricular means.

- a. Create and sustain an Energy Resources specific curriculum.
- b. Support cross-discipline energy and resource studies.
- c. Develop curriculum for University 101, taught to all incoming students.
- d. Develop a course in sustainability (Sustainability 101) toward an eventual program of study.
- e. Supply ideas for curriculum in a wide range of courses.

2. Develop outreach through extracurricular means.

- a. Foster connections to the City of Ellensburg and Municipal services.
- b. Promote environmental version of SOURCE.
- c. Create connections to the topic through the one book, one campus program.
- d. Encourage a Student Sustainability Coalition to build student ideas and activities.
- e. Continue development of a sustainability website that provides information to students, faculty, and staff so that individuals learn how they can impact and support the university's plan for carbon neutrality.

3. Develop institutional liaison relationships.

- a. Foster internship potential with energy agencies.
- b. Foster potential job banks for students graduating with Energy Resources Major.

PREDICTED TIMELINE

These actions can begin to take place immediately and continue to develop on an ongoing basis with the support of the faculty. More formal support structures (possibly as part of a campus sustainability organization) which can help link CWU specific issues into sustainability and climate curriculum could be in place within a year.

PROJECTED COSTS AND EXPECTED SAVINGS

This is a very low cost action since it consists merely of integrating sustainability into the curriculum. It can be attained through the support of professors, and the development of an organization that focuses on sustainability as part of the curriculum. A budget to employ organizers would allow this proposal to move forward. Apart from this, many of the costs could be absorbed through the efforts of the faculty as part of their salaries. The exception to this cost analysis is the creation of a new curriculum. The energy curriculum has already been designed and has invested in funding for the program through the hiring of the Energy Program Director.

Funding for activities done by a Student Sustainability Coalition would be paid for through student activity fees.

Savings are intangible, helping to potentially increase recruitment for students, faculty, and staff. Voluntary conservation from educational efforts may be reflected in overall campus operational cost savings.

CAMPUS-WIDE SUSTAINABILITY COUNCIL

DISCUSSION

At present, a number of diverse departments and programs work on the myriad facets of sustainability. As CWU furthers its focus on sustainability in operations and the curriculum, some coordination of ideas and activities is in order. Climate issues are a part of this broader goal and intertwine with all other elements of sustainability. The activities presented in this plan should be under the responsibility of a Sustainability Council. The group will enhance interdepartmental/ unit communication across campus as regards sustainability issues. This collaboration will help reduce duplication of efforts and create synergies in all manner of sustainable operations.

A continuation of the type of representation provided for the task force, with student, faculty, and staff membership, is recommended. It is important to note the essential nature of having student members on the committee in order to move the projects forward with the involvement of the student body.

Many of the recommended climate neutrality actions in this plan are significant changes to existing operations. Due to the cross-unit nature of these actions and decisions, the president should be apprised of recommendations and programs from the Sustainability Council, as the authority and direction of the president will be likely necessary to implement some programs.

The Sustainability Coordinator position should also be a continuing funded and filled position at the university. This person will be the point person for actions recommended in the plan and chair of the Sustainability Council. This position should report to the Office of the President for the same reasons listed above for the council.

The Sustainability Council should have opportunity to review and comment over major campus projects, plans, and policies, guaranteeing that sustainability concerns will be a consideration in campus actions.

GOAL

Institute a permanent committee to continue the efforts of the Carbon Reduction Task Force to ensure climate neutrality. Membership should be developed so that there is at a minimum one representative from the department, program, or committee responsible for each activity presented in this plan.

RECOMMENDED STRATEGIES

- 1. Review and update the Climate Commitment Action Plan.**
 - a. Maintain annual inventory records in perpetuity.
 - b. Ensure actions are being met.

2. Implement activities in this plan.

- a. Develop a timeline to accomplish these goals based on feasibility within available funding mechanisms and strategic plans of the university.
- b. Appropriate tasks to departments and on-campus groups best equipped to manage particular tasks.
- c. Develop liaisons with external agencies and organizations that can help foster sustainability.

3. Explore and review new activities that will ensure a sustainable campus.

- a. Go above and beyond the ACUPCC charter.

PREDICTED TIMELINE

It is recommended that the Sustainability Council is initiated as soon as the Carbon Reduction Task Force completes its 2 year set term. The council should operate indefinitely in order to maintain the high standards of sustainability on campus.

PROJECTED COSTS AND EXPECTED SAVINGS

Service on committees is part of existing salary allotment for faculty. Salaried staff will shift duties into their current workload. There are no direct costs for the formation of a committee but proposed actions, programs and activities are likely to incur costs.

PACIFIC NORTHWEST UNIVERSITY CONSORTIUM

DISCUSSION

Due to Central Washington University's geographic location and climatic regime, there is high potential to harness the strengths and situation of our region. Other universities based in the Pacific Northwest have expressed desire to streamline their carbon reduction efforts that would allow for transparency of procurement, implementation, and results of carbon offset measures. The creation of a university consortium would allow universities to pool their resources to fund carbon based initiatives throughout the Pacific Northwest. This would allow for educational, financial, and developmental partnerships between universities.

GOAL

Foster a regional approach towards the mitigation of carbon emissions. By combining resources, the steps towards carbon neutrality become less daunting.

RECOMMENDED STRATEGIES

1. Creation of Pacific Northwest University Consortium.

- a. Establish carbon emission trading platform that would allow for a transparent system of sharing and trading of land, resources, finances, and education.
- b. Creates a network that plays off the strengths of particular universities (Western Washington University, tidal power, Central Washington University and Washington State University, wind power, etc.)
- c. Consortium participants would most likely comprised of members from other sustainability councils or environmental compliance officers.

PREDICTED TIMELINE

A majority of the universities in the Pacific Northwest are committed to the ACUPCC and currently working on their plans to be carbon neutral. The university consortium should be formed as soon as possible to gain the most benefit.

PROJECTED COSTS AND EXPECTED SAVINGS

With the creation of the university consortium, the pooling of resources for universities, would allow for land trade, commodity sharing, direct management, and educational opportunities for the universities involved. The actions of the consortium could potentially be utilized when considering carbon offset costs.

PLAN IMPLEMENTATION

The ACUPCC report needs to be reviewed by the external carbon reduction committee, approval by the President and the Board of Trustees, and draft reviewed by the university community, prior to being implemented.

Each action is suggested to be delegated to the appropriate department for review and eventual implementation. Although each action affects the campus, it is best to have a point of responsibility for subsequent policy creation and review.

The Sustainability Council will ultimately be in charge of subsequent carbon emission tracking and mitigation responsibilities.

TRACKING PROGRESS

This plan is part of an adaptive management protocol. The results of our actions will be monitored and reported annually, by the Sustainability Council. Changes and data input will also occur on an annual basis.

Throughout the course of this process there are different items that need to be monitored. Emissions monitoring and tracking baseline data has been established. Over time, it will be necessary to analyze the resulting emissions after activities under this plan have begun in order to determine the efficacy of those activities. Actions will be adapted based in part by quantitative analysis of the campus greenhouse gas contributions.

APPENDIX 1: INVENTORY INFORMATION

As directed by the ACUPCC guidelines, Central Washington University used the Clean Air, Cool Planet calculator to derive the carbon footprint for the Ellensburg main campus. Data was gathered from Central Washington University's Institutional Research Department, Central Washington University's fiscal records, and Facility Management records. Categories are:

- 1. Institutional Data**
 - a. Budget
 - 1) Operating Budget
 - 2) Research Dollar Revenue
 - 3) Energy Budget
 - b. Population
 - 1) Full Time Student
 - 2) Part-Time Student
 - 3) Summer School Students
 - 4) Faculty
 - 5) Staff
 - c. Campus Physical Size
 - 1) Total Building Space
 - 2) Total Research Building Space
- 2. Purchased Electricity**
 - a. Electricity produced off-campus
- 3. Purchased Steam/chilled water**
- 4. On Campus Stationary Sources**
 - a. On-Campus Cogeneration Plant
 - b. Stationary sources of emissions
- 5. Transportation**
 - a. University Fleet
 - 1) Gasoline Fleet
 - 2) Diesel Fleet
 - b. Air Travel
 - c. Commuters
 - 1) Faculty/Staff
 - 2) Students
- 6. Agriculture**
 - a. Fertilizer Application
 - b. Animal Agriculture
- 7. Solid Waste**
 - a. Land filled Waste with no CH₄ recovery
- 8. Refrigeration and other Chemicals**
 - a. HFC-404a
 - b. HCFC-22
- 9. Offsets**
 - a. Composing
 - b. Renewable Energy Credits

For full report disclosure, please review the Greenhouse Gas Inventory.

APPENDIX 2: BIBLIOGRAPHY AND LINKS

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