



Colorado State University

CLIMATE

ACTION PLAN

September 2010

September 1, 2010

Ms. Toni Nelson, Director
The American College & University Presidents' Climate Commitment
c/o Association for the Advancement of Sustainability in Higher Education
213 ½ N. Limestone
Lexington, KY 40507

Dear Director Nelson:

I am pleased to enclose Colorado State University's Climate Action Plan, in keeping with our responsibility as a signatory of the American College & University Presidents' Climate Commitment. This plan reflects our continued work to minimize greenhouse gas emissions and promote education, research, and outreach in support of environmental sustainability and long-term climate neutrality.

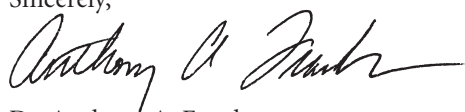
This plan is a natural evolution of Colorado State's longstanding role as a research leader in disciplines that impact the health of our planet. Our faculty engineered the first solar-heated and -cooled building in the world and developed the nation's first emissions-control program. Today, they are pioneering the development of clean- and alternative-engine technology, leading vital climate research, and have launched a groundbreaking program in global and sustainable enterprise. This academic focus has helped shaped the character of our university as a place that takes seriously its responsibility to our planet and to future generations – a place well-positioned now to uphold the commitments outlined in this plan.

Our plan establishes a series of short-term, medium-term, and long-term strategies for reduction and mitigation of CSU's net emissions. It builds on the greenhouse-gas emissions inventory we completed in 2009. It also notes our commitment to tangible action during the development of the plan and beyond through adherence to three of the specified ACUPCC criteria – specifically, to build new construction to LEED Gold standard or equivalent; to encourage use of public and alternative transportation among our students, faculty, staff, and visitors; and to continue to compete in the waste minimization component of the national RecycleMania competition, which has become a popular tradition on our campus.

I am particularly pleased that this plan represents a broad cross-section of expertise from within our campus community. In particular, I want to thank Dr. Ron Sega, chair of CSU's Sustainability, Energy, and Environment Advisory Committee, and Ms. Carol Dollard, chair of the Climate Action Plan Task Force, who has played a significant leadership role in seeing this project through to this stage – and as a vocal champion of environmental responsibility and sustainability on our campus for many years.

Thank you for your leadership and vision in guiding this nationwide effort. Colorado State University remains proud to be an ACUPCC signatory and a partner with other institutions in demonstrating our shared responsibility – as a national community of scholars – to the health and preservation of our earth.

Sincerely,



Dr. Anthony A. Frank
President



Acknowledgements

The following individuals and organizations are recognized for their valuable input to the development of this Climate Action Plan.

Sustainability, Energy and Environment Advisory Committee

Climate Action Plan Task Force

Carol Dollard - Chair
Chris Anderson
Ralph Bodin
Gillian Bowser
Nancy Hurt
John Keller
Doug Max
Tonie Miyamoto
Denise Sheahan
Mary Warren

Additional Contributors

Sheela Backen
Pat Burns
Brian Chase
Susanne Cordery-Cottery
Heidi Mechtenberg
Tom Wardle
Emily Wilmsen
Brendle Group



Table of Contents

Acknowledgements	3
1.0 Introduction	5
2.0 Campus Greenhouse Gas Emissions Inventory	8
3.0 Education, Research, and Community Outreach Efforts	10
4.0 Climate Action Plan: Reduction and Mitigation Strategies	13
5.0 Financing	32
6.0 Uncertainty	34
7.0 Implementation and Measuring Success	36



1.0 Introduction

On March 20, 2008, Colorado State University announced its intent to “seek environmental solutions that include making CSU carbon neutral in a rapid timeframe.” Subsequently, CSU committed to signing the American College & University Presidents Climate Commitment (ACUPCC), whereby CSU agrees to set climate neutrality as a long-term climate goal. This Climate Action Plan begins the process of defining a path for CSU to achieve climate neutrality.

The ACUPCC is a high-visibility effort by a network of colleges and universities to address global climate change. Participating institutions have committed to eliminate net greenhouse gas emissions from specified campus operations, and to promote research and educational efforts to equip society to re-stabilize the earth’s climate. Its mission is to accelerate progress toward climate neutrality and sustainability by empowering the higher education sector to educate students, create solutions, and provide leadership by example for the rest of society.

The University is proud to put forth this initial plan for achieving climate neutrality that recognizes CSU’s unique land-grant heritage and strong research ties. As a land-grant university and home to the Colorado State Forest Service, CSU has unique opportunities to utilize renewable energy from wind and solar resources and to consider the potential for sequestering carbon in forest projects. This plan also includes green building practices that leverage the research of the Department of Construction Management and advanced control of buildings and energy loads through research being conducted by the College of Engineering and Facilities Management as part of the Renewable and Distributed Systems Integration (RDSI) project, a subset of the larger FortZED SmartGrid initiative.

The strong collaboration CSU is building around sustainability and clean energy through the School of Global Environmental Sustainability (SoGES) and the Clean Energy Supercluster has the potential to advance research that will better enable CSU to achieve climate neutrality and reduce greenhouse gas emissions, both on campus and in the broader global community. Finally, CSU will also be relying on the strong commitment of students, faculty, and staff to implement this plan and further sustainable practices on campus.

1.1 ACUPCC Commitments

The ACUPCC provides a framework and support for colleges and universities to implement comprehensive plans in pursuit of climate neutrality. It recognizes the unique responsibility that institutions of higher education have as role models for their communities and in educating the people who will develop the social, economic, and technological solutions to reverse global warming and help create a thriving, sustainable society.



By signing the ACUPCC, Colorado State University agreed to:

- Develop a greenhouse gas emissions inventory, which was completed in 2009. Inventories have been submitted to the ACUPCC for fiscal years 2006-2009.
- Within two years, set a target date and interim milestones for becoming climate neutral. This plan strives to meet this commitment.
- Take immediate steps to reduce greenhouse gas emissions by choosing from a list of short-term actions, listed below.
- Integrate sustainability into the curriculum and make it part of the educational experience. See Section 3.0 below for a discussion of CSU's sustainability-related curriculum.
- Make the plan, inventory, and progress reports publicly available.


Signatories are required to take two or more of the following tangible actions to reduce greenhouse gas emissions while the Climate Action Plan is being developed:

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

The University has already implemented three of these actions. Specifically, under the guidance of Senate Bill 07-051, CSU has established a policy that all new significant campus construction will be built to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold standard or equivalent (a). CSU encourages use of and provides access to public transportation for faculty, staff, students, and visitors (d). Finally, the University has also participated in the waste minimization component of the national RecycleMania competition (g).

1.2 Climate Action Plan Approach

Since CSU is a signatory to the ACUPCC, this plan and associated analyses were prepared in accordance with the above guidelines established by the ACUPCC as well as the *Implementation Guide: Information and Resources for Participating Institutions* prepared by ACUPCC. It includes a discussion of CSU's



greenhouse gas emissions, its curriculum and research related to sustainability, and a set of greenhouse gas mitigation options to carry CSU toward long-term climate neutrality.

The term “climate neutrality” refers to achieving net zero greenhouse gas emissions by reducing or mitigating emissions through projects addressing energy efficiency, renewable energy, transportation, solid waste diversion, and other strategies along with a means to offset any remaining emissions with the purchase of carbon offsets.

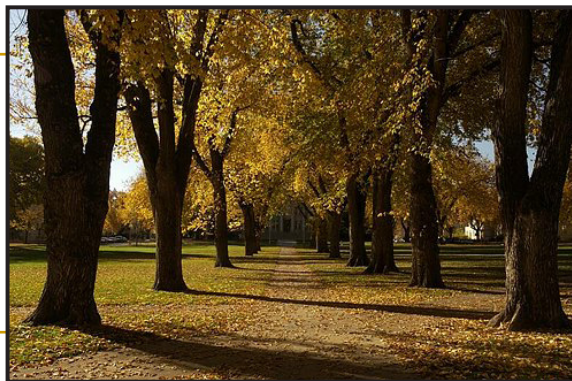
The ACUPCC *Implementation Guide* provides its own specific definition of climate neutrality for colleges and universities:

For purposes of the ACUPCC, climate neutrality is defined as having no net greenhouse gas emissions, to be achieved by minimizing greenhouse gas emissions as much as possible, and using carbon offsets or other measures to mitigate the remaining emissions. To achieve climate neutrality under the terms of the Commitment, all Scope 1 and 2 emissions, as well as those Scope 3 emissions from commuting and from air travel paid for by or through the institution must be neutralized.

This plan was developed through a collaborative process involving input from a campus task force, the campus community at large, and a consultant team. Specifically, a Climate Action Plan Task Force was convened to develop the plan; the Task Force comprised 12 volunteer members representing departments across campus, including faculty, staff, and students. The Task Force met a total of seven times to develop the plan and hosted a feedback session to coincide with 2010 Earth Week events on campus.

This plan has also been developed with oversight from and coordination with CSU’s Sustainability, Energy, and Environment Advisory Committee (SEEAC). The vision of the SEEAC is to “Always consider energy, environment, and the community.” Its mission is to advise the University president, the provost and executive vice president, and all other members of the President’s Cabinet on the best methods of integrating energy issues, environmental stewardship, sustainability principles, and community action into campus operations in the interest of improving efficiency, generating awareness, and being a responsible public organization.

The SEEAC committee is chaired by Dr. Ron Segal, the Woodward Professor of Systems Engineering and the President’s Special Advisor for Energy and the Environment, who is appointed by the University president. The Committee consists of a single representative from a broad cross-section of campus units identified in Appendix A.



2.0 Campus Greenhouse Gas Emissions Inventory

The University's most recent greenhouse gas inventory was prepared using the Clean Air – Cool Planet (CACP) Campus Carbon Calculator, Version 6.3. The CACP tool was developed specifically to provide higher education institutions with a consistent approach to calculating campus greenhouse gas emissions and is recognized as an acceptable tool by the ACUPCC.

The inventory is based on utility data, other University records, discussions with staff, and a 2008 online campus commuting survey. The units of metric tons of carbon dioxide equivalent (MTCO₂e) are used in the inventory and throughout this plan to account for the collective global warming potential of all six greenhouse gases including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and various refrigerants. The University has completed inventories for fiscal years 2006 through 2009 as shown in Figure 1.

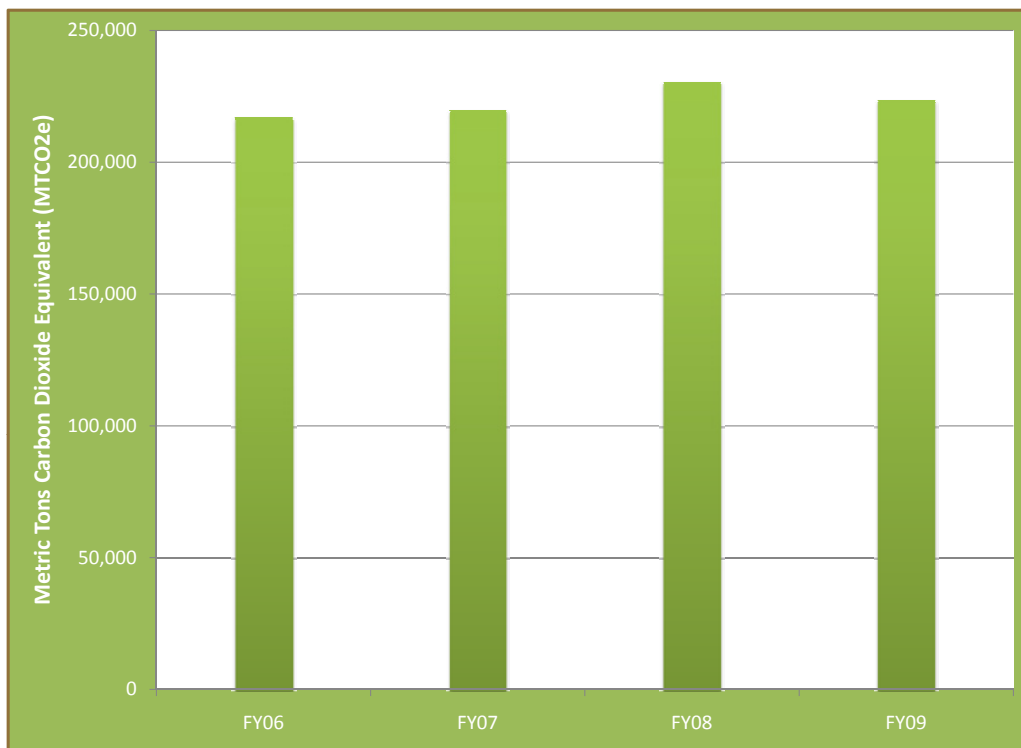


Figure 1. CSU Net Greenhouse Gas Emissions

Following ACUPCC guidance, CSU's inventory includes all direct emissions, or "Scope 1" emissions such as those from on-campus stationary fuel combustion, vehicle fleet operations, agricultural activities, fertilizers, and refrigerants. Indirect energy emissions, or "Scope 2" emissions, from electricity purchases are also included. Other indirect emissions, or "Scope 3" emissions from directly financed air travel, student commuting, faculty/staff commuting, transmission and distribution losses, and solid waste disposal are also included. The contribution of these emissions sources to CSU's inventory are depicted in Figure 2.

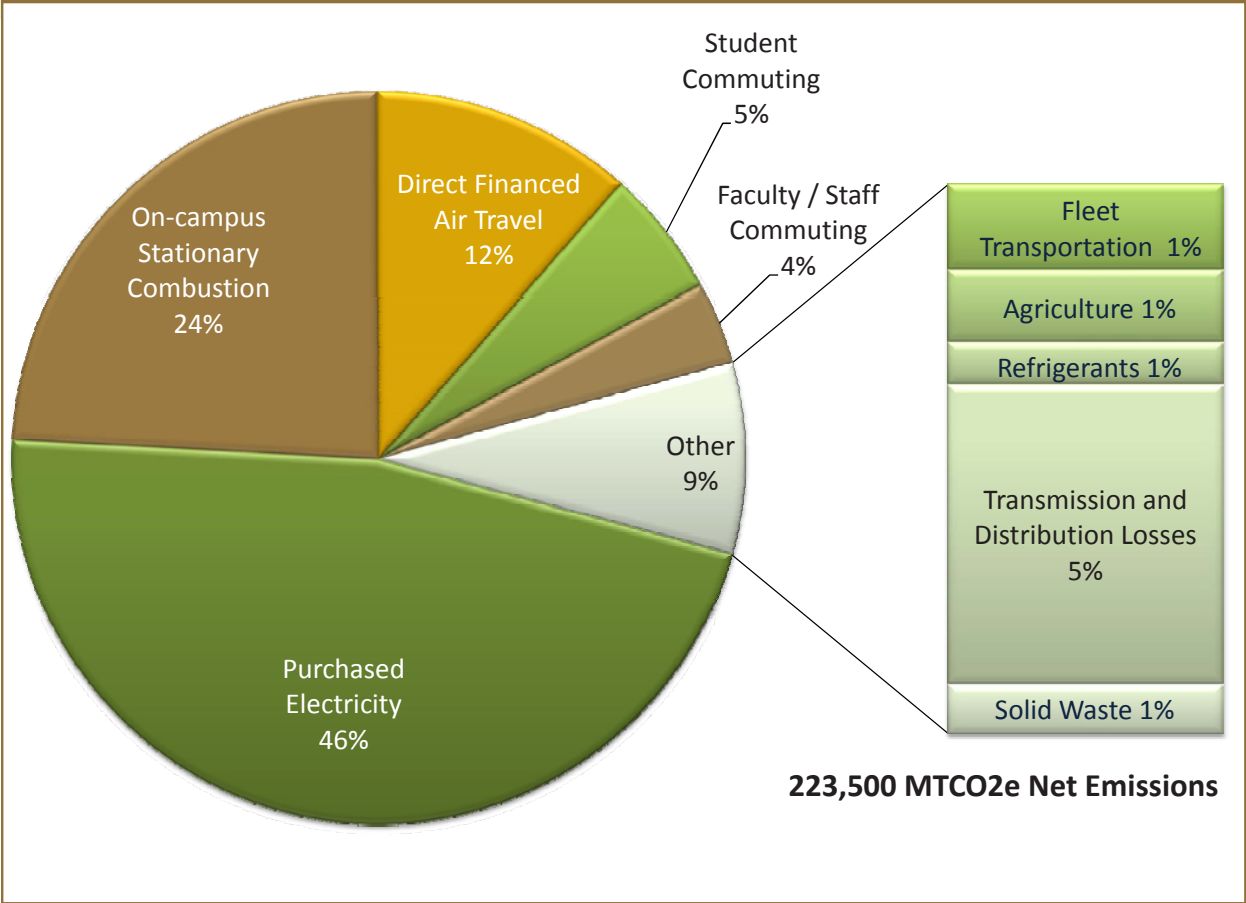


Figure 2. FY2009 CSU Greenhouse Gas Emissions Sources

This Climate Action Plan considers CSU’s projected emissions and identifies potential reduction and mitigation strategies between fiscal years 2010 and 2050. The business-as-usual forecast of emissions is primarily driven by increases in the intensity of electricity consumption in existing buildings (about 1 percent annually based on historical trends), and the construction of new buildings (assumed to be an average of 50,000 square feet annually).

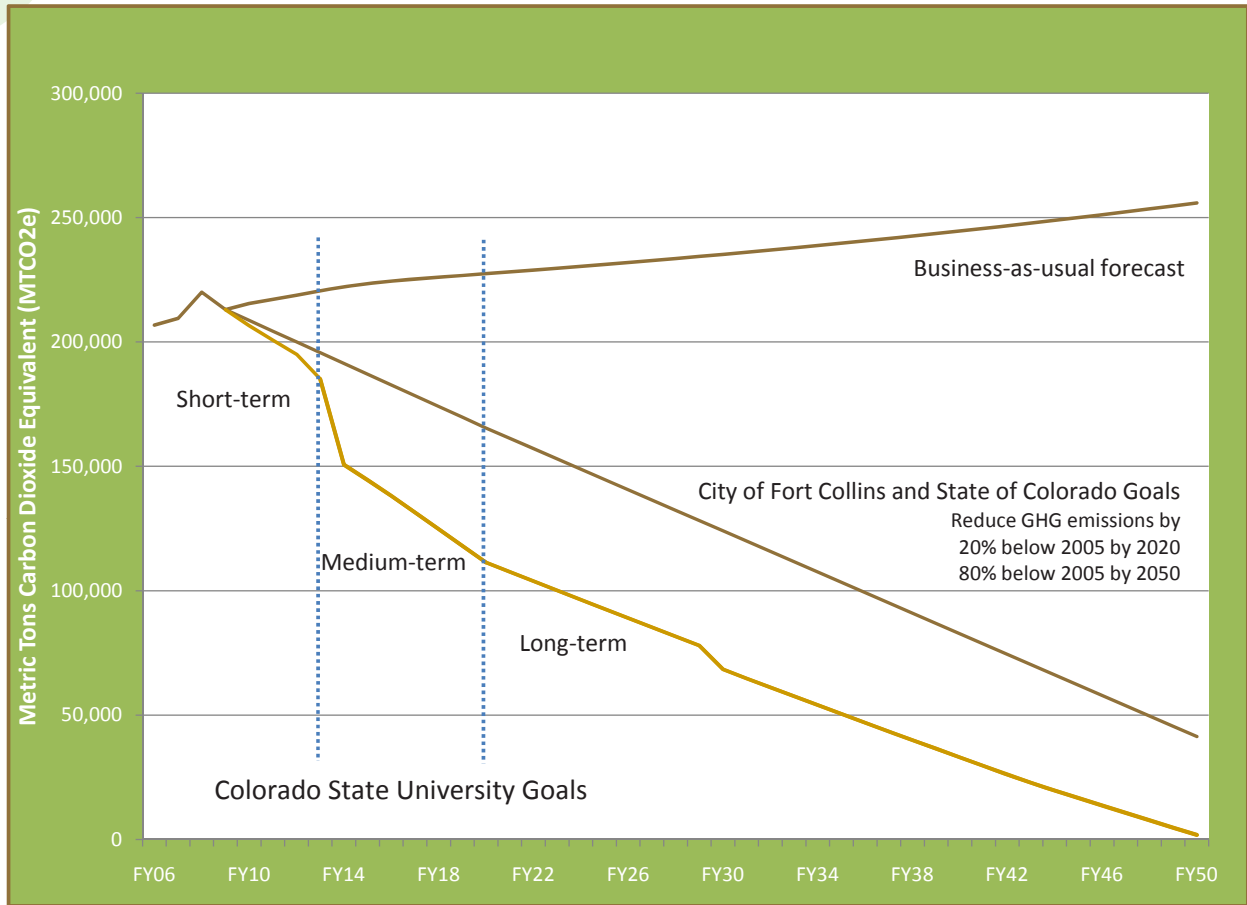


Figure 3. CSU Business-as-Usual Emissions Trajectory and Climate Plan

This plan establishes a set of reduction and mitigation strategies that are divided between short-term (0-3 years), medium-term (3-10 years), and long-term (>10 years). As depicted in Figure 3, these strategies are projected to reduce CSU’s net emissions to climate neutrality by approximately 2050. As an intermediate goal along this trajectory, CSU aims to achieve a reduction in emissions of 50 percent over business-as-usual projected emissions by 2020.



3.0 Education, Research, and Community Outreach Efforts

One of the commitments CSU made as a signatory to the ACUPCC is to integrate sustainability into the curriculum and make it part of the University educational experience. Academic areas at CSU that address environmental sustainability are offered in all eight of the University's colleges and span across programs in engineering, natural resources, forestry, public policy, environmental ethics, global and sustainable business, atmospheric science, soil and crop sciences, construction management, and many other programs. The University has been nationally recognized for its curriculum and research programs related to sustainability; some of these primary programs and initiatives are discussed below.

It is also important to recognize the links between professional development, research and learning, and the opportunities moving forward as the plan is implemented. Providing faculty with professional development opportunities in the realm of sustainability will help them integrate these topics into their research and teaching. Furthermore, academic research drives new technologies and understanding, which in turn can be integrated to inform decisions and create beneficial outcomes for larger society. This generates a “feedback loop” that can help accelerate this plan's goal of reaching climate neutrality at CSU while benefitting broader society.


3.1 School of Global Environmental Sustainability (SoGES)

Launched in 2008, SoGES is an umbrella organization that encompasses all environmental education and research at CSU. It is an interdisciplinary program that conducts the innovative research necessary to solve the most pressing human-environmental problems. The School provides innovative and challenging education programs to equip students – and the community – with the principles and the practices of sustaining the environment and meeting demands of the workforce for the environmental economy.

The School positions CSU to address the multiple challenges of global sustainability through broad-based research, curriculum, and outreach initiatives. Areas of emphasis include food security; environmental institutions and governance; sustainable communities; land and water resources; biodiversity, conservation and management; and climate change and energy. This approach capitalizes on CSU's historic strength in global environmental research and education that already exists within all eight colleges on campus from the Warner College of Natural Resources to the College of Business.

The specific mission of SoGES is:

To develop new strategies for global sustainability that will address and inform solutions to global human-environmental problems.



The School will accomplish this mission using a framework that advances scientific understanding while supporting the generation of new science and linkages to economics and society. This will be enhanced by engaging CSU's world-class expertise in innovative ways that cross traditional disciplinary boundaries.

3.2 Clean Energy Supercluster

The Clean Energy Supercluster at CSU is an innovative model to rapidly move the University's clean energy research into the global marketplace, creating new companies and jobs that enhance Colorado's economy while improving lives throughout the world. The Supercluster consists of a University-wide multidisciplinary alliance of researchers, social scientists, and business experts working on innovative research and discovery. An associated new enterprise, Cenergy, functions as the business arm of the Supercluster and greatly enhances the ability of University scientists and business partners to speed clean and renewable energy research to the marketplace. Cenergy directly enhances Colorado's leadership in building a new energy economy as well as improving quality of life for people around the world. More than 100 faculty members in all eight colleges participate in expanding knowledge, creating alternative energy solutions, and developing policies in the areas of biofuels, solar energy, wind power, and clean-burning engines. This research supports Colorado's efforts to lead the nation in creating clean and renewable energy technology and training the "green-collar" workforce. Faculty members represent fields as diverse as the physical sciences, engineering, humanities, applied human sciences, and business. The University's efforts through the Supercluster and Cenergy also support the state of Colorado's Climate Action Plan, which aims to reduce emissions of greenhouse gases in the state by 20 percent by 2020 and shares a commitment with other states and nations to make even deeper emissions cuts by 2050.

One example of the beneficial technologies being developed through these efforts is Envirofit International, a Fort Collins, Colorado-based non-profit organization founded in 2003. The company, developed from technological innovations at CSU's Engines and Energy Conversion Laboratory (EECL), is a world leader in designing energy-efficient, low-emissions engines. A team working with the EECL and the Materials Science and Technology Division at the Oak Ridge National Laboratory developed the EnviroFlame Combustion System, the heart of the new line of Envirofit cookstoves. Since unveiling its first line of clean cookstoves in May 2008, Envirofit has sold more than 60,000 cookstoves in India. The stoves sold to date could keep more than 400,000 tons of CO₂ and 90 tons of black carbon from entering the atmosphere while garnering savings for some of India's lowest-income consumers.

Another example of groundbreaking renewable energy technologies developed at CSU is the work of Dr. Amy Prieto, assistant professor in the College of Natural Sciences', Department of Chemistry who co-founded Cenergy's first startup company, Prieto Battery. The company is expected to produce batteries up to 1,000 times more powerful, 10 times longer lasting, and cheaper than traditional batteries. The development of this technology could revolutionize military, automobile, and healthcare industries.



4.0 Climate Action Plan: Reduction and Mitigation Strategies

The following sections identify a number of proposed greenhouse gas reduction and mitigation strategies for fulfilling the Climate Action Plan's goal of making progress toward climate neutrality. These strategies are the reflection of significant work by the SEEAC and Climate Action Plan Task Force as well as campus input to identify priorities and strategies that can provide the most significant economic, social, and environmental benefits to the University.

Mitigation strategies roughly fall into three categories:

Energy Use in Buildings

- Building Energy Efficiency
- Outreach, Smart Metering, and Behavioral Changes
- Re-commissioning and Retro-commissioning
- Computer Power Management and Server Virtualization
- Reduction of Full-Load Operation of Equipment and Tighter Scheduling
- High-Performance New Construction

Renewable Energy

- Biomass Boilers or Cogeneration
- Net Metered Solar Facilities
- Statewide Renewable Energy Standard
- Wind Power
- Landfill Gas

Other

- Fleet Fuel Consumption
- Waste Diversion
- Commuting
- Carbon Sequestration in Forests

Each of these strategies is identified as short term (0-3 years), medium term (3-10 years), and/or long term (greater than 10 years) depending on their particular implementation characteristics.

Each section below summarizes the context for each strategy and provides projections of greenhouse gas emission reductions and costs.

Cost estimates include:

- one-time or first capital cost for implementing the strategy
- annual operations and maintenance cost
- annual cost savings based on current utility rates
- a simple annual return on investment (net annual cost savings/one-time cost)
- a net lifetime effectiveness (net lifetime savings/cumulative lifetime CO₂e reductions)

Figure 4 provides a summary of estimated greenhouse gas reductions by strategy type.

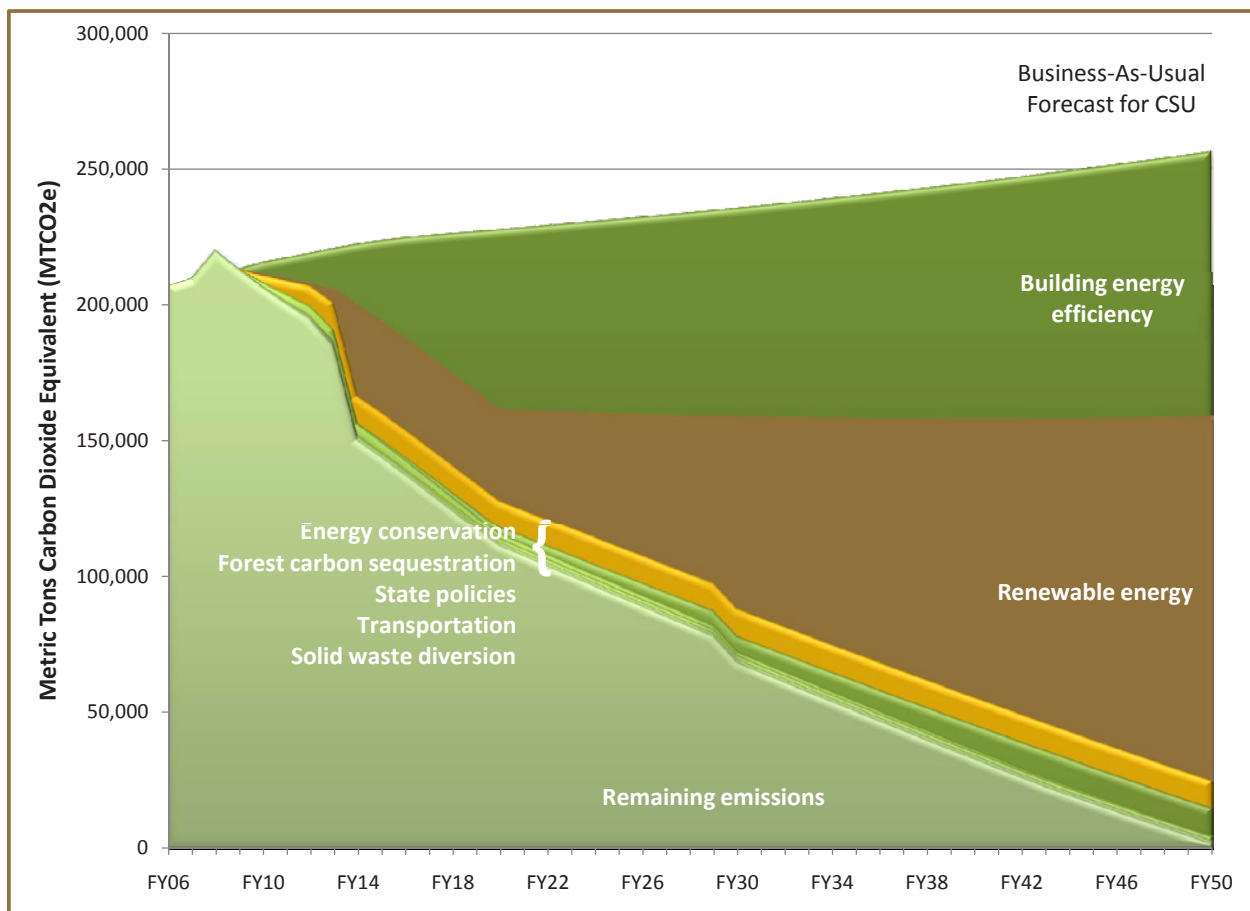


Figure 4. Greenhouse Gas Reduction Contributions by Strategy Type

4.1 Building Energy Efficiency

Term	Projected MTCO _{2e}	Percentage of Net FY09 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO _{2e}]
Short Phase 1	(5,500)	-3%	\$805,000	\$0	\$609,000	76%	\$102
Short Phase 2	(5,500)	-3%	\$2,087,000	\$0	\$615,000	30%	\$91
Medium Phase 3	(6,200)	-3%	\$5,148,000	\$0	\$689,000	13%	\$68
Medium Phase 4	(5,900)	-3%	\$9,276,000	\$0	\$652,000	7%	\$15
Long Phase 5	(5,300)	-2%	\$19,447,000	\$0	\$584,000	3%	(\$67)
Long Phase 6	(25,600)	-12%	\$61,111,000	\$0	\$3,127,000	5%	(\$2)

The University has made significant strides in increasing building energy efficiency and identifying conservation opportunities in a number of its facilities. This strategy focuses on a number of energy efficiency opportunities, grouped into six phases, which can be implemented over the short, medium, and long term based on anticipated payback. These strategies are largely based on energy assessments completed for CSU in 2009. While some projects have been funded and are underway, more than 100 potential projects have been identified, including:

- Lighting upgrades
- Heat Recovery
- Synchronous belt drives
- Demand control ventilation
- Controls upgrades
- Variable-air-volume terminals
- Heat-exchanger upgrades

Some Recent CSU Energy Efficiency Projects

- ▶ Staff from Facilities Management worked with occupants of Yates Hall to optimize ventilation for safety and energy efficiency. The result was a 26 percent decrease in electric use in the building.
- ▶ The University has retrofitted refrigerated vending machines across campus with energy-saving “vending miser” controllers that turn off machine lighting and compressors when idle for 15 minutes or longer for a savings of more than \$4,300 per year.
- ▶ Lights at the Veterinary Teaching Hospital were retrofitted with more efficient fluorescent lamps and ballasts. The project saves the University more than \$22,000 per year in energy costs.

Increasing energy efficiency in campus buildings saves both natural resources and money by decreasing electricity and natural gas use and thus reducing environmental consequences. Buildings are the leading energy users in the country, accounting for more than \$280 billion in annual energy costs. Colleges and universities control a large number of buildings including offices, housing, classrooms, labs, and athletic facilities and must pay for energy use in all of them. Straightforward retrofits to windows, insulation, electrical, lighting, or heating systems can yield large energy cost savings. Such retrofits not only save money and reduce greenhouse gas emissions, they also lead to increased productivity by students, faculty, and staff who use the buildings.

4.2 Biomass Boilers or Cogeneration

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Short	(5,000)	-2%	\$3,558,000	\$83,000	\$390,000	9%	\$30

This strategy builds on a pilot project already implemented - the installation of a biomass boiler - by adding a second boiler or cogeneration facility to provide energy for campus operations.

The current fuel cost for biomass is approximately one-half the cost of natural gas. Biomass is also effective in achieving lower greenhouse gas emissions because using energy from biomass displaces the need for fossil fuel-based energy sources and reduces the number of dead or dying trees from being burned during wildfires or prescribed burning.

Thinning of forests to remove dead or dying wood generally yields about 10 tons of wood per acre; as a result, the second boiler will support the additional thinning of several hundred more acres of forest per year. Wood chips will come from forest fire mitigation projects and potentially some urban tree pruning. The fuel is therefore considered renewable. Controlled burning in a biomass boiler produces 96 percent fewer overall emissions (CO, NO_x, SO₂, particulate matter, etc.) than natural forest fires

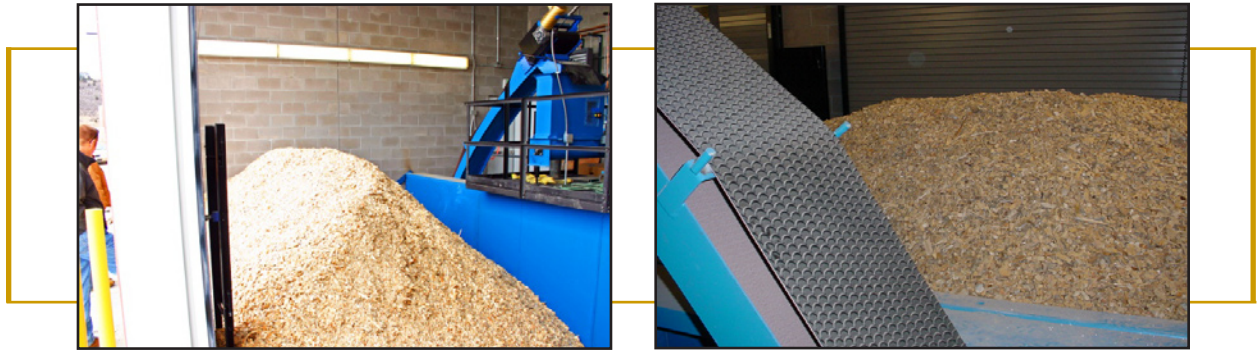
and 97 percent fewer emissions than prescribed burning.¹ Burning biomass also recycles atmospheric carbon that was absorbed during its growth cycle and does not add significantly to greenhouse gas emissions.

Cogeneration with biomass fuel sources is another opportunity under consideration that could further reduce CSU’s greenhouse gas emissions by generating electricity as well as heat. Cogeneration is the process of generating both electricity and thermal heat from the same energy source.

CSU Biomass Pilot Project

CSU’s existing hot water biomass boiler on Foothills Campus is rated for 46 boiler horsepower or 1.5 million Btus per hour.

This boiler reduces emissions and energy costs.



4.3 Outreach, Smart Metering, and Behavioral Changes

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Short	(10,000)	-5%	\$0	\$600,000	\$917,000	53%	\$30

¹Washington State Department of Natural Resources, http://www.dnr.wa.gov/Publications/em_forest_biomass_and_air_emissions_factsheet_8.pdf

While this plan identifies many strategies addressing specific topic areas such as energy efficiency and renewable energy, its successful implementation will ultimately hinge on the CSU community's awareness and willingness to learn, change behaviors, and take action. Research indicates that education alone can result in 5 percent to 30 percent energy savings². This strategy builds on and provides additional sustained resources for CSU's education and outreach efforts, focusing on expanding these efforts over the long term, building campus leadership and capacity, and providing greater incentives and recognition for outstanding efforts.

Other related campus engagement efforts are discussed under Strategy 5.7, Solid Waste Diversion. Examples of programs and initiatives that could be expanded are provided on the following page.

Other organizations that could be leveraged to expand current education and engagement efforts include:

- Student Sustainability Center (SSC)
- Live Green Community on Campus

Smart Meters for a Smart Campus

As part of the Live Intelligently for Earth (LIFE) project, students in residence halls will hold an energy-consumption competition using meters funded by the Rocky Mountain Institute. Real-time meters were installed on all residence halls and one classroom building on campus.



Students celebrate a victory in the annual RecycleMania Competition

² Doppelt, Bob and Markowitz, Ezra M. (2009) Reducing Greenhouse Gas Emissions through Behavioral Change: An Assessment of Past Research on Energy Use, Transportation and Water Consumption. Climate Leadership Initiative Institute for a Sustainable Environment, University of Oregon, Eugene, OR.

Campus wide surveys will continue to be developed and expanded to collect input on which programs and initiatives are particularly valued, how incentives are valued, where gaps may exist, and how additional resources could be used to fill these gaps.

Education and Outreach Initiatives on Campus

► Live Green Team: Green Warrior Campaign

The Live Green Team, sponsored by Housing and Dining Services, consists of student and staff volunteers who want to make a difference and are taking environmental action. Areas of focus include residence halls, dining centers, and University apartments.

The University's Green Warrior Campaign aims to engage students in creating a climate of sustainability at CSU. The campaign is a collaborative effort between several CSU organizations, including the Live Green Team, the Live Green Community, the Coalition for Campus Sustainability, and SoGES. During the campaign, students have the opportunity to register online and pledge to adopt environmentally friendly behaviors. Students track their sustainability efforts and can earn up to 100 points through efforts such as conserving water, saving electricity, and recycling on campus. The Campaign's website provides an area for students to track their sustainability efforts.

► Green is Gold Campaign

The Green is Gold campaign is an existing partnership between the Live Green Team, Communications and Creative Services, and Facilities Management. The Green is Gold campaign is a campus wide initiative for faculty and staff to save energy and reduce energy costs. Teammates from a location on campus (e.g., a department) work together to implement energy saving measures in their building. Teams are provided guidance in the form of energy saving tips for computers, best practices for transportation, recycling guidelines, water conservation tips, and others. Teams earn points for their conservation efforts and are rewarded for their level of achievement.



Recycled Valentine event at the Lory Student Center

4.4 Re-Commissioning and Retro-Commissioning

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/Cumulative MTCO ₂ e]
Short	(3,000)	-1%	\$2,786,000	\$0	\$306,000	11%	\$10
Medium	(10,000)	-5%	\$8,357,000	\$0	\$917,000	11%	\$10

The strategy expands on and will be used to refine efforts currently being piloted by CSU to re-commission or retro-commission its existing buildings. It includes two phases and the resources to conduct commissioning and implement changes in all of the buildings on CSU’s local campuses.

Commissioning is a quality assurance process that takes place after construction of a new building is complete, while re-commissioning essentially consists of a “tune-up” of an existing building’s mechanical and control systems. Commissioning verifies that building systems are performing as intended. Retro-commissioning, or commissioning of existing buildings for the first time (as opposed to re-commissioning), optimizes building systems so that they operate efficiently and effectively, resulting in reduced energy use and increased occupant comfort.

One successful model for implementing commissioning programs is to assemble an in-house multi-disciplinary team (e.g., engineer, HVAC, and controls technicians) that continually works through the existing building stock, starting over once commissioning of all buildings has been completed based on a multi-year cycle. This continuous commissioning model ensures that savings are maintained in the long term and new opportunities are realized as building uses change and equipment ages.

What is Commissioning?

Re- or retro-commissioning may include testing energy efficiency and thermal/environmental performance of a building’s automatic control, heating, cooling, and refrigeration systems. It can also include lighting and daylighting controls (e.g., verify sensor calibrations) and building envelope systems. The commissioning process can be particularly valuable in laboratory space and/or where internal loads and space layouts have changed. The purpose of testing, adjusting, and rebalancing heating, ventilation, and air conditioning (HVAC) systems is to assure that a system is providing proper airflow with maximum occupant comfort at the lowest energy cost possible. Instrument calibration and reporting can also help to optimize operations that affect energy consumption that might go unnoticed for years.

4.5 Net Metered Solar Facilities

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Short On-buildings	(250)	<-1%	\$0	\$0	\$7,000	-	\$30
Long Chrisman Field	(6,000)	-3%	\$5,300,000	\$106,000	\$0	-2%	(\$100)

This strategy includes net metering of existing solar photovoltaic (PV) facilities on CSU's Main Campus, Foothills Campus, and Chrisman Field that have been installed since the fiscal year 2009 inventory. Net metering is a policy that allows owners to take full credit for the cost of the electricity that their solar energy system produces and thereby reduces the amount of electricity that CSU has to purchase from the grid and the emissions associated with that electricity.

Sunny Colorado

► Photovoltaic solar systems are installed and operating on the Engineering building, Lake Street Parking Garage, Behavioral Sciences building, Academic Village, and the Research Innovation Center on the Foothills Campus.

► The 2 megawatt (MW) Chrisman Field facility, recently installed on the Foothills Campus, is one of the largest solar plants on a University campus in the nation.

While the Chrisman Field solar facility will be owned and operated by a private entity in the near term, CSU has the option to take ownership of this facility after 20 years, creating an opportunity to utilize the environmental benefits of the facility. An additional utility-scale PV facility is under construction and the long term benefits of that plant are included.



Two megawatt solar array at Chrisman Field

4.6 Reduce Fleet Fuel Consumption by 10 Percent

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Short	(300)	<-1%	\$0	\$0	\$108,000	-	\$360

This strategy includes opportunities to reduce the CSU campus fleet’s conventional fossil fuel consumption by 10 percent through a number of measures. This could include purchasing more efficient fleet vehicles when existing vehicles are due for replacement, optimizing fleet routes and combining trips to reduce vehicle miles traveled, more comprehensive maintenance practices, and use of alternative fuels.

4.7 Increase Waste Diversion to 75 Percent

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Short	(1,000)	<-1%	\$0	\$24,000	\$17,000	-27%	(\$10)

Under this strategy, CSU would increase the solid waste diversion rate to 75 percent using a combination of reduction, recycling, and composting. The University currently recycles more than one-half of the waste generated including bottles, cans, plastics, cardboard, and paper waste. Practices are also in place for composting food waste and recycling construction and demolition waste.



The Live Green Team coordinated volunteers to sort trash and recyclables at the Democratic National Convention.

Students Come, Students Go

- ▶ Existing recycling and composting programs divert about 55 percent of CSU's waste from the landfill. The effectiveness of these programs has enabled CSU to finish in the top 5 percent of the RecycleMania Grand Champion category since 2006. RecycleMania is an annual 10-week friendly competition between hundreds of colleges and universities throughout the country to increase the diversion of solid waste from landfills.
- ▶ Each fall, new residents move into CSU's halls and empty many cardboard boxes in the process. Each year during residence hall move-in, "cardboard corrals" are set up throughout campus. In 2009, 22.8 tons of cardboard were recycled in 5 days.
- ▶ In an effort to divert solid waste from landfills, unwanted items are also collected by the Integrated Solid Waste Department during residence hall move-out in the Spring under the Leave It Behind program. Items collected include food, clothing, shoes, towels, dishes, lamps, desks, couches, coffee pots, plants, and more. The items are then redistributed to local charities. In Spring 2010, eight tons of materials were donated.



Student interns help with the annual trash audit on campus to raise awareness about the amount of trash that can be recycled

4.8 Reduce Full-Load Operation of Equipment and Implement Tighter Scheduling

Term	Projected MTCO _{2e}	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/Cumulative MTCO _{2e}]
Medium	(26,600)	-13%	\$2,996,000	\$0	\$650,000	22%	\$20

This strategy involves expanding the controls infrastructure installed under the Renewable and Distributed Systems Integration (RDSI) project, including variable speed drives (VSDs), communication to VSDs, and additional programming to other buildings on campus above and beyond controls improvements in building energy efficiency projects. These controls can improve scheduling and monitor and control energy loads and temperature setpoints. These adjustments can achieve energy and cost savings through demand control and by reducing loads during periods of low occupancy such as holidays and summer months.

CSU and the Renewable and Distributed Systems Integration (RDSI) Project

CSU is a partner in a project funded by the U.S. Department of Energy to research, pilot, and demonstrate measures and technologies to reduce peak electricity load demand through demand management, renewable and distributed energy sources, and smart grid technologies.

On-campus projects include shedding electric loads from HVAC systems and a water fountain pump, integrating the solar PV panels on the Engineering building and the Lake Street Parking Garage, and using local generators.

4.9 Computer Power Management and Server Virtualization

Term	Projected MTCO _{2e}	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/Cumulative MTCO _{2e}]
Medium	(2,600)	-1%	\$751,000	\$0	\$79,000	11%	\$10

The objective of this strategy is to explore how to improve efficiency by reducing redundancies in common functions in information technology (IT) across campus, resulting in more streamlined and efficient IT services and more standardized power management practices.

CSU has nearly 29,000 hardwired devices and more than 16,000 wireless devices on its networks. These devices include switches, wireless access points, and printers, but many are computers. Computer power management is a great opportunity to reduce computer energy consumption by implementing lower power states. At CSU, the control of power management policies is currently decentralized

and lies with each department that manages a lab or set of computers. As a result, the level of penetration and effectiveness of power management is difficult to assess.

Furthermore, many IT services like email and file storage are provided at the departmental level; therefore, numerous servers are on campus. The exact number is unknown because of decentralization. Server virtualization is an opportunity to reduce energy consumption in servers by combining the functions of multiple physical servers onto a single server and better utilizing that server's computational and memory resources. Some departments are beginning to virtualize their servers already for any number of reasons, including flexibility, scalability, reliability, energy savings, and cost savings.

Internal Auditing has an initiative underway to review the IT infrastructure campus wide and across all departments. This review will identify additional opportunities to improve the efficiency of IT services and lower energy usage.

4.10 Use Landfill Gas from Larimer County

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/Cumulative MTCO ₂ e]
Medium	(28,500)	-13%	\$1,050,000	\$242,000	\$371,000	12%	\$0

This strategy involves using landfill gas from the Larimer County landfill in boilers at CSU's Foothills Campus. In addition to offsetting CSU's natural gas consumption, the University could also purchase carbon offsets for methane captured by this project. The benefits included in this strategy represent both avoided natural gas use as well as the purchase of associated offsets.

Presently, this strategy is considered mutually exclusive of Strategy 4.2 (Biomass Boilers) as current heating loads do not support using both methods for heating. Anticipated future buildings at the Foothills Campus or additional centralization of Foothills Campus loads, however, would add additional heating load and may support both projects.

4.11 Reduce Single Occupancy Vehicle Commuting by 5 Percent

Term	Projected MTCO _{2e}	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO _{2e}]
Medium	(1,000)	-1%	TBD	TBD	TBD	-	-

This strategy is focused on reducing single-occupancy vehicle commuting by the CSU community by 5 percent. Alternatives to single-occupancy vehicle commuting can reduce greenhouse gas emissions, contribute to good air quality, and encourage healthy walking and cycling habits.

The Mason Corridor, a transit corridor for Fort Collins that will bisect the eastern edge of CSU, will include bus rapid transit with construction beginning in 2011. Improvements in federal standards for vehicle fuel economies and increased adoption of telecommuting options will support this goal of reducing greenhouse gas emissions caused by commuting and perhaps allow for even more aggressive reductions in the future.

Colleges and universities around the nation and internationally have adopted policies and programs to support single-occupancy vehicle commute-trip reductions from which CSU can draw. Some of these ideas are to:

- Promote car-sharing programs and off-campus carpool programs that provide incentives for faculty and staff to carpool.
- Provide additional priority parking by creating reserved parking spots for carpools, provide subsidized or free parking passes, and create carpool ride boards or online databases where faculty and staff commuting from similar locations can communicate.
- Provide infrastructure and incentives for faculty, staff, and students who bike or walk to campus, such as bike racks and locker facilities.
- Encourage pedestrian and bike traffic when redesigning sites.
- Develop policies for faculty and staff that encourage telecommuting when feasible.
- Provide incentives for faculty, staff, and student owners and operators of low-emissions vehicles.



All students can use their student ID card to gain access to the bus system in Fort Collins.

Moving Toward Fewer Single Occupant Vehicle Commutes

▶ The University administered an online commuting survey in September 2008. The survey was completed by 8,555 members of the campus community – approximately 26 percent of students, 39 percent of faculty, and 32 percent of staff responded. Of all the respondents, 42 percent reported commuting by personal vehicle (alone), 31 percent by bike, 11 percent by walking, 9 percent by bus, 5 percent by carpooling, and 2 percent reported other modes of commuting.



- ▶ Electric vehicles or carts are used by Athletics, Parking Services, Facilities Management, and Central Receiving.
- ▶ CSU has three hybrid electric vehicles. One is used through the motor pool with online reservation requests, one by Housing and Dining Services, and the other is the department vehicle for Facilities Management.
- ▶ Segways are under trial use for Trades, Grounds and Maintenance, and Police.
- ▶ The Transit Center is the hub for mass transit for the community.
- ▶ The campus is being made more pedestrian friendly by moving parking lots to the edges of campus.

4.12 Statewide Renewable Energy Standard

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Medium	(5,000)	-3%	-	-	-	-	-

This strategy incorporates Colorado’s Renewable Energy Standard (RES) into the plan. The University receives electric power from multiple utilities – Fort Collins Utilities, Xcel Energy, and several rural electric associations served by Tri-State Generation and Transmission – all of which are required to comply with the latest standard. The new RES will significantly increase the percentage of renewable energy required in each provider’s portfolio of energy sources and will thereby reduce the emissions associated with the electricity CSU purchases without any additional action on the part of CSU.

Renewable Energy: More Opportunities for CSU

In addition to the solar PV and wind strategies in this plan, CSU is exploring other renewable energy opportunities for its facilities.

For example, the University is exploring the feasibility of a small hydroelectric facility and small-scale wind power for its Pingree Park campus located in the Rocky Mountains west of the Main Campus.

Colorado became the first state to create an RES by ballot initiative when voters approved Amendment 37 in November 2004. The original version of Colorado’s RES required utilities serving 40,000 or more customers to generate or purchase enough renewable energy to supply 10 percent of their retail electric sales by 2015. Eligible renewable energy resources include solar electric energy, wind energy, geothermal electric energy, biomass facilities that burn nontoxic plants, landfill gas, animal waste, hydropower, recycled energy, and fuel cells using hydrogen derived from eligible renewables.

Additional state legislation signed in 2007 and March 2010 further increased the RES for investor-owned utilities and made other changes. Colorado’s RES now requires investor-owned utilities to increase their renewable energy portfolios to 30 percent, with cooperative and municipal utilities required to increase their renewable energy portfolios to 10 percent by 2020.



4.13 Plant 5,000 Acres of Trees

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Medium	(10,100)	-5%	\$12,500,000	\$0	\$0	-	(\$10)

This strategy entails collaborating with the Colorado State Forest Service (CSFS) to sequester carbon dioxide (CO₂) by planting 5,000 or more acres of trees under conditions where biomass sequestration can be increased. Scenarios might include planting in mountain areas of Colorado impacted by fire damage or pine bark beetles (an insect pest that has killed many trees in Colorado during a recent outbreak), and/or in lower-altitude areas as windbreaks and living snow fences for agricultural operations, solar plants, highways, and other areas needing protection.

Terrestrial carbon sequestration is the process through which CO₂ from the atmosphere is absorbed by trees, plants, and crops through photosynthesis and stored as carbon in biomass (tree trunks, branches, foliage, and roots) and soils. The term “sinks” is also used to refer to forests, croplands, and grazing lands and their ability to sequester carbon. Agriculture and forestry activities can also release CO₂ to the atmosphere. Therefore, a carbon sink occurs when carbon sequestration is greater than carbon releases over some time period. Carbon sequestration rates vary by tree species, soil type, regional climate, topography, and management practice. In the U.S., fairly well-established values for carbon sequestration rates are available for most tree species.



CSFS Tree Nursery on the CSU Foothills Campus

4.14 Develop 60 MW of Wind Power

Term	Projected MTCO _{2e}	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO _{2e}]
Long	(95,000)	-45%	\$138,464,000	\$1,178,000	\$4,516,000	2%	(\$40)

For this strategy, CSU would acquire significant wind power assets and take advantage of the favorable wind power generation conditions on CSU lands throughout Colorado. Projects could be led by CSU, may involve partnering with third-party financing, or may involve collaborating with other institutions. Such projects would reduce CSU's carbon footprint and create opportunity for University research.

Wind energy is a clean energy source that results in no CO₂, nitrogen oxide (NO_x), or sulfur dioxide (SO₂) emissions. Wind facilities would also become an educational laboratory to provide students a hands-on learning experience in renewable energy development. Furthermore, the strategy would create a sustainable energy source to meet the electric needs of CSU and would provide clean, efficient, renewable energy to assist in meeting Colorado's RES requirements and the state's Climate Action Plan.

Colorado has wind resources consistent with utility-scale production. According to the National Renewable Energy Laboratory (NREL) in Golden, the state of Colorado alone has enough wind energy to supply 9 percent of the electricity consumption for the lower 48 states. That translates into 481 billion kWh per year of electricity. This proposed strategy is estimated to be about 20 percent of the potential wind energy resource on CSU lands.

Maxwell Ranch

The Colorado State University Research Foundation has signed a leasing agreement with a wind development company to investigate the development of a project at Maxwell Ranch. The project is in due diligence now.

The due diligence process will investigate such issues as transmission alternatives and number of wind turbines and locations on the property - one of the windiest corridors in the state of Colorado.

More will be known about the potential of this project by the next revision of the Climate Action Plan in 2012.

4.15 Improvements in New Construction

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
On-going	(360)	<1%	-	-	-	-	-

Buildings are the major users of energy on the CSU campus and nationwide. According to the U.S. Green Building Council, in the U.S. today buildings consume approximately 70 percent of electricity and account for nearly 40 percent of CO₂ emissions³. As a result, in addition to exploring energy efficiency in existing buildings (see Strategy 4.1), this plan also includes a focus on high-performance building in new construction.

Energy efficiency, water conservation, and other elements of green design can be promoted and encouraged in new buildings and renovations. New development can be energy and resource efficient, use renewable and recycled building materials, provide for healthy working and living environments, reduce building operating costs, and help reduce greenhouse gas emissions. All new major construction on CSU's campus is being designed to a standard of LEED Gold or higher, resulting in higher performing, more energy-efficient buildings.

Building to a Higher Standard

- ▶ CSU was the first university in the world to obtain a LEED-CI (Leadership in Energy and Environmental Design - Commercial Interior) Certification, thanks to the efforts of students, faculty, and staff from the Institute for the Built Environment, Construction Management, Interior Design, and Facilities Management. Guggenheim's second-floor classrooms obtained the U.S. Green Building Council's LEED Silver Certification in 2006.
- ▶ More recently, CSU's Transit Center achieved LEED Gold certification. Eight buildings funded by a bond are recently completed or nearing completion. All but one of these buildings is expected to achieve the LEED Gold rating.
- ▶ The new Recreation Center includes a remodel of existing space (100,000 square feet) and a significant addition (75,000 square feet). This remodel/addition is expected to earn 10 energy points and possibly an innovation point for energy efficiency under LEED 2.2. The resulting building, though nearly twice as large as the original, will use less energy than the original building.

³ U.S. Green Building Council. (2009) Green Buildings for Cool Cities: A Guide for Advancing Local Green Building Policies. <http://www.usgbc.org/ShowFile.aspx?DocumentID=6445>

4.16 Emerging Technologies

Term	Projected MTCO ₂ e	Percentage of Net FY2009 Emissions	One-time Cost	Annual Cost	Annual Cost Savings	Annual ROI	Net Lifetime Effectiveness [Net Savings/ Cumulative MTCO ₂ e]
Long	TBD	TBD	TBD	TBD	TBD	TBD	TBD

As a living document, this plan will undergo regular review, and the opportunities to include new technologies will be many. A myriad of technologies on the horizon may become viable within the timeframe of this plan and alter the course of CSU's path to climate neutrality. Some of these technologies will come from the broader clean energy economy while others will emerge from research done at CSU. Some technologies that were considered for this plan but were not found to be viable at this time (or are on the horizon) include synfuels, solar thermal, micro hydroelectric, anaerobic digestion for food and animal waste, additional cogeneration, plasma waste-to-energy, algae biofuels, and other sequestration options such as capturing carbon for use in building materials.



**Thermal Storage Tanks & Solar Electric (PV)
at the Academic Village Residence Hall**



5.0 Financing

The costs and savings projected in the previous strategies are based on conservative assumptions such as all-cash funding coming from CSU and no escalation in current utility rates. Other financing mechanisms, such as bonding and third-party financing, could be used to reduce the capital requirements associated with climate neutrality and to level out the cost of this plan. Furthermore, many of the strategies proposed in this plan result in positive net cash flows and can be largely self-funding. These projections are based on today's utility rates, and the positive cash flow associated with utility savings will increase with increasing utility rates.

Due to current and anticipated future budget limitations, priorities for funding this plan may focus on low and no-cost strategies such as education programs and those with very favorable paybacks that can help to finance the cost of later measures through their savings.

The University can explore several opportunities to help fund implementation of the plan's measures including:

- Utility rebates
- Federal incentives
- Grants
- Lease-purchases or other financing mechanisms
- Performance contracting
- Capital campaigns
- Revolving loan funds

The University will stay apprised of the latest funding opportunities. This is a fast-changing landscape where legislation, incentives and rebates, and maturing technologies can rapidly improve the financial options around plan strategies.



6.0 Uncertainty

This Climate Action Plan is considered the first version of what will be a living document subject to further review and revision on a two-year cycle as strategies are implemented, new technologies and strategies develop and mature, progress is monitored, and intermediate goals are revisited.

The ACUPCC requires biennial updates of the greenhouse gas inventory and the Climate Action Plan in alternating years (e.g., inventory in 2011 and action plan in 2012). CSU intends to update the greenhouse gas inventory annually to improve, and ensure continuity in, organizational practices around gathering information for the inventory. Updating the inventory annually also ensures more accurate tracking of progress toward emissions reduction goals.

Considering the many uncertainties in forecasting growth, greenhouse gas emissions, and the realities of implementing the strategies in this plan, it is apparent that the biennial updates to this living document will be pivotal to maintaining its relevancy and ensuring that CSU is establishing a trajectory toward climate neutrality. Rather than attempting an exhaustive forecast of potential scenarios, this plan recognizes some key uncertainties that could significantly alter the trajectory of CSU's greenhouse gas emissions or the financials associated with this plan:

- **Growth rates for CSU's emissions** – Much of the growth in CSU's emissions will be driven by new construction, enrollment, and research growth, which are difficult to forecast in a continually fluctuating budgetary environment. While improving construction practices and efficiency and conservation in existing buildings can minimize the impact of this growth, the plan is still very sensitive to these trends.
- **Utility rates** – The potential cost savings associated with most of the strategies in this plan are sensitive to utility rates. Accurately projecting utility rates through 2050 is an impossible task and subsequently dependent on the cost of fuels (e.g., coal and natural gas) and the cost of carbon in a potentially monetized carbon future. Under these scenarios, it is generally safe to assume that the cost of utilities will be increasing and the savings associated with these strategies will improve from this conservative analysis using today's rates.
- **Legislation** – In addition to federal legislation that may affect the price of carbon, there is the potential of increased stringency in the state's RES. The majority of CSU's electricity purchases are from utilities that are currently required to supply 10 percent renewable energy by 2020. It is conceivable that this requirement will be elevated within the timeframe of this plan.

- **Changing technologies and associated costs** – the technological picture with respect to the built environment, renewable energy generation, and transportation is changing rapidly, particularly with the current focus on development in these areas. There are likely to be existing technologies that become increasingly viable and new technologies that will be introduced into future iterations of this plan.
- **Financing mechanisms** – Legislation, tax credits, renewable energy standards, and community goals can drive the introduction of new financing mechanisms that could enable CSU to achieve some of these strategies with less up-front capital than is modeled in this plan. For example, a third-party financing mechanism made the Chrisman Field Solar Plant financially feasible for CSU and still allows CSU to recognize the environmental benefits of the project within this plan's timeframe.



The Indoor Practice Facility is a LEED Gold Certified Building



The Academic Village is built to LEED Gold Standards



7.0 Implementation and Measuring Success

The development of this Climate Action Plan is a major step toward reducing the University's greenhouse gas emissions, pursuing climate neutrality, and furthering campus sustainability.

Collaboration among the members of the campus community, faculty, researchers, and community partners will benefit the implementation of the plan. A next step in implementing the strategies in this plan is to identify who will be responsible for implementing them and who can play a supporting role. The diverse nature of the strategies in this plan provides an opportunity for broad collaboration across the University. It is recommended that working groups be established around each of the plan's strategies and that each proceed independently and in parallel while still reporting results. A Sustainability Office could also be established that would be responsible for contributing to the plan's goals, keeping the independent working groups moving forward, consolidating reporting of progress, communicating status to the campus, and updating the inventory and the living document.

Partnerships are a particularly important component of implementation. CSU is fortunate to have many partners with an interest in sustainability in general as well as specific greenhouse gas reduction strategies in the Climate Action Plan. Such partnerships can be leveraged to share resources and expertise and can ensure that sustainability becomes part of the fabric of the campus and the community.

While this plan sets a long-term goal of climate neutrality, achieving interim milestones will help demonstrate tangible progress toward this goal over time. As discussed earlier in this plan, an interim goal has already been established to track progress.

Certain strategies contained in the plan can be implemented in a fairly short period of time while others will need to be phased over time. Establishing specific timelines for implementing various strategies will ensure that there is enough time to complete them before the target goal year is reached.

Finally, implementation of strategies should be documented for future reference and reporting to the community and to decision makers. For instance, what was the actual cost of the strategy and when was it implemented? Who was involved and what were their tangible indications of success, such as number of participants, number of buildings retrofitted or kilowatt hours (kWh) of electricity reduced? This type of information can be used to celebrate success, adjust strategies, or develop new strategies.

CSU has a strong foundation of existing research and operational activities on which to begin the journey to climate neutrality. This plan establishes an initial path to climate neutrality that recognizes CSU's unique opportunities to reach this goal as a land-grant research University. The plan also recognizes the many uncertainties associated with a long-term planning effort and the need to revisit this plan and refocus efforts on a regular basis.

With the strong commitment of students, faculty, staff, and the broader Fort Collins community, CSU is eager to implement this plan and begin to realize the local and global benefits of setting a trajectory for climate neutrality.

Appendix A: Sustainability, Energy and Environment Advisory Committee and Climate Action Plan Task Force Members and Affiliations

Sustainability, Energy and Environment Advisory Committee

Affiliation	Member
Student Sustainability Center	Chris Anderson
Procurement	Farrah Bustamante
Warner College of Natural Resources	Gillian Bowser
College of Liberal Arts	Michael Carolan
Facilities	Brian Chase
Faculty Council	Norm Dalsted
College of Applied Human Sciences	Brian Dunbar
Classified Personnel Council	Cam Elvheim
Vice President for Research	Bill Farland
University Libraries	Jim Farmer
Colorado State University Foundation	Kathleen Henry
Vice Provost for International Affairs	Chad Hoseth
School of Global Environmental Sustainability	Gene Kelly
College of Business	Paul Mallette
Athletics	Doug Max
Housing & Dining Services	Tonie Miyamoto
College of Natural Sciences	Tony Rappe
Cenergy	Tim Reeser
Woodward Professor of Systems Engineering and the President's Special Advisor for Energy and the Environment	Ron Segal (Chair)
Vice Provost for Outreach and Strategic Partnerships	Lou Swanson
School of Education	William Timpson
College of Agricultural Sciences	Lorraine Voss
Administrative Professional Council	Andrew Warnock
ASCSU	John Wilcoxon
Vice President for Public Affairs	Emily Wilmsen



Climate Action Plan Task Force

Affiliation	Member
Student Sustainability Center	Chris Anderson
Institute for the Built Environment	Ralph Bodin
Warner College of Natural Resources	Gillian Bowser
Facilities Management	Carol Dollard (Chair)
Colorado State University Research Foundation	Nancy Hurt
Institute for the Built Environment	John Keller
Athletics	Doug Max
Housing & Dining Services	Tonie Miyamoto
Facilities Management	Denise Sheahan
Facilities Management	Mary Warren **
Brendle Group – consultant	Judy Dorsey
Brendle Group – consultant	Seth Jansen

** The Climate Action Plan Task Force would like to dedicate this document in memory of Mary Warren. Mary, a student member of the task force and a deeply committed advocate of sustainability, was killed in a car accident as this document was being finalized. Her bright, enthusiastic and well-grounded attitude personified the attributes that future generations will need to tackle difficult issues like climate change.

