CALIFORNIA STATE UNIVERSITY, CHICO CLIMATE ACTION PLAN

May 23, 2011

Today Decides Tomorrow

California State University, Chico is committed to achieving climate neutrality by the year 2030, with an interim target of reaching 1990 emissions levels by the year 2020. The actions taken to reach the interim target will all be local actions.

Our Sustainable Future

California State University, Chico Climate Action Plan

TODAY DECIDES TOMORROW

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ACKNOWLEDGEMENTS

The 2010 California State University, Chico Climate Action Plan has been developed by The Institute for Sustainable Development

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1.0 PURPOSE

The 2010 California State University, Chico Climate Action Plan (CAP) is a document designed to guide the University's efforts in achieving climate neutrality by 2030. The Climate Action Plan suggests projects for achieving this goal by 2030 with the interim target of achieving 1990 levels (29,038 $MTeCO_2$) by 2020. All measures to reach the 2020 target will be accomplished with local actions. The CAP is a planning and policy document put forward as an initial effort by The Institute for Sustainable Development on behalf of the University, designed to guide a Climate Task Force in developing policy and setting priorities. It is intended to be a working document with regularly scheduled updates made by the Climate Task Force to the president of California State University, Chico (CSU, Chico).

President Paul J. Zingg signed the American College & University Presidents' Climate Commitment (ACUPCC) as a founding signatory in 2006. This move galvanized campus efforts to achieve climate neutrality, lending weight to emissions reduction efforts already in place and driving new initiatives. The CAP is informed by two greenhouse gas inventories, performed during the 2006-2007 and 2007-2008 fiscal years.

1.1 Context for the Climate Action Plan

CSU, Chico has a full-time equivalency (FTE) of 15,664 students, 2,003 faculty and staff, and encompasses a 119-acre main campus, an 800-acre farm, and 4,000 acres of nature reserves. The main campus is adjacent to downtown Chico, California. The city of Chico is roughly 33.14 square miles and boasts a vibrant downtown and a population of 87,713 residents.

CSU, Chico is part of the 23-campus California State University System. CSU, Chico is a comprehensive university principally serving Northern California, our state and nation, through excellence in instruction, research, the arts, and public service.

The University is committed to assisting students in their search for knowledge and understanding and to prepare them with the attitudes, skills, and habits of lifelong learning in order to assume responsibility in a democratic community and to be useful members of a global society.

Our Sustainable Future

CSU, Chico has a long-standing commitment to sustainability. Prior to signing the ACUPCC, the University had signed the Talloires Declaration, adopted a student fee to support campus and student sustainability efforts, operated a nationally recognized campus recycling program, and had hosted the first three of five annual sustainability conferences. The University also established The Institute for Sustainable Development (http://www.csuchico.edu/sustainablefuture/) to focus campus sustainability efforts, to be a central point of contact for sustainability efforts between the campus and the community, and to implement the University's sixth strategic priority. An Associated Students (AS) Sustainability Program was established as part of the student sustainability fee. This program initiates and enhances sustainability practices in AS operations and funds student sustainability internships and projects through the AS Sustainability Fund. The support and involvement demonstrated by students, faculty, and staff can best be summarized by President Zingg's statement:

"California State University, Chico is, fundamentally, a place of public purpose and service. We fulfill our responsibilities through the high aspirations we set for ourselves and the values that inform and govern our endeavors. We aim to be a leader in American higher education by building on our core commitments, connecting to our region, and helping to create a more just and vibrant democratic society. Among the choices we've made to prepare our students for the challenges they will face are cultivating respect for the planet and championing sustainable development.

The term "sustainable development" assumes that the people of the world have a common future and that they can and must work together to protect it. Our job, as members of a university community, is to help students see the relationship among environmental, social, and economic issues. Because we want sustainability to be infused across the curriculum, we adopted a plank in our Strategic Plan that affirms our belief that each generation owes something to those who follow and that we will create environmentally literate citizens who embrace sustainability as a way of living.

Embracing this core value of the University requires us to act on it… Faculty, staff, students, and other members of the Chico State family are acting to make a sustainable future a reality. They are helping to implement the University's vision and values, and they are making a commitment to create a vital community of public purpose and service…." —Paul J. Zingg, President, California State University, Chico

Embracing the Presidents' Climate Commitment was an affirmation of campus values and one of the ways in which we will implement the University's sixth strategic priority:

> **Believing that each generation owes something to those which follow, we will create environmentally literate citizens who embrace sustainability as a way of living. We will be wise stewards of scarce resources and, in seeking to develop the whole person, be aware that our individual and collective actions have economic, social, and environmental consequences locally, regionally, and globally.**

CSU, Chico's Climate Action Plan supports not only the American College & University Presidents' Climate Commitment but also the newly established CSU Climate Action Council, which was formed November 2009. The CAP also responds to California Assembly Bill 32, the Global Warming Solutions Act of 2006.

Other policies that influence the University's actions include the state initiative Title 24, the Energy Efficiency Standards for Residential and Nonresidential Buildings, and Executive Order 987, which mandates that all new buildings and major renovations will be built at a minimum to LEED Certified equivalent standards and strive for LEED Silver equivalent standards.

1.2 Relationship to Other Plans

The CAP is a planning and policy document designed to guide a CSU, Chico Climate Task Force in developing policy and setting priorities. The document aims to shape ongoing decisions and operations. Two recent documents support the CAP and the reduction of greenhouse gas emissions:

- **Master Plan.** This plan, last updated in 2005, outlines the growth of the University, including capital projects, in both new construction and renovation of our 123-year-old University. (http://www.csuchico.edu/fcp/docs/master_plan_2005.pdf)
- **Transportation Demand Management Plan.** This plan outlines the current transportation issues surrounding CSU, Chico's landlocked campus in an urban setting and suggests solutions and a plan of action for the mitigation of emissions and reduction of traffic congestion. The plan was developed

under the CSU, Chico Facilities Planning department in the Business and Finance division. It was produced in collaboration with the transportation consulting group Fehr & Peers. (http://www.csuchico.edu/fcp/docs/tdm_final_report.pdf)

1.3 Greenhouse Gas Emissions

The CSU, Chico CAP identifies and responds to the emission sources generally accepted as the standard for universities and outlined by the ACUPCC. These include Scope 1[1] and Scope 2[2] emissions, as well as Scope 3[3] emissions relating to commuting, travel, and solid waste. While this plan outlines specific reduction targets in Scopes 1 and 2, it also supports further action in reducing Scope 3 emissions.

Water is an increasingly scarce resource in the state of California. Coupled with this scarcity, the transportation and treatment of water is energy-intensive, contributing to greenhouse gas emissions. Other emissions not addressed in the CAP are emissions due to supply chain, manufacturing and shipping of goods purchased by CSU, Chico, and the emissions associated with the production of the food served on campus. Greenhouse gases are recorded and monitored in the biennial greenhouse gas inventories conducted as specified by the ACUPCC.

[1] Scope 1 refers to direct GHG emissions occurring from sources owned or controlled by the institution, including: on-campus stationary combustion of fossil fuels; mobile combustion of fossil fuels by institution-owned/controlled vehicles; and "fugitive" emissions. *Implementation Guide* (American College & University Presidents' Climate Commitment, 2009). Greenhouse Gas Emissions Inventory.

[2] Scope 2 refers to indirect emissions generated in the production of electricity consumed by the institution. *Implementation Guide* (American College & University Presidents' Climate Commitment, 2009). Greenhouse Gas Emissions Inventory.

[3] Scope 3 refers to all other indirect emissions -- those that are a consequence of the activities of the institution but occur from sources not owned or controlled by the institution. *Implementation Guide* (American College and University Presidents' Climate Commitment, 2009). Greenhouse Gas Emissions Inventory.

1.4 Organization and Preparation of the CAP

The CAP outlines emissions reduction goals and subsequent implementation steps by emissions sector. It includes the results of the latest greenhouse gas emissions inventory (2007-2008 fiscal year) and a description of the baseline emissions projections. The baseline assumes a business-as-usual scenario with no action taken toward mitigating the emissions produced by the University. To model this scenario, certain assumptions must be made, including campus population and building renovations and additions. A further discussion of these assumptions will be found in section 2.2, Future Projections of Greenhouse Gas Emissions.

The CAP summarizes emissions targets and identifies projects to achieve the reduction goal of returning to our 1990 emissions level by the year 2020. This section focuses on actionable projects for the near future. It also discusses the educational and research opportunities already in place and those being developed for our campus members to increase their knowledge of how to achieve climate neutrality and sustainability.

The CAP then discusses the actions necessary to reach climate neutrality by 2030 and the opportunities the University has to meet that target, while taking into account the fiscal challenges and changes in enrollment levels the University will experience in the next decade.

The CAP was drafted by Halli Bovia, sustainability coordinator, with The Institute for Sustainable Development (http://www.csuchico.edu/sustainablefuture/) at CSU, Chico. She was assisted by two undergraduate students, Fletcher Alexander and Edwin Liebig. The CAP was funded by The Institute for Sustainable Development. Input from campus stakeholders was obtained from: 1) a series of presentations and roundtable discussions with key CSU, Chico faculty, and administrators; 2) guidance from peer institutions in Northern California; and 3) technical comments from faculty and staff experts. The CAP is based on research and analysis from the following:

- Past emissions trends based on the two previous inventories.
- Identification of best practices in GHG emissions inventory, mitigation, planning, and implementation at other academic institutions in the state of California.
- Campus policy documents, the University's organizational structure, and CSU, Chico and the state of California budgetary constraints.
- External trends including state initiatives, federal policy, and technological advances.
- Cost-benefit analysis of proposed projects.

2.0 GREENHOUSE GAS EMISSIONS TRENDS AND PROJECTIONS

2.1 Previous Trends in Greenhouse Gas Emissions

In 2007, the first greenhouse gas emissions inventory for CSU, Chico was completed by graduate student, Danny Salazar, in geography as partial fulfillment of the requirements for a master's degree. The inventory consisted of greenhouse gas emissions for the1990-2006 fiscal years. This initial inventory was completed using a different calculator than is currently recommended by the ACUPCC -- the Clean Air-Cool Planet Campus Carbon Calculator -- and did not include travel sponsored by the University. The second inventory was completed in 2009 for the 2007-2008 fiscal year using the Clean Air-Cool Planet Calculator, following the guidelines for inventorying emissions sources as outlined by the ACUPCC, including travel. The most recent inventory includes emissions from the following sources: natural gas, purchased electricity, fuel use for the University fleet, refrigerant use, agricultural and landscape practices, commuting, travel, solid waste, and composting (as an offset).

In the 2007-2008 fiscal year, CSU, Chico was responsible for 42,741 $MTeCO_2$[4] of emissions. As shown in Figure 2.1, energy use (natural gas use and purchased electricity) accounted for 55 percent of the emissions, travel, fleet and commuting accounted for 40 percent of emissions, while waste, agricultural and landscape practices, and refrigerants together accounted for 5 percent. The inventory results indicate an increase of roughly 29 percent from the 2005-2006 fiscal year to the 2007-2008 fiscal year (the 9.5% increase is in part due to an increase in enrollment and the use of different commute survey methods for the respective inventories).

[4] $MTeCO_2$ (Metric Tons of Carbon Dioxide Equivalents), a metric measure that is used to compare the emissions from various greenhouse gases based upon their global warming potential (*EPA Glossary of Climate Change Terms:* http://www.epa.gov/climatechange/glossary.html#C).

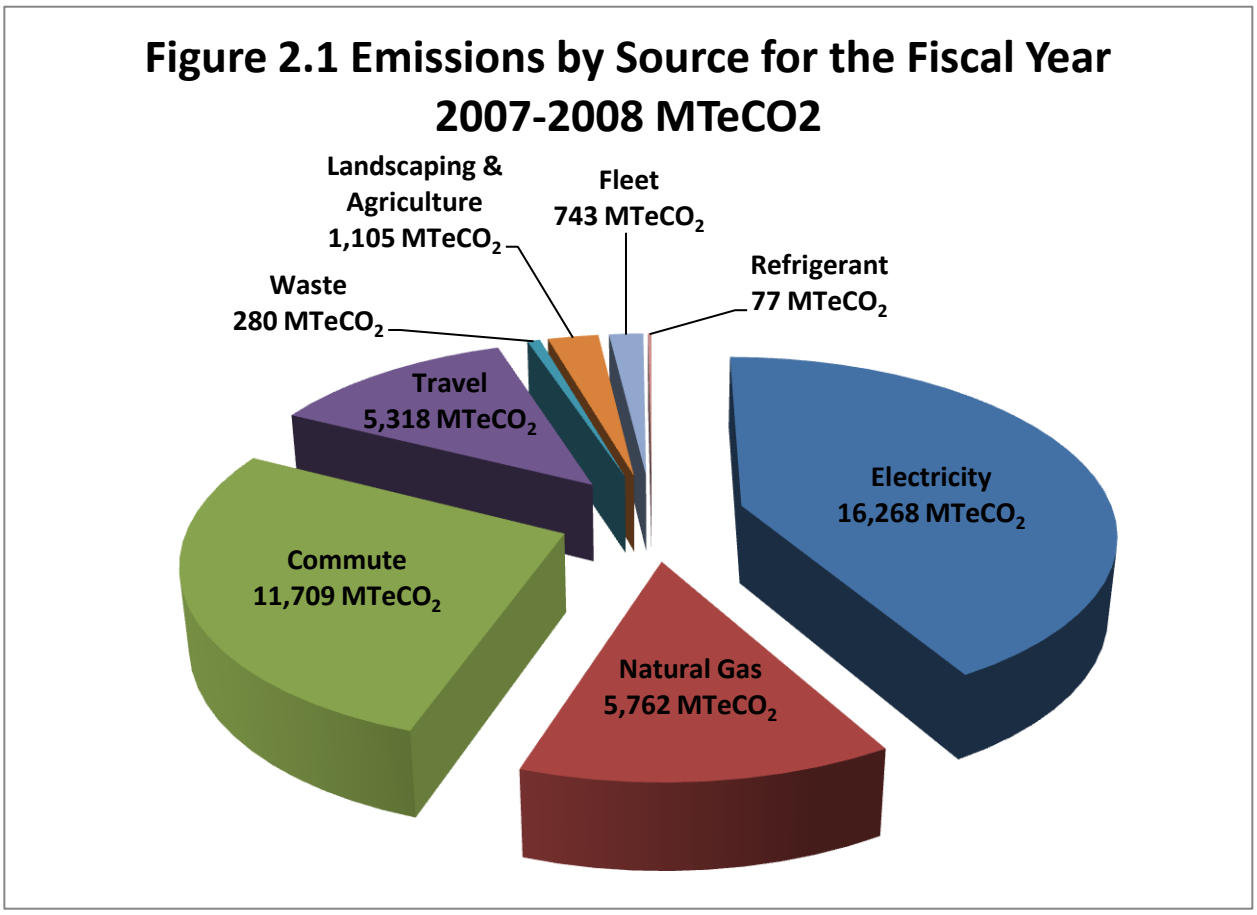


FIGURE 2.1: THE TOTAL GREENHOUSE GAS EMISSIONS REFLECTED IN THIS FIGURE DO NOT REFLECT THE CARBON OFFSET OF COMPOSTING (130 MTECO$_2$)

The largest opportunities for reduction lie in the sectors of purchased electricity, natural gas use, commuting habits, and University-sponsored travel. The CAP will address each emissions sector through education and measurable actions that can be verified, including measurement and verification of energy conservation measures.

2.2 Future Projections of Greenhouse Gas Emissions

The development of a climate action plan requires modeling a business-as-usual scenario that assumes no further actions would be taken to reduce emissions. This enables assessment of the comparative impact of different actions. To model this scenario, certain assumptions must be made, including campus population and building renovations and additions.

Population Growth

The 2005 Campus Master Plan anticipates an increase of the student population at an annual rate of 2.5 percent. However, the current state of California fiscal crisis suggests an alteration of course. Enrollment management is an increasingly difficult challenge for universities in the CSU system, and Chico is no exception. The campus is facing a mandatory reduction in enrollment, then a period of holding enrollment flat, followed by conservative annual increases. This conservative pattern of decline, maintenance, and growth (at a 1 percent annual increase) is used to project our population growth as a campus.

Campus Building Growth

Campus building growth is planned and referenced in the campus Master Plan. The business-as-usual scenario takes into account the planned building growth for the next two decades, including the three buildings added since the latest greenhouse gas emissions inventory (totaling 238,698 ft^2) and those planned for the future (180,480 ft^2).

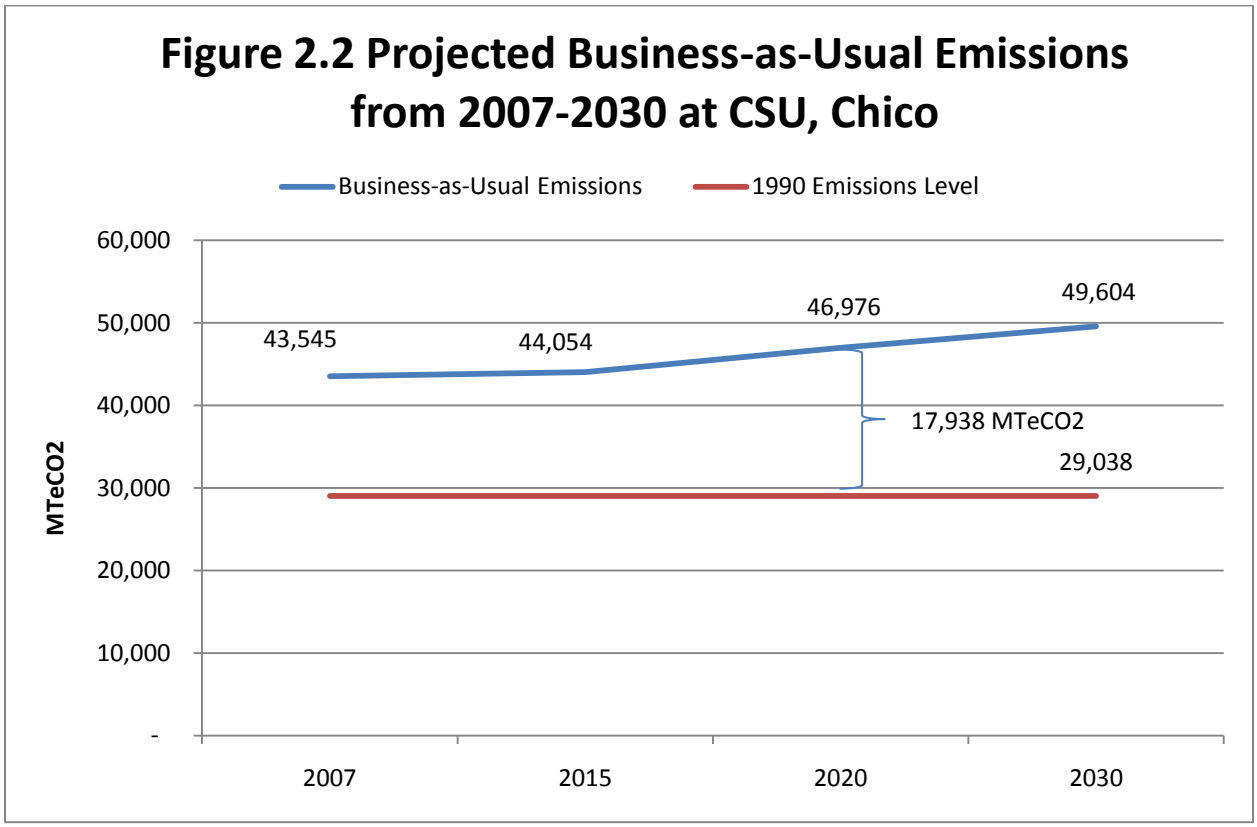
Changes in Electrical Supplies

Recent California legislation **(EXECUTIVE ORDER S-21-09)** requires retail utilities to provide 20 percent of their power from renewable sources staring this year (2010) and progressing to 33 percent renewable sources by 2020. However, CSU as a system can purchase direct access[5] from an energy services provider not held to the same standards. For example, during our most recent inventory year (2007-2008 FY), the University purchased electricity through direct access from Arizona Power Supply, which stated a power grid mix with only 2 percent renewable sources and made up of 39 percent coal.

Business-as-Usual Scenario for 2030

Figure 2.2 illustrates total projected business-as-usual emissions for CSU, Chico between 2007 and 2030. These emissions levels are estimated based on projected campus population growth and planned and anticipated capital projects.

[5] Direct access is the purchase of electricity directly from a competitive energy service provider rather than a local provider (PG&E for CSU, Chico). This is done through the CSU system office to provide bargaining power in guaranteeing a competitive rate for the system.



As shown in Figure 2.2, under a business-as-usual scenario, the University would see a steady increase of emissions due to expansions in operations and enrollment as the University experiences growth over the next 20 years.

With a total of 46,976 $MTeCO_2$ projected, and an estimated goal of 29,038 $MTeCO_2$ for 1990 levels, CSU, Chico needs to achieve a reduction target of 17,938 $MTeCO_2$ by 2020. The CAP outlines specific goals and potential projects that would allow the campus to reach the 17,938 $MTeCO_2$ reduction goal by the year 2020.

3.0 2020 CLIMATE ACTION PLAN

3.1 2020 Greenhouse Gas Reduction Strategies

The CSU, Chico CAP outlines a series of strategies for reducing our emissions to 1990 levels by 2020. This gives the University a realistic time frame, given current budget constraints, to complete the projects necessary to reach the reduction target of 17,938 $MTeCO_2$. The emissions reduction target calls for a minimum of approximately 38 percent reduction in emissions from. We have chosen a campus reduction target of 40 percent from the business-as-usual scenario for the year 2020 with efforts in the energy sector reducing campus-related emissions by 32 percent and efforts in the transportation sector reducing campus-related emissions by 8 percent. Additional reductions will be identified as implementation moves forward.

Although specific projects have been identified below, we will be updating the status of existing projects and identifying new projects as progress is made and targets are reached to continue reducing emissions. The status of these projects will be updated on a biennial basis.

Campus-Related Strategies

The following strategies to reduce greenhouse gas emissions are ordered by sector and bring about an overall reduction of 17,938 $MTeCO_2$. These strategies include an impact summary that describes the fiscal and physical impacts of the projects on the University. For some projects, a simple payback schedule has been established. All suggested projects were analyzed using cost-benefit analysis. Details on how this was calculated as well as the cost-effectiveness of each project can be found in section 6.0, Process for Prioritizing and Selecting Implementation Measures.

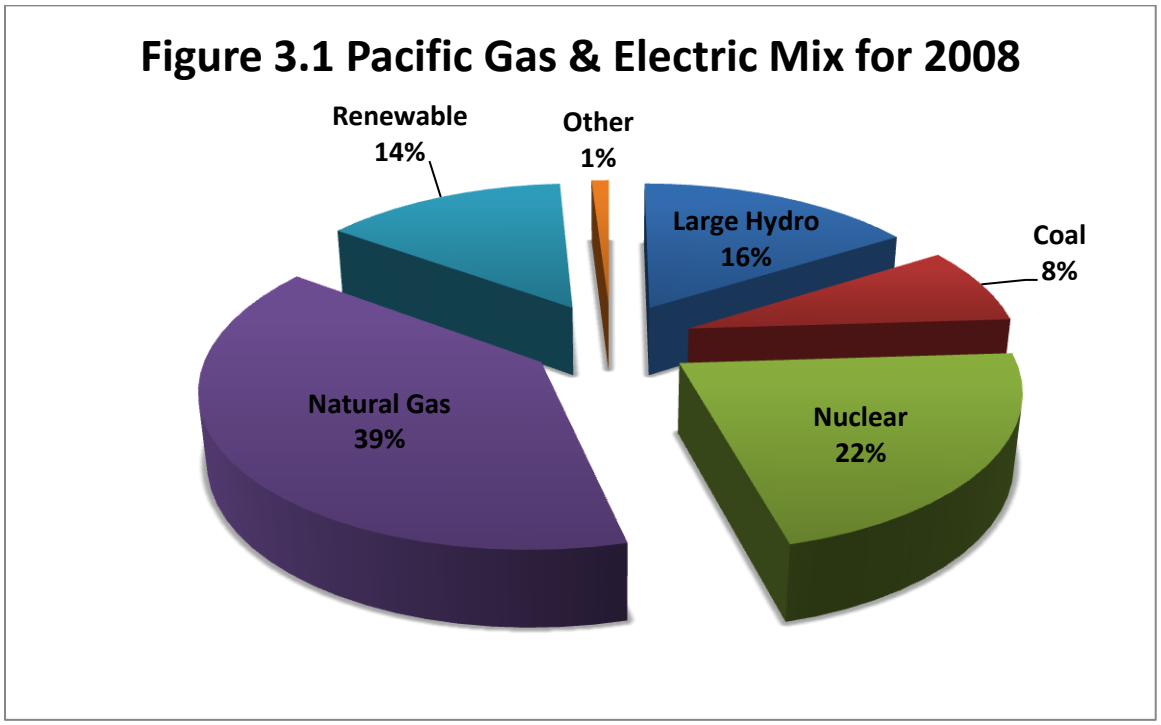
ENERGY SECTOR REDUCTION STRATEGIES

CSU, Chico has set an emissions reduction target of 32 percent for the energy emissions sectors. We have identified the following projects that may be implemented to help achieve this goal:

- Select an electrical services provider that provides a more climate-friendly power content label (grid mix)
- Retrofit lighting systems in 15 campus buildings
- Upgrade HVAC, boiler-chiller, and air handler efficiency
- Retrofit domestic H_2O booster pump in Housing
- Install PowerSave power management software
- Implement server virtualization

Select a More Climate-Neutral Grid Mix and Electrical Power Provider to Meet GHG Reductions

For the 1990-2006 and 2007-2008 greenhouse gas emissions inventories, CSU, Chico's power provider was Arizona Power Supply, which supplies 39 percent of its electricity by burning coal. CSU, Chico is currently purchasing a bundled source of "green" electrical energy. Pacific Gas & Electric (PG&E) uses coal for only 8 percent of its grid mix, as shown in figure 3.1. In selecting a more climate-friendly grid mix and electrical provider such as PG&E, CSU, Chico will reduce an estimated 12,646 $MTeCO_2$ for the year 2020. The gap in renewable energy between the two suppliers will only increase as a new California regulation, Executive Order S-21-09, and the Public Utilities Commission require that retail electrical providers increase the renewable portfolio of their grid mix to 20 percent by the beginning of this year (2010) and 33 percent by the year 2020. While PG&E and other in-state retail providers are required to hold to this standard, out-of-state providers are not, and the direct access agreement set up by the Chancellor's Office is also not required to meet these standards. To meet the goals of 2020 and 2030, CSU, Chico has the opportunity to search out new energy service providers that will make good financial sense and meet the goals for renewable energy.



As shown in Figure 3.1, this power content label burns less coal to provide electricity than other sources.

Impact of Changing Grid Mix:

Fiscal Savings: Currently positive. Spot market pricing[6] is currently lower than direct access offered by the CSU Chancellor's Office.

Emissions Savings: An estimated 12,646 $MTeCO_2$ for 2020

[6] Spot market pricing refers to the purchase of electricity at a market-driven rate without a contract and is driven by the cost at the time of purchase.

Retrofit Lighting Systems in 15 Campus Buildings

Already identified as fiscally responsible, a series of projects through the campus energy manager's office calls for the retrofit of lighting systems in 15 campus buildings. These projects were identified as part of an Investment Grade Audit[7] done by AECOM consulting services. This project has a 26-year lifetime.

Impact of Lighting Systems Retrofit:

Payback Schedule: 4.69 years

Lifetime Emissions Savings: 13,620.8 $MTeCO_2$

Average Annual Savings: $293,575

Upgrade Identified HVAC, Boiler-Chiller, and Air Handler Efficiency

Chiller replacements are called for at the main plant and at the Performing Arts Center, along with HVAC and VAV upgrades to Meriam Library and Holt Hall. These projects, some of which are currently underway, will reduce usage of both kilowatt hours (kWh) of electricity and therms of natural gas. This project has a 41-year lifetime.

Impact of HVAC, VAV, and Boiler-Chiller Efficiency Upgrades:

Payback Schedule: 32.19 years

Lifetime Emissions Savings: 20,833.9 $MTeCO_2$

Average Annual Savings: $220,523

Retrofit Domestic H_2O Booster Pump in Housing

This project replaced the 20hp pumps in University Housing that ran 24/7 deadheading (single pump) with a duplex 7.5hp system. This project demonstrates complete off-time and low-percentage load run times. It has a 20-year lifetime.

Impact of Water Booster Pump Retrofit:

Payback Schedule: 2.61 Years

Lifetime Emissions Savings: 476.9 $MTeCO_2$

Average Annual Savings: $14,582

[7] An Investment Grade Audit is a detailed energy audit that identifies specific energy projects and computes paybacks in order to provide investment-level economic information to the owners of the facilities on which the audit is being conducted. This is currently being conducted at CSU, Chico with engineering consultants AECOM.

Install PowerSave Power Management Software

Currently, CSU, Chico has installed 690 software licenses of PowerSave power management software. With centralized reporting, we have been able to monitor a distinct decline in kWh use for these lab computers (about 25,000 kWh/month). This project calls for adding PowerSave to the rest of the labs on campus that could feasibly utilize the software and also calls for the expansion on individual faculty and staff computers, increasing the total number of installed licenses to 2,767. For this project, an estimated increase in the price per kWh was increased by 3 percent annually. This project has a 22-year lifetime.

Impact of PowerSave Power Management Software:

Payback Schedule: 0.53 Years

Lifetime Emissions Savings: 4,237.4 $MTeCO_2$

Savings for the Year 2020: $147,121

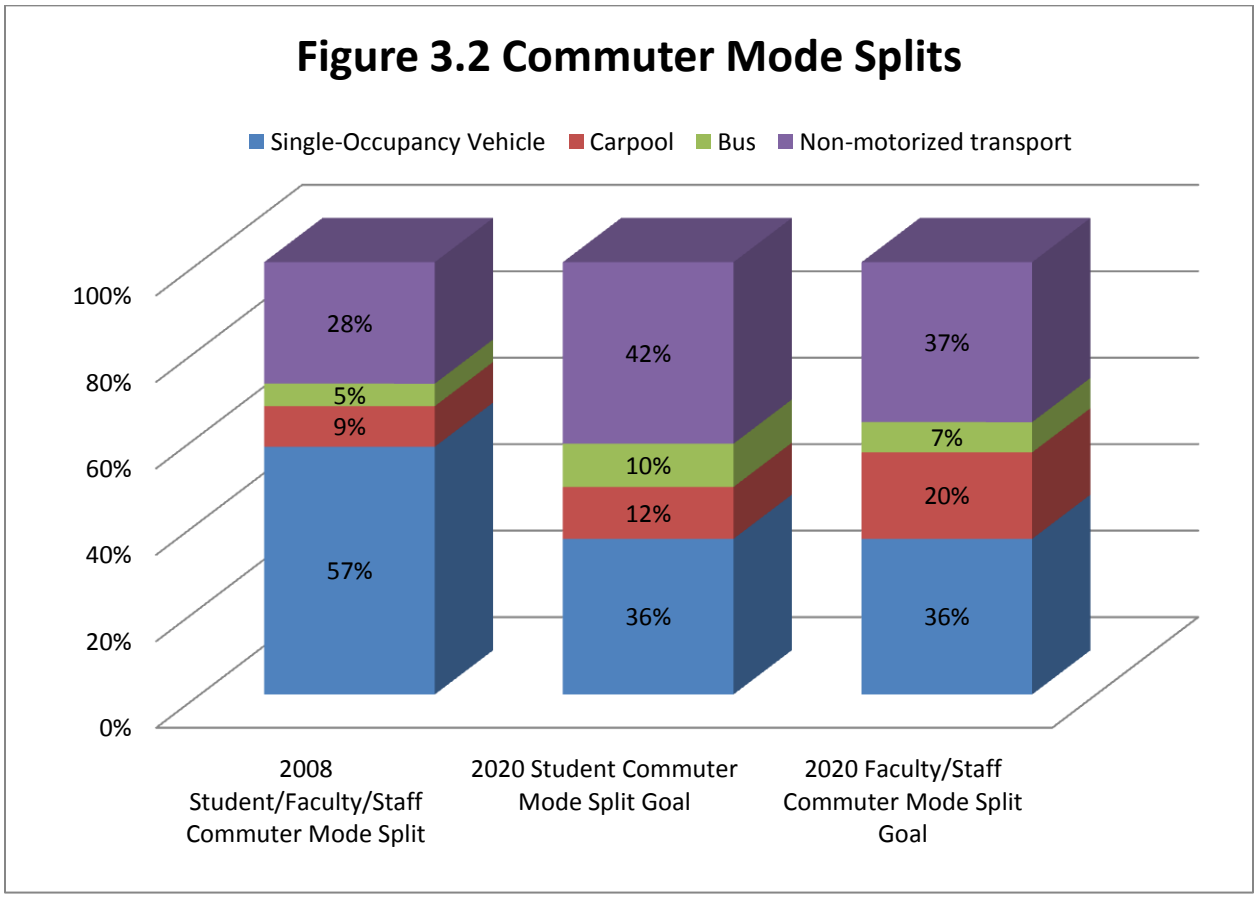
TRANSPORTATION SECTOR REDUCTION STRATEGIES

The CAP calls for an emissions reduction target of 8 percent from business-as-usual levels for the year 2020. This target will be met with various programs and educational strategies.

Reduce Single-Occupancy Vehicle Traffic to Campus

With the most current GHG emissions inventory, a campuswide mode of transportation split, single-occupancy vehicles (driving alone), carpooling, regional and local bus system, and nonmotorized transport (cycling/walking/skateboarding), was identified as shown in figure 3.2. This transit goal calls for the reduction of single-occupancy vehicle traffic to campus using a variety of campus programs and marketing campaigns that do not currently exist. There are regional efforts in this area that include BikeChico! week, local transit general marketing, local and campus cycling clubs, and recreational facilities such as extensive bicycle routes for mountain biking, cycling, and commuting, a skateboard park, and a BMX racing track. These local recreational facilities and routes encourage alternative transportation.

This goal calls for the expansion of on-campus marketing and programs for alternative modes of transportation. There are also more on-campus housing projects planned for completion by 2020 (with a potential increase of 600 beds) that should reduce student commuting. When implemented, this transit goal will reduce GHG emissions and relieve traffic congestion, a factor in greenhouse gas emissions. This project has an 11-year lifetime.



The shift in single-occupancy vehicle commute trips to campus would be significantly reduced by achieving the commuter mode-split goals.

Impact of Transit Goal Achievement:

Payback Schedule: None

Lifetime Emissions Savings: 30,072.1 $MTeCO_2$

Average Annual Savings: None

University-Sponsored Travel Education

While professional development is vital to CSU, Chico students, faculty, and staff, being cognizant of and taking responsibility for the environmental impact that traveling on behalf of the University has is an important factor of reaching climate neutrality. To address the sensitive nature of these emissions, the University will work with campus divisions to promote virtual meetings and conferences.

4.0 2030 CLIMATE ACTION PLAN

4.1 Climate Neutrality

CSU, Chico has chosen 2030 as its deadline for achieving climate neutrality and has selected the interim target of 1990 emissions levels by 2020. This deadline for climate neutrality is significant because it is close enough to require immediate action to mitigate the 49,604 $MTeCO_2$ of estimated business-as-usual emissions and provides a realistic timeline in order to achieve the most cost-effective local strategies before investing in local carbon offsets. A further discussion regarding the purchase of carbon offsets will be found in section 6.0, Process for Prioritizing and Selecting Implementation Measures.

4.2 After 2020: The Last Decade of Emissions for CSU, Chico

Upon implementing the above projects to reach the 2020 goal, there will still be 29,274.2 $MTeCO_2$ left to reduce from business-as-usual projections in order to achieve climate neutrality by 2030. All of the projects used to reach 2020 goals are local actions. In order to achieve climate neutrality, it is necessary to recognize that the University cannot simply cease certain campus operations that cause emissions, such as University travel and agricultural endeavors. The emissions from these operations could be mitigated, however, by the purchase of carbon offsets. CSU, Chico would like to use local offsets in order to achieve this goal. Currently, no local providers can offer this service, but two groups in Butte County are working to achieve this goal by becoming certified. It is reasonable to assume they will do so within the next 20 years.

4.3 2030 Projects: Further Actions

Because biennial emissions inventories and CAP updates are required by the ACUPCC on alternating years, the University is committed to creating an implementation plan for the 2020-2030 decade in the year 2018. This plan will outline strategies and identify potential projects to achieve climate neutrality by the 2030 target date.

Energy Sector Projects

SERVER VIRTUALIZATION

Data centers are historically one of the largest consumers of power at any institution, and running servers is the single largest component of that power consumption. A key tactic used for reducing data center power consumption is the move toward server virtualization, where many virtual servers can be run inside a few larger physical servers, more effectively using and sharing computing resources. In 2006, more than 300 separate physical servers running in various locations on campus, with about 85 of those in the data center. In 2007, the CSU, Chico data center began a server virtualization program, and since that time has been actively converting physical servers to virtual whenever feasible. As of this writing, there are about 90 virtual servers. It is estimated that each virtual server saves about 7,000 kWh and four tons of CO_2 annually compared with a comparable physical server. The goal of this project is to convert a total of 170 physical servers to virtual by 2015.

An additional power savings benefit that is not included in the above calculations is the reduced cooling requirement in the data center since there are fewer servers to cool. Energy savings from several activities geared toward reducing cooling in the data center may be reflected in a separate project in this plan. Further analysis using measurement and verification standards will provide more detail regarding greenhouse gas emissions reductions as well as a more complete cost benefit analysis.

FURTHER GOAL OF ELECTRICAL CONSUMPTION UTILIZING REAL-TIME METERS

Using the real-time meter system established for the 2020 reduction goals, we intend to reduce electrical consumption by 20 percent over a business-as-usual model.

INVESTMENT GRADE ENERGY AUDIT RESULTS

Energy-efficiency measures identified in the campus Investment grade audit will be implemented as economically feasible. The audit serves as a financial tool to identify projects designed to have the largest impact both economically and ecologically. Please see appendix 1 for the Investment Grade Energy Audit.

BUILDING RESTRICTION OR CLOSURE ON EVENINGS AND WEEKENDS

An issue faced by facilities staff is that the campus runs 24 hours a day, seven days a week. A reduction in the number of buildings needing to be heated, cooled, and lighted on evenings and weekends would greatly reduce the energy needed to power the campus. Restricting evening classes to only three buildings instead of across the entire campus is a way to achieve savings and needs to be further explored.

5.0 2030 VISION FOR CLIMATE ACTION EDUCATION, RESEARCH, AND COMMUNITY OUTREACH

CSU, Chico is bound by the ACUPCC to take "actions to make climate neutrality and sustainability a part of the curriculum and other educational experiences for all students [as well as take] actions to expand research or other efforts necessary to achieve climate neutrality."

5.1 Climate Action and Sustainability Education

The students and faculty at CSU, Chico were engaged in climate action and sustainability education for a number of years before committing to the goals of the ACUPCC. Since 2005, CSU, Chico has hosted the annual *This Way to Sustainability* Conference. It has grown over the years to host several prominent keynote speakers, including David Orr, Captain Paul Watson, Andrew Szasz, Michael Shuman, Ann Cooper, and Derrick Jensen. In 2009, it offered more than 90 sessions in seven tracks, including green energy, green solutions, and food and agriculture. The conference has always been free to students, and with more than 1,200 registrants from our campus, region, and state, CSU, Chico has made an impact over the last five years in bringing awareness about sustainability and climate action to the campus community and the community at large.

CSU, Chico offers close to 200 green courses, with a full listing found on the website http://cypress.csuchico.edu/APO/Course_net1/GreenCourses.aspx . In the last year, CSU, Chico started a Faculty Learning Community, which has the task of creating a new sustainability-themed general education track. This community is designed to identify learning outcomes for all sustainability classes, to have faculty create and share syllabi in order to create course links, stimulate interdisciplinary collaboration, and create guest lecture opportunities to augment these connections. A description of sustainability efforts on campus can be found in the brochure *Leading the Way to a Sustainable Future* (http://www.csuchico.edu/sustainablefuture/ISD%20Brochure.pdf).

5.2 Research to Mitigate the Effects of Climate Change

There are several research projects in the College of Engineering, Computer Science, Construction Management, and the College of Natural Sciences underway at CSU, Chico to help mitigate the effects of climate change. CSU, Chico benefits from local industry partnership with research centers such as the Cleantech Innovation Center, where research in high-altitude wind, zero-energy homes, and energy

management and control systems takes place under the direction of CSU, Chico faculty. In addition, a real-time metering research project in a section of student housing determines the effects of information and social networking on energy-use behavior.

5.3 Community Outreach

CSU, Chico offers several events and speakers throughout the year to bring awareness of climate change and sustainability practices to our immediate and regional communities. The campus participated and helped organize the most recent Focus the Nation event with an emphasis on county political leadership. This event organized several mayors from the region in regular meetings to discuss climate change. Along with the annual *This Way to Sustainability Conference,* CSU, Chico has hosted a series of lectures called *On the Creek* with speakers in sustainability, including Lester Brown, Jane Goodall, and Terry Tempest Williams, all open to the public. The University also hosts an annual *Greendance* film festival showing environmental films, and the Associated Students hosts an *EcoFest* festival every spring with environmental and sustainability groups and performances from campus and the greater community.

6.0 PROCESS FOR PRIORITIZING AND SELECTING IMPLEMENTATION MEASURES

Cost-benefit analysis was used to prioritize mitigation projects for implementation. Table 6.1 orders the projects by the cost of each $MTeCO_2$ mitigated per year as an average. The cost-benefit analysis uses a discount rate[8] of 7 percent. This fiscally conservative discount rate was chosen with the current budget climate in mind, and a recognition that a successful approach to accomplishing the goal of climate neutrality must work within the constraints of economic reality. Inherent to projects of this nature is a consideration of costs and benefits beyond those realized privately -- a consideration of the social costs and benefits.

Our criteria for selecting a project as being cost-effective was to determine the average annual cost of mitigation of $1MTeCO_2$ and compare this figure to the current average cost of purchasing certified carbon offsets ($\$10/MTeCO_2$). It is generally recognized that the most cost-effective route to achieving climate neutrality is to identify and implement local projects with a lower cost per $MTeCO_2$ mitigated than that of purchased offsets and to mitigate remaining emissions -- those emissions that cannot cost-effectively be locally eliminated -- with the purchase of certified carbon offsets.

At a 7 percent discount rate, four of the five proposed mitigation strategies have a positive net present value, and the fifth project comes in well under the $\$10/MTeCO_2$ threshold. Because most or all of these project costs occur early in the project lifetime, and the majority of the benefits occur later in the project lifetime, using a lower discount rate (such as 3%) increases each project's net present value and makes the project even more cost-effective according to this criteria. The payback schedule was calculated using the same 7 percent discount rate and represents the point in time at which the present value[9] of the annual net savings equals the upfront costs. The use of a 7 percent discount rate reflects both the opportunity cost and any risk or uncertainty associated with the project investment, whereas a 3 percent discount rate reflects only the opportunity cost. While the discount rate appropriate for projects concerning the environmental welfare

[8] The discount rate is the annual rate at which future benefits or costs are discounted relative to current benefits or costs. It can also be looked at as the annual rate at which dollar values are considered to increase over time. J. Harris, *Environmental and Natural Resource Economics: A Contemporary Approach* (Houghton Mifflin, 2006), p. 114.

[9] Discounting any cost or benefit expected in the future provides an estimate of its present value. J. Harris, *Environmental and Natural Resource Economics: A Contemporary Approach* (Houghton Mifflin, 2006), p. 114.

of future generations is still under debate[10], the use of a 7 percent discount rate is fairly standard in business investment analysis.

Table 6.1: Projects for Greenhouse Gas Emissions Mitigation

	Payback Schedule (Years)	Up-Front Project Costs	Project Net Present Value	$MTeCO_2$ Mitigated Over Project Lifetime	Cost per $MTeCO_2$ Mitigated
PowerSave Software	0.53	$26,818	$1,543,411	4,237.4	($364)
Lighting Retrofits	4.15	$1,821,486	$2,081,864	13,620.8	($153)
Housing Domestic H_2O Booster Pump Retrofit	2.61	$39,000	$169,016	468	($354)
HVAC/ Boiler Upgrades	32.19	$2,989,000	$171,474	20,833.9	($8)
Single-Occupancy Vehicle Reduction	None[11]	$715,164	($2,486,113)	30,072.1	$83

The cost per $MTeCO_2$ mitigated gives a direct comparison of what it will cost to implement the project vs. purchasing a carbon offset. Carbon offsets currently can be purchased for an average of $10/$MTeCO_2$. It is clear that in comparing all of the suggested projects with a payback schedule, implementing the projects will be more cost effective than the purchase of carbon offsets at an average price of $10/$MTeCO_2$.

[10] W. Nordhaus. "Critical Assumptions in the Stern Review on Climate Change" (*Science*, July 13, 2007), p. 201.

[11] The project that implements a commuter transportation mode split, which reduces single-occupancy vehicle trips to campus, does not save the University money and ends up costing the University $2,486,113 over the project lifetime (these costs include capital investment costs, and annual operating costs including: local transit fare subsidies, carpooling program, and staff time). However, when compared with the purchase of carbon offsets, which average $10/$MTeCO_2$, the project saves $2.48 per $MTeCO_2$ over the purchase of offsets.

7.0 IMPLEMENTATION

The previous sections outline CSU, Chico's goal of climate neutrality and the recommended interim steps to achieve that aim. These recommendations, made by the authors, represent the best strategies to achieve these goals with current information and technologies. Because this is a working document and the University is in a dynamic environment, conditions surrounding the recommendations may change. As such, it is critical to establish internal mechanisms for responding to those political and fiscal changes, helping to ensure that progress continues. The Climate Task Force will take on this responsibility.

7.1 Implementation Responsibility

The early success in the progress of climate action achieved by CSU, Chico has been due to the work of many students, faculty, and staff. The signing of the American College and University Presidents' Climate Commitment as a charter signatory by President Zingg was a logical extension of our collective campus values and work in the area of sustainability. This bold action by the president has served to focus and galvanize these efforts. With the aggressive goal of achieving climate neutrality by 2030, and reaching 1990 levels by 2020, implementation responsibilities must be designated and are outlined below:

- Responsibility for policy choices and priority setting should rest with the Climate Task Force, which reports to the Campus Sustainability Committee. Currently, the Climate Task force does not exist but is under consideration by the newly formed campus sustainability committee.
- Responsibility for GHG emissions mitigation implementation and reporting is shared broadly across the University, resting with the campus divisions, auxiliaries, Research and University Foundations, faculty, staff, students, and campus clubs and student groups.
- Biennial GHG emissions inventories (as per the ACUPCC) will be conducted by The Institute for Sustainable Development and will be coordinated by the campus sustainability coordinator, with reporting supported and contributed to by all campus divisions and auxiliaries, including the Research and University Foundations.
- Monitoring of implementation strategies will be conducted by the campus sustainability coordinator, who will report annually on the progress to the Climate Task Force.

- The monitoring of the implementation of climate neutrality and sustainability into curricular and educational experiences is the responsibility of The Institute for Sustainable Development director, who will report annually on the progress to the Climate Task Force.
- CAP updates will be conducted every five years by the Climate Task Force (with the next report due in 2015).

This implementation plan identifies the need for the formation of an official Climate Task Force. This task force may be a working group within a campuswide sustainability council. The process of greenhouse gas emissions mitigation will necessitate expertise from all campus sectors, and the committee will require the expertise of all major University stakeholders, who will be represented on the Campus Sustainability Committee. The authors of the CSU, Chico Climate Action Plan look forward to the implementation of these ambitious and worthy goals.

APPENDIX 1: INVESTMENT GRADE AUDIT RESULTS

Building-By-Building Summaries	All Facilities	KENDALL HALL	AYRES HALL	GLENN HALL	STUDENT HEALTH CENTER	LAXSON AUDITORIUM	TRINITY HALL	MODOC HALL	PLUMAS HALL	VESTA HOLT HALL	PERFORMING ARTS CENTER	LANGDON ENGINEERING CTR
Facility Number		1	4	6	11	16	19	21	23	25	27	28
Facility Sq. Ft.	728,404	51,232	45,803	41,245	22,296	33,092	26,817	35,225	64,015	130,610	111,132	58,249
	Rows:	287-404	4 - 80	406-507	1026-1099	82-105	210-285	932-1024	509-638	640-930	1197-1425	1101-1195
Pre-Retrofit Lighting Technology	Summary											
Luminaire Quantity	10,249	737	551	770	251	97	323	581	1211	2413	1442	970
kW per Space	879.65	64.20	90.65	52.91	22.64	8.91	25.66	36.97	96.39	157.19	113.80	117.19
kWh per Space	3,347,751	149,579	355,996	206,345	86,009	29,659	102,964	144,756	373,594	618,364	487,458	453,155
Post-Retrofit EEM Lighting Technology	Summary											
EEM Quantity	10,248	737	551	770	251	96	323	581	1211	2413	1442	970
kW per Space	459.48	32.75	24.63	33.15	12.16	4.86	12.95	25.13	51.21	112.03	56.81	43.06
Sensor Quantity	448	34	43	44	8	0	0	18	68	120	38	51
kWh per Space	1,476,138	62,013	81,323	116,556	40,720	17,673	50,749	87,018	151,609	362,675	218,895	127,223
Savings	Summary											
Space Savings kW	420.17	31.45	66.03	19.76	10.48	4.05	12.70	11.84	45.18	45.16	56.98	74.13
Annual Savings kWh	1,871,614	87,566	274,674	89,789	45,289	11,986	52,215	57,738	221,985	255,689	268,563	325,932

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