COLORADO CLIMATE ACTION PLAN

A STRATEGY TO ADDRESS GLOBAL WARMING

GOVERNOR BILL RITTER, JR.

NOVEMBER 2007

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A Message from Governor Bill Ritter, Jr.

Global warming is our generation's greatest environmental challenge. The scientific evidence that human activities are the principal cause of a warming planet is clear, and we will see the effects here in Colorado. But the seeds of change are also here in Colorado, in our scientific and business communities, and in each of us individually.

This Colorado Climate Action Plan is a call to action. It sets out measures that we in our state can adopt to reduce emissions of greenhouse gases by 20 percent by 2020, and makes a shared commitment with other states and nations to even deeper emissions cuts by 2050.

Why is this important? For Colorado, global warming will mean warmer summers and less winter snowpack. The ski season will be weeks shorter. Forest fires will be more common and more intense. Water quality could decline, and the demand for both agricultural and municipal water will increase even as water supplies dwindle.

Can Coloradans really make a difference? I believe we can, and that we have a moral obligation to try. In setting and achieving our climate action goals we will show leadership as a state, engage with neighboring states in a regional effort, and call upon the federal government to take strong actions on national initiatives.

This plan has been developed over several months, in a collaborative process, including business and community leaders, conservationists, scientists and concerned citizens. It pushes energy efficiency measures that will reduce demand for electrical energy and lower utility bills; builds on the state's recently expanded Renewable Portfolio Standard and looks for ways to develop our renewable energy supplies even further; includes an ambitious goal for making cars and trucks run more cleanly and efficiently while saving consumers money at the pump; and provides an exciting new opportunity for rural Colorado by creating economic incentives for major utilities and industries to pay farmers and ranchers to sequester more carbon in the soil.

The plan includes a strong plea, voiced also by the bipartisan Western Governors' Association, for an accelerated round of federal investments to deploy clean coal technologies.

Its success depends on everyone doing his or her part. We can reduce global warming and keep our economy strong and vibrant. This is an exciting time for Colorado as we look toward an expanded New Energy Economy with new jobs, new businesses and new investments.

If we do this right, we can turn the challenge into opportunity for Colorado's workforce. Insulating homes and buildings, establishing wind farms, building solar arrays, and constructing clean coal power plants will demand thousands of trained workers. Stepping up energy conservation and developing new sources of clean, renewable energy will grow the New Energy Economy in Colorado. These benefits will radiate across the state, from coal mining areas in western Colorado to farms in eastern Colorado, and from Fort Collins to Pueblo, where urban areas have an enormous need for efficiency retrofitting in homes and buildings.

If we don't do it right, in Colorado, across America and around the globe, our children and grandchildren will inherit a much diminished world.

I urge all Colorado residents and communities to join in as we take these bold steps toward preserving a livable climate for future generations.

Sincerely,

Bill Ritter Jr.

Bill Ritter, Jr.
Governor

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Credit: Brian Gadbury / CTO

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EXECUTIVE SUMMARY

Colorado's greenhouse gas emissions are steadily climbing, contributing to a worldwide climate change crisis. Our emissions in 2005 were 35 percent higher than in 1990 and under a business-as-usual scenario, are projected to grow to 81 percent above 1990 levels by the year 2020.

Our goal is to mobilize Colorado's businesses, governments and citizens in an effort to first slow and halt the increase and then reduce emissions to 20 percent below 2005 levels by 2020. We believe that goal is achievable, that it will make a material difference, and that it will put us on the path to making the even steeper emissions reductions that the world's scientists say we must achieve by the middle of this century.

These are real challenges for the State of Colorado. But by fully engaging in the New Energy Economy – by training thousands of workers to improve energy efficiency in our homes, stores and factories, and training thousands of others to build wind farms, solar facilities and geothermal plants across the state, and by aggressively pursuing new technologies for using our abundant coal resources cleanly – we can reduce our emissions, create jobs and build more sustainable communities.

Colorado state government has three important roles to play in facing the climate change challenge:

- Enact "bridge strategies" that immediately reduce greenhouse gas emissions while we pursue technologies to generate cleaner energy.
- Provide leadership to ensure that long-term solutions, such as renewable energy and clean coal technologies, are fully developed and broadly implemented.
- Prepare the state to adapt to those climate changes that cannot be avoided.

Specifically, Colorado will…

Reduce Greenhouse Gas Emissions

- By 2020, reduce greenhouse gas emissions by 20 percent below 2005 levels.
- By 2050, reduce greenhouse gas emissions by 80 percent below 2005 levels.

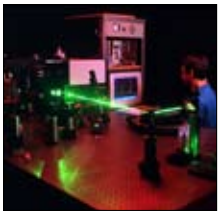
Recognize Agriculture as Part of the Solution

- Encourage agricultural carbon sequestration and reductions of emissions by leading the establishment of a carbon credit market.
- Provide revenues to farmers and ranchers for switching to management practices that sequester carbon in soils and reduce greenhouse gas emissions.
- Encourage the energy sector to offset its emissions by buying carbon offset credits from farmers and ranchers in Colorado and the West.

Transportation

- Reduce emissions from passenger vehicles by adopting greenhouse gas emissions standards.
- Expedite broadband access statewide to expand teleworking and teleconferencing options for business, education and government.
- Increase clean transportation options for state employees through the Greening of State Government program.
- Recognize community excellence in land use and transportation in the Governor's Annual Awards of Excellence in Sustainability.

EXECUTIVE SUMMARY (CONT.)



Provide Greener Electricity
- Establish a goal for major electric utilities to reduce greenhouse gas emissions by 20 percent by 2020 and work with smaller electric utilities to set comparable goals to reduce greenhouse gas emissions.
- Give utilities flexibility to meet the 2020 goal while encouraging broad implementation of energy efficiency measures that are cost effective, create jobs, and save consumers money.
- Expand renewable energy resources and make use of new clean coal technologies.

Research and Innovation for Coal, Natural Gas and Renewable Energy
- Partner with research institutions and industry to expand research and development of clean coal technology, such as integrated gasification combined cycle and geologic sequestration.
- Partner with research institutions and industry to develop ways to prevent methane leakage from natural gas drilling.
- Promote the research and development of new energy resource technologies through the Colorado Renewable Energy Collaboratory.

Recycling/Solid Waste
- Establish a state government waste diversion goal of 75 percent by 2020.
- Expand Greening of State Government to implement a three-bin strategy throughout state government.

Emissions Reporting
- Phase in mandatory reporting as standardized protocols become available.

Lead by Example
- Launch the Governor's Energy Office "Best Practices" website.
- Reduce state government energy consumption by 20 percent by 2012.
- Reduce petroleum use in state vehicle fleet by 25 percent by 2012.
- Use performance contract financing to audit and make energy efficiency improvements to state buildings and K-12 schools.
- Increase E-85 fueling stations statewide.

Regional Carbon Emissions Trading
- Continue to serve as observers in the Western Climate Initiative.
- Call for the federal government to adopt a national global warming strategy as soon as possible.
- If Congress and the President fail to agree on a national carbon credit trading program, join the Western Climate Initiative.

Foster an Educated Workforce
- Partner with K-12 educators to develop and teach sustainability curricula.
- Partner with higher education to educate the work force needed for the New Energy Economy.
- Utilize the Governor's Jobs Cabinet to create a well-trained workforce for the New Energy Economy.

Adapt to Climate Change
- Investigate vulnerabilities of the state's water supplies to climate change.
- Analyze impacts on interstate water compacts.
- Plan for severe drought, flooding and other risks of climate change.
- Reduce risk of wildfires.

THANK YOU


Credit: Eric Wunrow / CTO

Over the course of the last several months, business leaders, conservationists, water and electric utilities, and many others have worked to help us understand the impacts from global warming, what it means for Colorado, and what Colorado should do to help address this issue.

During late September and early October 2007, we conducted a series of nine roundtable meetings to seek input into the preliminary Climate Action Plan. The roundtable topics were:

- Agriculture and Forestry
- Solid Waste/Recycling
- Energy Efficiency and Renewable Energy
- Business and Industry
- Transportation and Land Use
- Residential and Commercial Built Environment
- Environmental Community
- Utilities
- Water and Tourism

Many ideas that came forward through this outreach are reflected in this preliminary plan. We thank the more than 250 people who gave us their time and expertise. We certainly could not have done it without you.

We also want to recognize the efforts conducted separately that also informed this preliminary action plan. The Colorado Climate Project, the Colorado Climate Action Network, and many concerned citizens forwarded ideas and proposals that are reflected in this plan.

THIS IS A LIVING DOCUMENT

While this first installment of Colorado's Climate Action Plan is ambitious, it does not include the full array of measures we will need to undertake to comprehensively address climate change in Colorado. We have not yet fully evaluated all of the measures that other states have adopted or that citizens proposed to us. We look forward to continued analysis and further conversation with Coloradans and others about what additional measures might make sense for Colorado.

This effort will accelerate as we look beyond the 2020 goals to the deeper cuts in emissions needed to meet our 2050 goals. We hope and expect that new technologies will emerge that will enable us to reduce emissions more efficiently and to adapt better to global warming.

For all of these reasons, we see this plan as a living document that will evolve along with the science, technology, economics and our understanding of the effects of climate change on our natural resources and environment. And, as the federal government engages on this vitally important issue – as it must do, and do soon – Colorado will continue to demonstrate its leadership as it fits into that larger national effort.

I. INTRODUCTION

A. Understanding Climate Change

Scientists around the globe have been working together for decades to track the increase of greenhouse gases in the Earth's atmosphere, rising temperatures and extreme weather. They agree that the planet is warming much more than under natural conditions, and the cause is human activity — primarily the burning of fossil fuels.

Earlier this year, the Intergovernmental Panel on Climate Change (IPCC), which includes hundreds of scientists worldwide and was awarded the Nobel Peace Prize last month, issued three new reports on climate change. The key statements are:

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

"Most of the observed increase in globally averaged temperatures since the mid-20th Century is very likely due to the observed increase in [human-caused] greenhouse gas concentrations."

How greenhouse gases work to raise temperatures: Three greenhouse gases produced by natural processes and human activity — carbon dioxide, methane and nitrous oxide — make up less than 1 percent of Earth's atmosphere, but they exert powerful control over global temperatures. The greenhouse gases absorb the sun's heat as it radiates back from the Earth's surface toward space, and trap that heat in the atmosphere.

Over the past 650,000 years, the average concentrations of greenhouse gases maintained by nature gave the planet a balanced climate that fostered bountiful ecosystems and eventually civilization and agriculture. Greenhouse gas concentrations went up and down with the natural cycle of ice ages, but were never higher than 300 parts per million (ppm).

The last century and a half of industrialization changed the balance. Billions of tons of carbon, once safely stored deep underground in the form of coal, oil and gas, are being released into the atmosphere. About 80 percent of human-produced greenhouse gases are released from the burning of fossil fuels. The other 20 percent comes from burning tropical forests and from agriculture and landfills.

In the air or by combustion, carbon mixes with oxygen to form carbon dioxide, or CO_2. Of all greenhouse gas emissions resulting from human activity, CO_2 makes up about 75 percent. Worldwide, we are releasing 7 billion tons of carbon per year into the atmosphere.

Ice cores drilled in Antarctica show that greenhouse gas concentrations started spiking in the late 1800s, at the time of the Industrial Revolution. At that time, the atmosphere held 280 ppm of CO_2. By 2006, CO_2 concentrations reached 382 ppm, a 35 percent increase and by far the highest level in all of human history. In the last decade alone, we increased the concentration of CO_2 in the atmosphere by 19 ppm.

As a result, the global average temperature increased by 1.4 degrees Fahrenheit (F.) in the last century. That may not seem like much, but scientists are observing many examples of rapid, destructive changes in ecosystems worldwide from that increase.

Scientists project the global temperature will continue to rise — the question is by how much. The IPCC developed a range of future scenarios based on no new policies to stabilize or reduce greenhouse gas emissions. Under these "business as usual" scenarios, greenhouse gas concentrations could reach 600 to 1,000 ppm by the end of this century, resulting in global temperature increases of 3.6 to 10.4 degrees F.

I. INTRODUCTION (CONT.)

B. Impacts of Climate Change on Colorado, Present and Future

We are already seeing the impacts in Colorado from the global average temperature increase of 1.4 degrees F.

Eleven of the past 12 years were the warmest on record worldwide since 1850, when record-keeping began. Glaciers, snowpack and sea ice are shrinking, oceans are rising, droughts are longer and more intense in some areas, and weather extremes, such as heavy downpours that cause flooding, intense hurricanes and wildfire, are more frequent. Climate disruption is already happening.

While some of the most obvious impacts of climate change won't affect Colorado, the state will experience indirect effects from the displacement of millions of people living in coastal areas, thawing of arctic ecosystems and accelerated loss of usable lands to desert. However, the direct risks to the state are very serious.

Observations in recent decades show that Colorado is seeing:

- Shorter and warmer winters, with a thinner snowpack and earlier spring runoff.
- Less precipitation overall, and more falling as rain than snow.
- Longer periods of drought.
- More wildfires, burning twice as many acres each year than before 1980.
- Widespread beetle infestations wiping out pine forests, and die-off in aspen stands.
- Rapid spread of West Nile virus due to higher summer temperatures.

In the coming decades, scientists project that Colorado and neighboring western states will see:

- Temperatures increasing by 3 to 4 degrees F. by 2030. Summer heat extremes will become more frequent and last for longer periods. Air conditioning demand will stress electric utilities, vulnerable populations will suffer increasingly from heat-related illnesses, and summertime air pollution levels will increase.
- Longer and more intense wildfire seasons. Fires are projected to claim more land each year than the year before.
- Midwinter thawing and much earlier melting of snowpack. The seasonal changes will cause flooding, shorten the ski season by three to six weeks, and place added stress on reservoirs.
- Much lower flows in rivers in the summer months and a greater vulnerability to drought. Already over-used river systems will have an even harder time filling existing water rights and future growth. Hydropower production may decline. Water quality will suffer as flows are depleted.
- Water shortages and heat stress for irrigated agriculture. Soil moisture will decline, crops will need more irrigation and some crops may not survive mid-summer droughts and heat spells.
- Slower recharge in groundwater aquifers. Water storage in the Ogallala aquifer, which underlies eastern Colorado, is projected to decline by 20 percent if temperatures increase by more than 5 degrees F.
- Movement of plant and animal species to higher elevations and latitudes. High-elevation habitat will become fragmented. Many of today's high-elevation species will face localized or total extinction. Local ecosystems will be more like those now found at lower elevations.
- Insect attacks in forests. Warmer winter temperatures reduce winterkill of beetles, warmer summer temperatures allow faster insect life cycles, and summer droughts further tip the advantage, making forests more vulnerable. Gypsy moths may invade aspen groves.
- Less snow cover and more winter rain on farm lands. Pelting rain on bare ground will increase soil erosion.
- More weeds. Higher CO_2 levels give weeds an advantage over preferred species.

I. INTRODUCTION (CONT.)

Scientists say some additional global warming is inevitable, since greenhouse gases can stay in Earth's atmosphere on average for over a century, and some for as long as 1,000 years. Even if we can cut greenhouse gas emissions significantly today, temperatures and sea levels will still rise over the coming decades. If we continue on our present path of emissions, temperatures will rise much, much more.

It is clear that human activity has been a significant cause of this unprecedented rise. It is just as obvious that our state, our region, our country, and the nations of the world must join together to develop effective measures to stabilize and then reduce emissions of greenhouse gases. The challenge is huge, and Colorado will become a leader in the worldwide effort to slow global warming.

C. Turning Adversity to Opportunity

Colorado is rich in energy resources — coal, oil, gas, wind, solar, and geothermal — and rich in intellectual and entrepreneurial resources. The brainpower and initiative of Colorado businesses and institutions is already focused on leadership in the New Energy Economy. For example:

- The National Renewable Energy Laboratory in Golden is the nation's primary laboratory for renewable energy and energy efficiency research and development. Colorado research universities are working with NREL to develop new energy technologies.
- Vestas Corp. is building a wind turbine manufacturing facility in Windsor.
- British Petroleum opened a large new wind farm at Grover in Weld County.
- SunEdison is building an 8-megawatt solar photovoltaic facility near Alamosa.
- Xcel Energy, the city of Fort Collins, and the Delta-Montrose Electric Association are showing that investments in energy efficiency can save consumers and businesses money and avoid the need for costly new power plants.

These are only some examples of how Colorado is already proving its leadership in the New Energy Economy. But there are far more opportunities waiting to be developed that will allow us to reduce our carbon footprint and build a sustainable economy. It will take ingenuity and a spirit of enterprise. It will take strong private-public partnerships to help entrepreneurs develop new technologies and bring them to market. It will require us to promote new energy technologies while helping our existing resource industries prosper in this new environment.

Our plan begins this process by directing state agencies to work with local governments, utilities, the agricultural sector and other stakeholders on several new initiatives.

II. COLORADO'S EMISSIONS PROFILE

Our first task in preparing this plan was to learn the volume and sources of Colorado's greenhouse gas emissions. We found that Colorado's emissions profile closely mirrors the country as a whole. As the pie charts illustrate, electricity consumption and transportation are the largest contributors to greenhouse gas emissions in Colorado and the nation.

By volume, greenhouse gas emissions from human activity in Colorado grew by 35 percent from 1990 to 2005. Per capita emissions changed very little over that time, but Colorado's growing population and economy pushed up the total volume of emissions.

In 2005, Colorado sources emitted 118 million metric tons of CO_2 equivalent gases ($MMTCO_2e$), up from 87 $MMTCO_2e$ in 1990. Current projections suggest that under a business-as-usual scenario, Colorado's emissions will climb to 158 $MMTCO_2e$ by 2020.

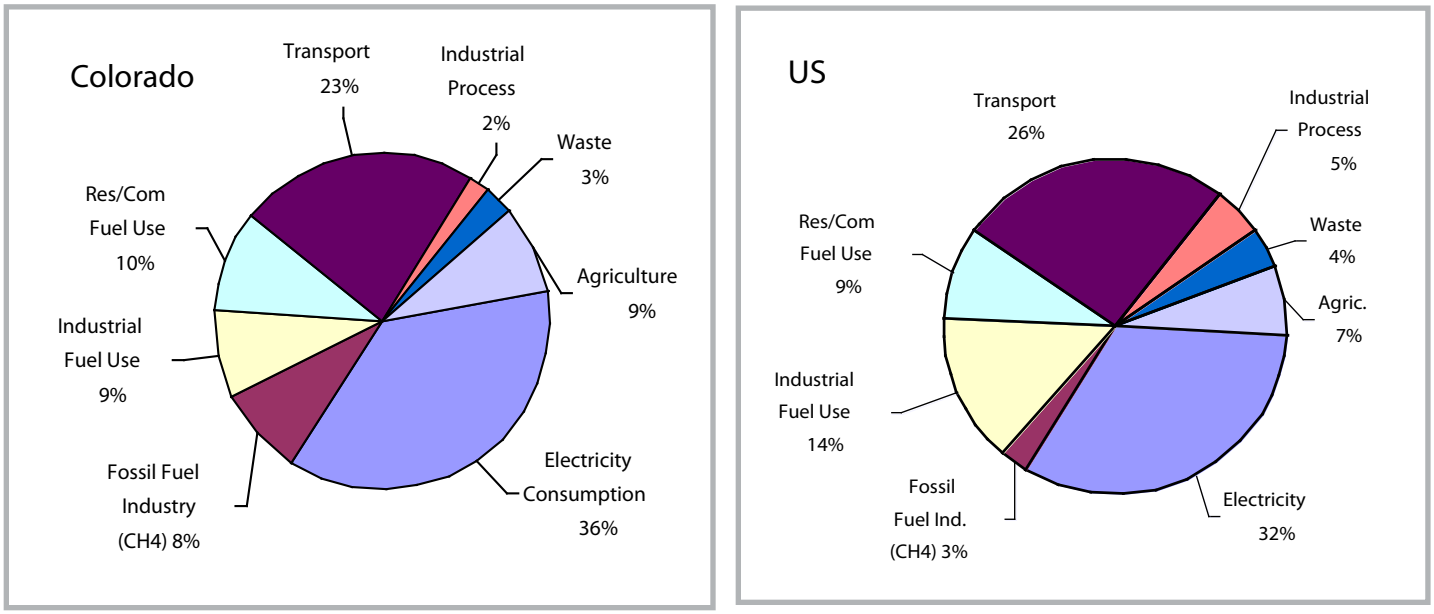


Chart 1. Greenhouse gas emissions produced in Colorado and the United States by sector, 2000

III. GREENHOUSE GAS EMISSIONS REDUCTION GOAL

Our next step was to determine the goal Colorado should set for reducing greenhouse gas emissions. Scientists tell us that to head off catastrophic disruptions to our environment and society by the second half of this century — when our children and grandchildren will be running this state — we must slash greenhouse gas emissions by 80 percent below 2005 levels by 2050.

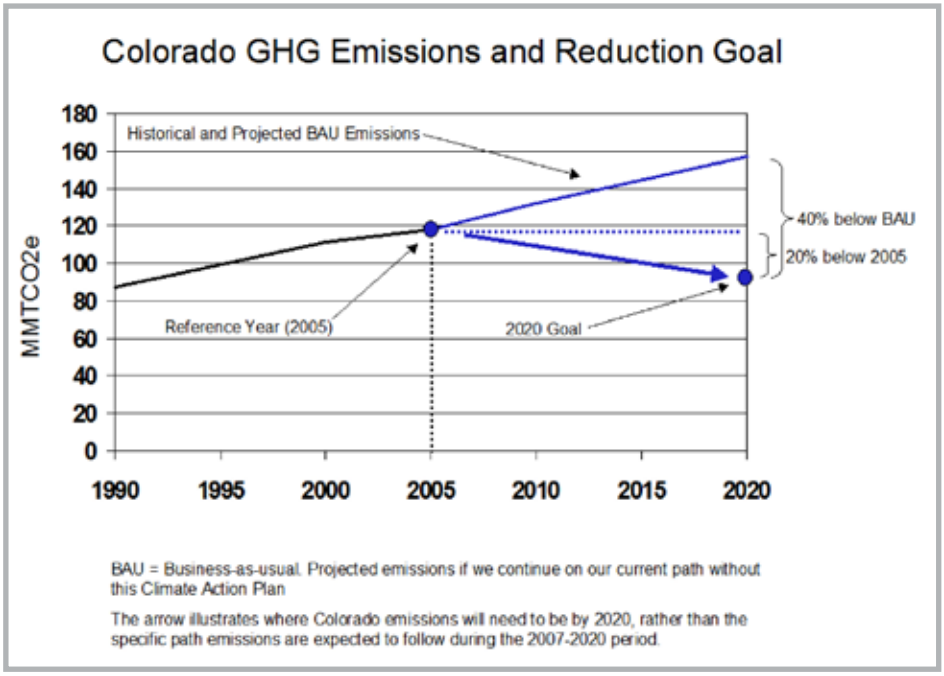
For Colorado, an 80 percent reduction would mean lowering our annual emissions from the present 118 MMTCO$_2$e to 24 MMTCO$_2$e by 2050.

We fully acknowledge that is a very ambitious goal, so ambitious that we cannot today be certain how Colorado and the nations of the world will meet it. However, we cannot allow the size of the long-term challenge to keep us from starting down the path of emissions reductions.

Over the course of a number of months, we consulted with experts to identify an intermediate goal that we believe is attainable, even if it represents a stretch goal. At the same time, we wanted to set a goal that we believe will put us on a path to achieve the more challenging long-term goal. We settled on an interim goal of reducing Colorado's greenhouse gas emissions 20 percent from 2005 levels by 2020.

Reaching this goal would curb Colorado's emissions to 94 MMT CO$_2$e by 2020. Compared to the level our emissions are projected to reach by 2020 under a business-as-usual scenario, this goal is a cut of 64 MMT CO$_2$e, or 40 percent.

This is an economy-wide goal that will require specific and measurable actions over many sectors.



Immediate Action:
By the end of this year, the Governor will issue a Global Warming Executive Order that establishes this 2020 goal for reducing emissions of greenhouse gases and directs all state agencies to join in a statewide effort to achieve this goal.

IV. BUILDING FROM A STRONG FOUNDATION


Credit: Eric Wunrow / CTO

Colorado already established a strong foundation of measures in the 2007 legislative session to reduce emissions of greenhouse gases and strengthen the New Energy Economy.

In 2007, legislators and Governor Ritter approved measures to:

- Require utilities to boost their renewable energy portfolios and energy efficiency programs.
- Finance energy efficiency, renewable energy and transmission lines.
- Map power line capacity to bring new sources of renewable energy from rural to urban areas.
- Offer incentives for clean energy development in rural areas.
- Spend nearly $500,000 a year to improve energy efficiency in K-12 schools, including grants for wind turbines.
- Align city, town and county building codes with the 2003 International Energy Conservation Code.
- Require state vehicles to use biofuel and expand funding for biofuel research.
- Require state buildings to meet LEED energy efficiency standards.
- Give statutory cities and towns authority to offer energy efficiency and renewable energy incentives.
- Establish and fund a research collaboration between the Colorado School of Mines, the University of Colorado, Colorado State University and the National Renewable Energy Laboratory.
- Require the State Land Board to identify suitable areas for renewable energy development.
- Require rural electric co-ops to offer net metering.
- Increase trash and tire disposal fees to fund state government recycling programs.


Credit:Brian Gadbury / CTO


Credit: Eric Wunrow / CTO

V. THE COURSE FORWARD: BRIDGING STRATEGIES

The legislation and "Greening of State Government" Executive Orders enacted in 2007 were a good beginning. We will need to adopt many more technological and political advances to reach the point where we are using our energy resources in a sustainable manner. The course forward will require a set of thoughtful bridge strategies as we aim toward significant reduction of our carbon footprint.

In the long run, we expect the National Renewable Energy Laboratory, companies such as Xcel, Vestas and General Electric, and cities such as Denver and Fort Collins, to develop new technologies and strategies to help us achieve a sustainable economic future. Colorado's New Energy Economy is poised to play a role in developing these new technologies and strategies. But getting from today's emissions profile to a time when an array of new technologies and strategies allow us to dramatically reduce greenhouse gas emissions requires a set of "bridge" strategies.

By bridging strategies, we mean a menu of actions that can be taken immediately. Some of these actions can and should become permanent. The bridging strategies in Colorado's Climate Action Plan are:

Agricultural offsets. Lead in the establishment of a carbon credit market through which farmers and ranchers may sell carbon credits for reducing greenhouse gas emissions.

Natural gas. Continue to use our abundant reserves of this fossil fuel, which contributes fewer greenhouse gases than coal or gasoline, as a source of fuel for power plants and for heating.

Energy efficiency. Heighten work on demand side management to lower the use of electricity, natural gas and gasoline. Strategies include efficient lighting, improved insulation and industrial efficiencies.

Renewable energy. Build our portfolio of renewable energy sources such as wind, solar, hydropower and geothermal.

Clean coal research. Encourage investment in the research and development needed to find ways to use coal without creating more greenhouse gases.

Personal responsibility. Calculate the carbon footprint from our households, our travel, our recreation and our work. Initiate actions that will reduce our personal footprint and help Colorado reach its overall goal.

FIVE WAYS YOU CAN FIGHT CLIMATE CHANGE

1. Travel smart
- Walk or ride a bike
- Ride the bus
- Drive a hybrid car
- Combine trips
- Drive at slower speeds
- Keep tires inflated to manufacturer's recommended limit

2. Waste not, watt not
- Replace incandescent bulbs with compact fluorescents
  Use 13 to 19 watts instead of 60 to 100 watts
  Start with the lights you use most often
- Turn off lights when you don't need them

3. Live smart at home
- Use a low-flow showerhead
- Insulate your water heater and hot water pipes
- In summer, open the windows at night to cool your house
- Lower the thermostat in winter
- Buy only Energy Star appliances
- Get an energy audit for your home and act on the results
- Use caulking and weather stripping to seal windows and doors
- Hang your clothes out to dry

4. Buy green power
- If your electric utility offers wind power, buy it
- Ask your electric utility to increase its renewable power portfolio
- Install solar panels on your home

5. Reduce • Reuse • Recycle
- Don't buy products in packaging that can't be recycled
- Buy recycled and recyclable products
- Use reusable shopping bags
- Say "No" to plastic shopping bags
- Recycle household waste
- Compost kitchen scraps and yard waste

VI. CLIMATE INITIATIVES

A. Agricultural Offset Market

Experts conservatively estimate that by providing incentives to adjust cultivation, tillage and other practices, Colorado's farmers and ranchers could capture additional CO_2 in their soils and reduce greenhouse gases. With the right incentives, farmers and ranchers could also adopt management practices that reduce emissions of nitrous oxide and methane, thereby cutting farm produced greenhouse gas emissions.

Changing farm practices to reduce greenhouse gas emissions:

- Less frequent tilling limits the release into the atmosphere of carbon and carbon compounds stored in the soil, creating less CO_2.
- Converting tilled cropland to a permanent vegetative cover provides long-term storage of carbon in the soil. The U.S. Department of Agriculture Conservation Reserve Program actively works with farmers on this practice.
- Proper fertilization, irrigation, and rotational grazing can increase plant productivity on pasture lands, resulting in more absorption of carbon.
- Adjusting the amount and timing of fertilizer application can reduce emissions of nitrous oxide, a fertilizer byproduct.
- Improving the storage and management of livestock manure reduces methane emissions.
- Capturing and using livestock-produced methane as a biogas energy source offsets the use of fossil fuels.

Taking these strategies together, farmers and ranchers could reduce Colorado's greenhouse gas emissions by roughly 10 percent and make money in the process. That helps meet our 2020 goal and is precisely the kind of bridge strategy needed while we develop commercial-scale energy production that carries a low carbon footprint.

This bridge strategy offers a second very important benefit. If we can create the right kind of carbon emissions trading program, carbon credits could be sold by farmers and ranchers to major greenhouse gas emitters that are seeking ways to reduce their carbon footprint. This could create a significant new source of economic development in the rural parts of Colorado and across the region.

We should do all we can to make sure that early action is credited, so farmers and ranchers who have already taken action to sequester carbon and reduce emissions can benefit from this program.

It will take time and a lot of work, however, to create a carbon emissions trading program. To do this, we are launching the Western Regional Agricultural Offset Program. We hope to enlist farmers and ranchers in Colorado and neighboring states to participate in a regional consortium to sequester carbon and reduce emissions on agricultural lands and trade the resulting carbon credits over a multi-state region. Here's how it could work:

1. Farmers and ranchers interested in participating would use information provided by institutions such as Colorado State University to learn about the carbon reduction options that fit their property and develop a carbon sequestration or emissions reduction plan.

2. Concurrent research would refine the methods used to measure actual reductions in greenhouse gas emissions from changed farm management practices.

Colorado laid the foundation to measure carbon sequestration and greenhouse gas reductions with House Bill 1203, signed by Governor Ritter on May 23, 2007. HB 1203 provides funding for Colorado State University to conduct county-level appraisal of carbon stocks and assess the carbon sequestration and greenhouse gas mitigation potential by March 2009.

VI. CLIMATE INITIATIVES (CONT.)

3. State government would promote a market to bring together carbon offset buyers and sellers. Existing markets, such as the Chicago Climate Exchange, may be suitable, or we may create a regional market-trading platform. The state will also work with public and private institutions to establish a regional carbon credit bank, where farmers and ranchers could deposit carbon offset credits that could be packaged into larger portfolios for purchasers.

4. With measurable greenhouse gas reductions in hand, farmers and ranchers could offer carbon credits for sale on this offset market. A third party verification system would be necessary to ensure that the carbon sequestration or emissions reduction is actually taking place. For example, a third party verifier would confirm that the farmers who sold credits for reducing tillage did, in fact, change their farming practices to minimize soil disturbance.

The success of our offset program will depend on the market process being transparent and verifiable. The specified changes in farm management practices must be in addition to greenhouse gas mitigation efforts that would otherwise occur. The offset measures must also be verifiable, permanent and enforceable, resulting in a solid, reliable "carbon offset currency" for buyers and sellers.

We are excited about this new offset market program because its benefits extend beyond greenhouse gas mitigation. A functioning agricultural offset market will help preserve our farms and ranches, improve soil fertility, reduce soil erosion, and improve air and water quality. Because an agricultural offset market offers a win-win solution to reducing greenhouse gases in Colorado and our region, it is a centerpiece of this Climate Action Plan.

But we also recognize there is a lot of work ahead to get this program up and running. We look forward to working with the General Assembly, our higher education research institutions such as Colorado State University, trade groups such as the Rocky Mountain Farmers Union, farmers and ranchers themselves, and neighboring state governors to establish this market.

Immediate action:
The Governor will issue an Executive Order directing the Colorado Department of Agriculture and the Colorado Department of Public Health and Environment to develop a market mechanism and accompanying carbon accounting mechanisms for the transfer of emission offsets in accordance with established timelines. To this end, we will develop partnerships with public and private entities, many of which are currently engaged in various aspects of carbon trading.

B. Transportation

The transportation sector — cars, trucks, trains and construction equipment — represents 23 percent of total greenhouse gas emissions in Colorado. We cannot fight climate change if we do not address emissions in this sector. Also, the transportation sector is 90 percent dependent on oil and oil products, most of which come from foreign supplies. The rising cost of petroleum products adds to the imperative to address solutions in this sector. There are a number of initiatives that, over time, we will take in this sector, but the greenhouse gas emissions standards for cars and light trucks is the centerpiece of our plan for the transportation sector in this initial phase of our Climate Action Plan.

1. Clean Cars

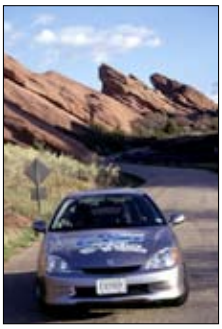
In the absence of federal action, state governments are taking direct action to ensure that automakers reduce greenhouse gas emissions from new automobiles. To date, 16 states have adopted new regulations to require reductions in emissions of greenhouse gases from new cars and trucks. The regulations are structured in a way that allows every model to comply, so American drivers will still be able to choose from a wide range of vehicles.

VI. CLIMATE INITIATIVES (CONT.)

Under this new program, greenhouse gas emissions from new passenger vehicles in Colorado would significantly decrease by 2020. In addition, these new standards will also reduce emissions of the pollutants that are causing high ozone levels in Colorado's Front Range cities. It will be at least several years before these new regulations, requiring automobile manufacturers to meet the standards for vehicle sales in Colorado, take effect. When that time comes, these regulations will preserve consumers' freedom of choice when they decide to buy a new vehicle.

Colorado will join those states, which together constitute over 40 percent of the U.S. market, in adopting greenhouse gas emission standards for passenger vehicles.

The 16 states that have adopted or committed to adopt vehicle emissions standards are Arizona, California, Connecticut, Florida, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Utah, Vermont and Washington.



Immediate Action:
The Governor will issue an Executive Order directing the Air Quality Control Division in the Department of Public Health and Environment to propose clean car standards to the Air Quality Control Commission within the next 12 to 24 months. The Governor will instruct the Division and the Commission to ensure that the regulations will preserve consumer choice.

2. Other Transportation Measures

According to the U.S. Environmental Protection Agency, the number of vehicle miles driven by Coloradans increased by 69 percent from 1990 to 2004, reaching nearly 46 billion miles a year. This is the third fastest growth rate in the nation. While Coloradans will continue to drive their cars and trucks to work, to shop, and to enjoy the mountains, we need to find ways to reduce the emissions associated with all those vehicle miles traveled.

We will also look for ways to help Coloradans do all of those things while driving less, such as rapid implementation of FasTracks in the Denver metropolitan area.

We have begun work through the Greening of State Government initiative to reduce the percentage of state workers who drive alone to work. We will measure and report progress on this effort, demonstrating what is possible for a 50,000-person workforce. This includes providing state employees an expanded array of options, such as use of flex time, telecommuting and carpooling and vanpooling options.

We recently established the state's first Innovation Council to spur advances in Colorado's technology sector. Broadband access across the state will also help expand teleworking, teleconferencing and transportation options for workers across the state. We recognize the integral link between transportation and land use and the importance of community and neighborhood design to enable residents and workers to more easily get where they want to go without using their cars. Community excellence in land use and transportation will be recognized in the Governor's Annual Awards program.

C. Electric Energy

1. Providing Reliable and Sustainable Energy Supplies

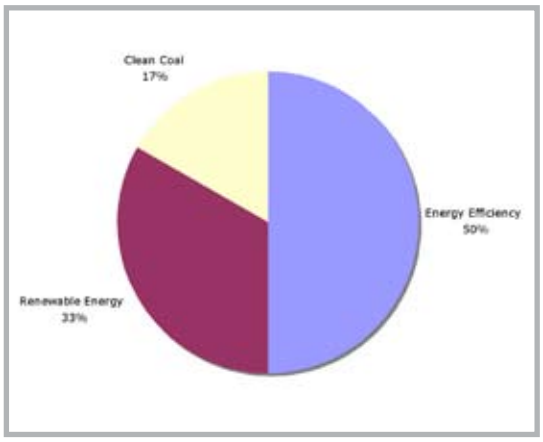
In 2005, total emissions from the utility sector amounted to 36 percent of CO_2 emissions in Colorado. Clearly, the state cannot do its part in addressing the problem of climate change unless we work with utilities large and small to reduce their CO_2 emissions.

VI. CLIMATE INITIATIVES (CONT.)

That is why this plan articulates a goal of reducing greenhouse gas emissions from the utility sector by 20 percent by the year 2020. That is consistent with the overall emissions reduction goal the Governor will establish for the state as a whole.

Colorado's utilities — from Xcel Energy to municipal providers and rural electric cooperatives — provide a vitally important service for our state. For that reason, we are seeking a collaborative, step-by-step approach to achieve our emissions reductions goals in this sector.

We outline below specific actions we are taking to work with large and small utilities to reduce emissions of greenhouse gases from this sector. The benefits to the state from significant new investments in energy efficiency and renewable energy may be measured by reduced air pollution and new jobs, as well as a more diverse, and therefore less volatile, energy supply portfolio. We also believe that new clean coal technologies will play a vitally important role in meeting the demand for electrical energy in the future, and our plan includes measures to encourage more rapid development and deployment of these technologies.



The following chart shows how utilities can shape their plans for adding new energy resources to achieve their 20 percent reduction goal, and includes the renewable energy resources that the state is already committed to doing.

2. Efficiency

Energy efficiency is our most affordable energy resource. Simply by using our energy wisely and taking advantage of efficient technological advances, we can reduce emissions, save money and make businesses more competitive. This plan calls for achieving half of the CO_2 reductions within the utility sector by increasing energy efficiency.

We have identified five key ways to achieve these efficiency savings:

- Increases in Lighting Performance: Expanding the use of highly efficient light bulbs and lighting applications in homes, institutions and businesses can meet 25 percent of our efficiency goal. Net economic benefit: $9.08 billion

- Expanded Demand Side Management Programs: By reducing customer demand for electricity, utilities can avoid building costly power plants and transmission lines. Xcel Energy has made a commitment to invest $725 million in efficiency measures, reducing demand by 704 MW of electricity — the equivalent production of one large coal burning power plant. Demand side management can meet 41 percent of our efficiency goal. Net economic benefit: $2.1 billion

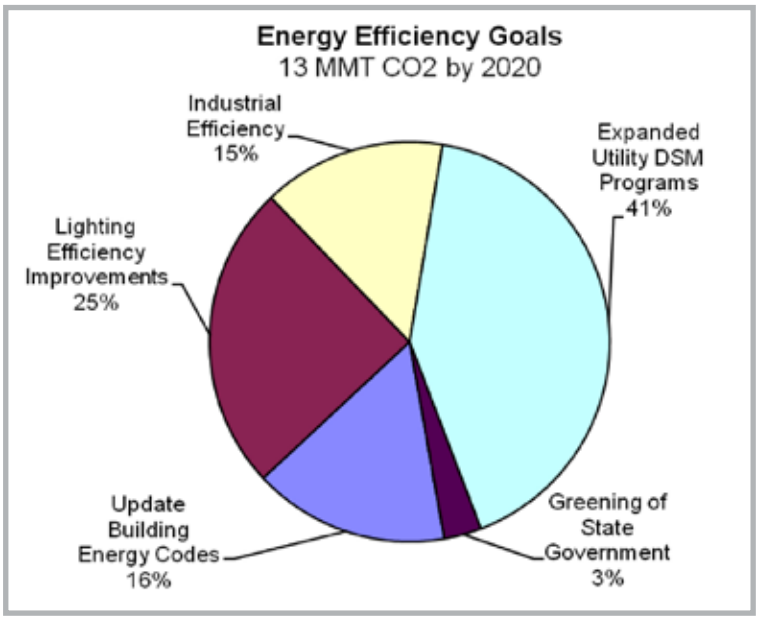
- Industrial Efficiency Measures: Many Colorado-based companies, such as IBM, are already reducing greenhouse gas emissions while saving money. There are hundreds of industrial power customers in the state that could achieve similar energy savings. We will meet 15 percent of our efficiency goal through industrial efficiency. Net economic benefit: $970 million

Immediate Action:
The Governor will direct the Energy Office to launch an Industrial Energy Efficiency program. It will encourage large industrial customers to implement all efficiency measures available that can pay for themselves within five years.

VI. CLIMATE INITIATIVES (CONT.)

- Greening of State Government: The state is a tremendous consumer of energy and we have an obligation to use that energy as efficiently as possible. Our program of leading by example through energy efficiency will contribute nearly 3 percent of the statewide energy efficiency goal.

- Updating Building Codes: Legislation passed in the 2007 session increasing efficiency standards in building codes will have an immediate impact on emissions from new homes. By continuing to update these codes, we can keep pace with technological advancements in construction methods and lower the energy impacts of a growing population. Updated building codes will provide the energy savings to meet 16 percent of our efficiency goal. Net economic benefit: $1.32 billion



3. Renewable Energy
Colorado is fortunate to be one of the richest states in renewable energy resources. We are the 11th windiest state, the 6th sunniest state and rank high in geothermal potential as well. Most of these resources are spread throughout Colorado, offering the benefits of renewable generation to virtually every community in the state.

The Renewable Portfolio Standards established by the 2007 Legislature will lead to the development of over 5 gigawatts of renewable energy generation in the state and a high-profile role for Colorado in the new energy economy. This production of clean and renewable resources represents one-third of the proposed reduction in emissions by 2020 from our utility sector.

This is only the beginning of the opportunity for renewable energy in Colorado.

Affordable solar panels. The next generation of solar photovoltaic panels promises to offer increasingly competitive energy prices. If solar photovoltaic systems can be installed for $1 or $2 per watt by 2017 (the current price is around $8-$9 per watt), photovoltaic electric production could be more affordable than today's conventional power sources. It is possible that the next generation of high performance buildings will have a net zero energy performance — putting as much energy into the electrical grid as they take from it.

Wind power. Xcel Energy is researching the production of hydrogen from wind. If we can harness and store wind energy in hydrogen, it could become a more steady and productive source of power. Building transmission lines into Wyoming would help Colorado utilities use the variable wind patterns in the two states to increase wind capacity.

VI. CLIMATE INITIATIVES (CONT.)

Concentrated solar power. This form of renewable power includes storage and dispatch capabilities for utilities, potentially allowing it to offset base load and intermediate production currently dependent on coal and natural gas. The San Luis Valley is being eyed as an ideal location for a CSP project.

Geothermal energy. Idaho Springs, Glenwood Springs, Pagosa Springs, Steamboat Springs, Hot Sulphur Springs — all of these Colorado towns understand the value of the heat from below the earth's surface. In fact, a clean steady source of baseload energy from geothermal heat offers great opportunity for some communities on the Western Slope.

Hydro-power. There are tremendous opportunities for Colorado to tap into small-scale hydropower potential without the need to build large dams. Technologies continue to advance in low impact, micro-hydro applications and we have the potential to take advantage of existing facilities that have not been tapped for their hydropower capacity.

Certainly, the state has an opportunity to significantly increase its production of renewable resources. Some of that development is contingent upon the technological advances to come, while others can be applied today.

This will require concerted effort and public-private partnerships will continue to be highly effective in moving renewable energy projects from concept to reality.

Immediate Action
The Executive Director of the Governor's Energy Office will report bi-annually to the Governor on the status of renewable energy development in the state and additional measures that could be taken to accelerate renewable energy development in the state.

4. Clean Coal
There are an estimated 9.76 billion tons of recoverable coal reserves remaining in Colorado. In the last five years, the state's active coalmines produced more coal than ever before. The coal industry employs more than 2,000 people and generates about $50 million in annual lease royalties and mineral severance taxes for state and local governments.

Colorado is and will remain a coal-producing state. While we need to diversify our resource mix by integrating renewable energy resources, coal will remain an important part of our energy portfolio. But we must recognize that current methods of burning coal are responsible for significant emissions of CO_2 into the atmosphere.

That means we need to pursue opportunities to mitigate the emission of CO_2. This climate action plan anticipates the development of proven advanced coal burning technologies within 10 years. Currently, the most promising of those technologies is Integrated Gasification Combined Cycle (IGCC) generation plants combined with Carbon Capture and Sequestration (CCS) applications.

An initial survey by the Colorado Geological Survey under a grant from the U.S. Department of Energy to the Southwest Partnership for CO_2 Sequestration indicates that the geologic repositories near existing power plants could sequester the carbon produced by those plants over the next several hundred years.

However, it is clear that deployment of this technology in Colorado and across the country faces significant obstacles. Private capital markets are reluctant to invest large sums in a technology that they perceive as untested, especially since there are no national or state regulations for managing and storing CO_2 in the ground.

VI. CLIMATE INITIATIVES (CONT.)

That is why the Western Governors' Association and Governor Ritter consistently have called on the Congress and the President to dramatically accelerate federal investments in these technologies. The Colorado congressional delegation has also been strongly supportive of such research and development funding.

Actions over the next two years:
The Governor calls upon the Congress and the President to make research and development of IGCC and other similar technologies a high priority so that these technologies will be widely deployed as soon as possible.

To ensure that geologic sequestration can begin along with the deployment of IGCC technologies, the Departments of Natural Resources and Public Health and the Environment will work to expeditiously resolve the hurdles to geologic sequestration, including identifying potential sequestration sites in Colorado and developing an appropriate regulatory framework.

5. Investor Owned Utilities
The Public Utilities Commission (PUC) requires the state's investor-owned utilities to periodically file a "Electric Resource Plan" (ERP) that shows how they will meet their customers' energy needs well into the future. Xcel Energy, the state's largest provider of electrical energy, will soon file with the Public Utilities Commission its next ERP. Aquila, the state's other investor-owned utility, is not due to file its ERP until spring 2008. We see these filings as a tremendous opportunity for the state's largest electric utilities to show how they could reduce their greenhouse gas emissions by 2020.

Immediate Action
The Governor will issue an Executive Order requesting the Public Utilities Commission to seek from each utility within its jurisdiction an Electric Resource Plan that includes an analysis that shows how that utility could achieve a 20 percent reduction in CO_2 emissions from 2005 levels by the year 2020. This is consistent with the overall state emissions goal the Governor will establish in a separate Executive Order.

We recognize that large utilities will have to weigh many approaches to achieve a 20 percent cut in emissions. Those steps could include significant expansion of renewable energy sources and energy efficiency, investments in new clean coal technologies, retirement of old, inefficient coal-fired generating stations, and purchases of carbon credits to offset emissions.

Therefore, in his Executive Order, the Governor will also direct the Energy Office to work with the Department of Regulatory Agencies and other relevant agencies to identify regulatory and legislative changes that may be needed to provide investor-owned utilities with the appropriate incentives to invest in renewable energy sources, energy efficiency, carbon credits and clean coal technologies.

6. Municipal Utilities and Rural Electric Cooperatives
Colorado is home to 57 different utilities of varying sizes and resources. The vast majority of these public utilities do not fall under the jurisdiction of the PUC — instead, they are governed by local boards and city councils. These utilities provide critical services to the citizens of Colorado and are crucial partners in the state's effort to reduce greenhouse gas emissions. However, many of these utilities have smaller and less diverse portfolios of electric energy generating resources than do larger utilities and therefore may encounter greater obstacles in reducing their carbon footprint. Nevertheless, we believe all of Colorado's electrical utilities and their wholesale providers should contribute to reducing the state's greenhouse gas emissions.

VI. CLIMATE INITIATIVES (CONT.)

Immediate Action
The Governor will request the Executive Director of the Governor's Energy Office, in consultation with the Executive Directors of the Departments of Natural Resources, Public Health and Environment, and Regulatory Agencies, along with key stakeholders, to develop comparable goals for public power entities. The Governor will then request that those entities submit plans showing how and when they propose to meet the goals.

7. New Power Plants
Finally, we recognize that demand for electrical energy is growing in some parts of the state. As we explained above, we believe energy efficiency and renewable resources can play an integral role in meeting that demand. However, we also recognize that some electric energy providers may elect to pursue resources such as conventional pulverized coal plants, since they offer well-understood technologies and the potential for attractive rates. At the same time, these facilities could run for a long time (40 years or more) and would emit large quantities of carbon dioxide into the atmosphere.

This is a complex and important issue that requires careful study and outreach to many key stakeholders. We are not prepared today to address what the state's position should be with respect to permitting new conventional coal-fired power plants that would serve Colorado consumers. Therefore, the Governor's Executive Order will direct the Colorado Department of Public Health and Environment to evaluate alternatives for addressing greenhouse gas emissions from new coal-fired power plants in consultation with affected parties and to make a recommendation to the Governor within 12 months.

8. A Unified Effort
Energy conservation, new sources of renewable energy, and clean coal technologies offer practical ways to reduce greenhouse gas emissions.

Although this plan calls on the state's electrical utilities to be key players in achieving significant reductions in greenhouse gas emissions, all of us are also partners in this effort. Each time someone buys and installs a compact fluorescent light bulb, replaces an old appliance with an Energy Star model, or installs a solar photovoltaic power system, they will be conserving energy or boosting the statewide renewable portfolio.

Utilities may help pay for some of these costs through rebates, but all the emissions savings will be credited to the utility sector's overall goal.

D. Natural Gas
Natural gas is a key element in our bridge strategies to a cleaner energy future for Colorado. It is a plentiful and reliable energy source that generates 43 percent less CO_2 than coal. Over the immediate future, it can serve as a primary fuel source for electrical energy generation, serve as backup power for intermittent renewable technologies such as photovoltaic and wind, and be used as a direct energy source for heating, cooking and industrial applications.

Because we have abundant natural gas supplies, Colorado is well positioned to realize these benefits. Colorado contains 8 percent of the nation's natural

VI. CLIMATE INITIATIVES (CONT.)

As part of BP America Production Co.'s greenhouse gas strategy, the company adapted closed-loop completion technology to its coalbed methane wells to eliminate the release of greenhouse gases. Conventional well completion methods involve pumping air down into the well to lift sand and fluid out, which results in a mixture of air and gas returning to the surface that must be flared for safety purposes.

BP's closed-loop system pumps natural gas into the well and then separates the returning gas for cycling back into the well or for pipeline sales. Virtually no greenhouse gas is released. During its first year of operation, this technology prevented the release of 7.8 tons of carbon monoxide and 7.8 million cubic feet of natural gas.

This exemplifies the kind of entrepreneurial action we want to promote in Colorado — one that reduces emissions, is economically beneficial, and furthers the responsible development of our resources.

gas reserves, with proven reserves of 16 trillion cubic feet. But the future production of these reserves must occur in a balanced and responsible manner that preserves our environment and protects our quality of life.

In addition, methane can be released to the environment during well drilling and transmission of natural gas to markets. Methane is a greenhouse gas that is far more potent than CO_2, but it also has economic value, creating incentives for reducing losses and capturing leaks that would otherwise be released into the atmosphere. Some energy companies have instituted measures to reduce losses and leaks and more steps could be taken. We will work with the energy companies to create incentives and provide assistance to expand the use of measures that capture methane.

Next Steps:
The Departments of Natural Resources and Public Health and Environment will work with the oil and gas sector to reduce methane leakage by expanding the use of proven emission reduction practices and encouraging the development of new technologies that both reduce emissions and save money.

E. Solid Waste and Recycling

Colorado residents recycle only 12 percent of their wastes. The opportunity to capture more benefits from waste reduction and increased recycling is substantial, including economic development opportunities and expansion of the array of products available to Coloradans that are made from recycled materials.

While only 3 percent of the current greenhouse gas emissions are assigned to the waste sector, that figure likely is an under-calculation of total emissions from solid waste. It does not take into account the transportation of waste to landfills or the potency of methane emissions from landfills.

The fastest, least expensive approach to greenhouse gas emission reductions in this arena is methane avoidance, achieved by reducing the volume of solid waste taken to landfills. This is particularly true for biodegradable materials (food, yard, and land wastes), which are the source of significant methane emissions.

Communities in other parts of the country have demonstrated success in increasing recycling through two simple, straightforward strategies. The first is to institute "pay as you throw" trash rates, that is, the more you send to the landfill, the more you pay for trash removal. The second is to provide households with three waste bins for separating landfill trash, compostable materials, and recyclable materials.

Recognizing that counties and cities manage most landfills and that the state has limited authority over them, and recognizing that trash removal is governed at a municipal or county level, we present two actions here:

First, to encourage all cities, towns and counties to examine their trash and recycling systems, and consider implementing the three-bin strategy and a "pay as you throw" fee structure for trash removal.

VI. CLIMATE INITIATIVES (CONT.)

Secondly, an amendment to Governor Ritter's April 2007 Greening of State Government Executive Orders will be issued by December 2007 that establishes a 75 percent by 2020 waste diversion goal for state government. In that amendment, state agencies will begin demonstrating the three-bin strategy in their own operations. Beginning with the recycling efforts already underway in the Department of Corrections, the Greening of State Government team will work with each state department to institute expanded employee education and use of the three-bin strategy.

F. Greenhouse Gas Emissions Reporting

It is impossible to manage something that can't be measured. While Colorado has a working inventory of greenhouse gas emissions, we need a far better understanding of emission sources and volumes throughout the state.

Toward that end, Colorado joined The Climate Registry – along with 38 other states, the District of Columbia, three Canadian Provinces, one Mexican State, and three Native American tribal nations — to establish a common, North American registry of greenhouse gas emissions. Other states and the remaining Canadian provinces are poised to join as well. The Climate Registry is developing greenhouse gas reporting protocols and other standards for use by the end of 2007.

Some Colorado businesses have past experience with reporting greenhouse gas emissions, but many do not. In 2008, Colorado will encourage potential reporting entities to voluntarily participate in The Climate Registry. As standardized protocols become available, the state will establish regulations that create mandatory reporting requirements for major greenhouse gas emitters.

Action over the next year:
The Colorado Department of Public Health and Environment will work with emitters of greenhouse gases, including other state agencies, businesses and communities across the state to encourage broad, voluntary participation in The Climate Registry.

The Governor will issue an Executive Order directing the Air Pollution Control Division in the Colorado Department of Public Health and Environment to propose regulations at an appropriate time to the Air Quality Control Commission to mandate reporting for all major sources of greenhouse gas emissions. The mandatory reporting will be phased in as standardized quantification protocols, base data, and tools become available. We anticipate broad and extensive stakeholder involvement in that process to ensure that it is workable and effective.

Future action:
The Governor will direct the Colorado Department of Public Health and Environment to update the emissions inventory for the state every five years, so that progress, or lack thereof, can help determine further actions required.

G. Leading by Example

Government must lead by example. The state and local governments are already demonstrating strong leadership in an effort to reduce greenhouse gas emissions.

State government examples
In 2007, Governor Ritter issued an Executive Order directing the state government to reduce overall energy consumption by 20 percent by 2012, and petroleum use by the state vehicle fleet by 25 percent by 2012.

VI. CLIMATE INITIATIVES (CONT.)

To monitor our progress, we will implement a central utility data system to track energy use in state buildings. Our state fleet is investing in hybrid electric and alternative fuel vehicles, and cutting back on unnecessary four-wheel-drive vehicles.

The state is leveraging future utility savings to fund upfront investments in energy efficiency. This strategy, called "performance contracting," has yielded tremendous results already. In just the capital complex, for example, efficiency improvements have led to savings of more than $650,000 per year. In the first year alone, savings allowed the state to invest in two photovoltaic solar systems for the Governor's mansion at no additional expense. These investments in renewable technologies, funded by efficiency improvements, will leverage even larger reductions in utility costs and their associated emissions.

Colorado also established a biofuels coalition to increase the number of E-85 and bio-diesel fueling stations statewide, so government and private vehicles will have ready access to biofuels. In 2007 alone, the efforts of the Governor's Biofuels Coalition will quadruple the number of stations providing E-85 and bio-diesel for Colorado's consumers.

Local government examples

- The City of Aspen established the Canary Initiative to reduce local GHG emissions. An initial inventory and climate action plan have been followed by a broad array of program and educational efforts.

- The Town of Basalt initiated a greening government program to improve energy efficiency of town government and is conducting an energy audit of its municipal buildings.

- The City of Boulder's Climate Action Plan includes a greenhouse gas inventory, a plan to reduce energy consumption in commercial and residential buildings, green city operations including the city's fleet, rebates on qualified solar photovoltaic or thermal (hot water) systems, aggressive recycling and tree-planting.

- In Breckenridge, the town's Green Team developed a sustainability program, which took advantage of a free preliminary energy audit of municipal buildings provided by the Governor's Energy Office.

- The Town of Carbondale implemented an Energy and Climate Protection Plan. Carbondale voters passed a $1.8 million Clean Renewable Energy Bond Resolution to fund construction and operation of town-owned renewable energy facilities. Town Hall is powered in part by solar photovoltaic panels on the roof.

- Central City replaced light bulbs in city buildings to conserve energy, and provides 29 free energy-efficient bulbs to each homeowner. As of June 2007, approximately one-third of the 300 Central City households participated in the program.

- In October 2007, Denver Mayor John Hickenlooper adopted a Climate Action Plan for the city. Based on an inventory of emissions, the Plan contains ten recommendations intended to help reduce the city's per capita greenhouse gas emissions 10 percent by 2012.

- With the assistance of La Plata Electric Association, the City of Durango analyzed its energy efficiency, installed demand meters, and purchased power generated from renewable sources.

VI. CLIMATE INITIATIVES (CONT.)

- The Town of Frisco launched the Environmental Stewardship and Sustainability (ES2) program to encourage visitors, businesses and residents to be better stewards of the Earth. In 2006, Frisco committed to complete a greenhouse gas inventory through the U.S. Mayor's Climate Protection Agreement.

- Eagle County replaced half of its light duty fleet with energy efficient Toyota Prius hybrid cars.

- The City of Fort Collins is a strong leader, enacting its climate action plan in 1999. The city is measuring its progress toward renewable energy and energy efficiency goals and established a Climate Wise program to promote broad educational efforts for residents and businesses.

Next Steps:
The Governor's Energy Office will include on its web site best practices of communities throughout the state. Other communities can adopt the practices that best suit them, helping them to quickly launch their own climate initiatives.

The Governor's Energy Office will host an annual conference that brings together community representatives and experts from around the state to educate participants and to encourage wider use of best practices.

The Governor's Annual Excellence in Sustainability Awards will include a "Governor's Excellence in Climate Action" category. It will recognize businesses, communities and non-profit organizations that make the most significant efforts to reduce greenhouse gases.

The Governor's Energy Office and the Colorado Department of Public Health and Environment will continue to implement the initiatives in the Governor's Greening Government Executive Orders.

H. The Western Climate Initiative

The Western Climate Initiative (WCI) offers another example of how states are leading the way in the development of comprehensive regimes to address climate change. The Governors of Arizona, California, New Mexico, Oregon, Utah and Washington, as well as the Premiers of British Columbia and Manitoba, are developing an emissions trading program designed to reduce greenhouse gases across the region to 15 percent below 2005 levels by 2020.

Cap and Trade 101

The Western Climate Initiative is proposing a cap-and-trade system, in which the total amount of greenhouse gas emissions in, for example, a region (although the geographic scale could be a state, country or collection of countries) is "capped" to meet a greenhouse gas (GHG) reduction goal. This cap on GHG emissions creates a demand for allowances to pollute that may be traded between the regulated entities.

The numbers of emissions allowances that are allocated to individual entities add up to the total emissions cap for the region. Those entities that can reduce their emissions at a relatively low cost using, for example, newer equipment and enhanced technologies, can sell their allowances to entities with higher abatement costs.

Accordingly, the entities that do not have sufficient allowances to account for expected emissions can purchase allowances on the market. In addition to limiting GHG emissions, the overall scheme rewards regulated entities with relatively lower abatement costs and gives those with higher abatement costs the time to gear up for capital investments in technologies that will reduce GHG emissions.

VI. CLIMATE INITIATIVES (CONT.)

Colorado and eight other jurisdictions are observers in that process. Like the Regional Greenhouse Gas Initiative adopted by the northeastern states, the WCI offers a promising trading regime on a regional level.

Although we support the WCI's efforts to develop a regional cap-and-trade regime, we believe that fundamental greenhouse gas strategies such as this should be implemented on a national scale so that all emitters can do their part. A unified national trading market would have consistent rules, be more comprehensive, have fewer administrative burdens and could be integrated into an international program.

Action over the next year:
In the event that President Bush and our current congressional delegation do not reach an agreement on strong and effective legislation establishing a national trading program, we will work with other states to implore the next President and Congress to do so.

In the event there is no demonstrable progress on the national front and the design of the Western Climate Initiative is compatible with Colorado's resources, we will join that trading group. We will continue to serve as observers in the WCI, while encouraging the design of a trading protocol that treats energy-producing and energy-consuming states fairly and gives credit to those entities that acted early to reduce their greenhouse gas emissions.

I. Climate Education and the New Energy Economy

"If we fail to educate the youngest generation in the ways of sustainability, then we will truly fail as a whole." U.S. Sen. Gaylord Nelson

Education about the choices we can make as citizens and as consumers is a primary ingredient in our individual and collective ability to successfully limit human contribution to climate change. People want to do the right thing — but they must be provided the right information and means for doing so. Education will also be key to training Colorado's workforce to meet the challenges and expectations of the New Energy Economy.

Climate curricula. The state will work through the Governor's P-20 Education Council and others to make sustainability curricula become standard fare in K-12 classrooms throughout the state. Today's students will be living in a warmer climate resulting from the activities of previous generations. They need to understand the science of climate change, what its impacts will be on their lives, and how to critically evaluate the steps needed to reach our 2020 and 2050 emission reduction goals. Students will also need academic and technical skills to be ready for jobs in the New Energy Economy.

Best practices already in use, such as in the Poudre Valley School District in northern Colorado, will be featured through state web-based communications. A "Best in Education" category will be highlighted in the Governor's Annual Excellence in Sustainability Awards program.

VI. CLIMATE INITIATIVES (CONT.)

The Colorado Renewable Energy Collaboratory. Research and development of new technologies that can become commercially viable in the marketplace is a key need and opportunity for Colorado. To that end, the Colorado Renewable Energy Collaboratory was established in 2006 and statutorily funded in 2007. It is a partnership between the National Renewable Energy Laboratory (NREL) and Colorado's three science research universities: Colorado State University, the Colorado School of Mines and the University of Colorado.

The Collaboratory's work is aimed at closing the gap between energy demand and supply through increased production and conservation, and the development of economically viable sources of renewable energy. The highest priority for the Collaboratory will be the development and transfer of new energy technologies to the private sector for commercial application. In addition, the Collaboratory will coordinate research, educational and outreach programs with other Colorado public and private colleges to serve the needs of students, local communities and local economies.

Workforce development. The Department of Higher Education has initiated a collaborative effort on education and workforce development strategies for the New Energy Economy. This includes a strategic effort to work with the state's community colleges on workforce training for the clean energy jobs of today and tomorrow.

The Governor's Jobs Cabinet. To develop an adequate and well-trained workforce for the New Energy Economy, we have created a Jobs Cabinet in the executive branch to align the state's economic development and education goals with funding and strategies for preparing that modern labor force. The Colorado Jobs Cabinet includes senior business leaders and representatives from K-12 and higher education, as well as economic and workforce development officials. In the work they are undertaking, they have both the new energy economy and climate change firmly in their sights.

VII. ADAPTATION

Climate change is already happening, so we must deal with it in two ways. One is to mitigate our present greenhouse gas emissions, doing everything possible to reduce them. The other is to adapt to the climate changes that are now forecast to occur, even under the best scenarios.

To successfully adapt to higher temperatures and the consequences that will result, we need continued research to anticipate changes and prepare for emergencies. We expect that the most serious consequences Colorado will face relate to our water and forests.


Credit: Eric Wunrow / CTO

A. Water

A warming climate will amplify Colorado's water related challenges, such as smaller snowpacks, earlier snowmelt, more extreme flooding, greater evaporation, less groundwater, and more frequent droughts. These changes will make it harder to meet the state's water needs and compact obligations, threaten recreation and agriculture, and increase wildfire. The Departments of Natural Resources and Public Health and Environment, in collaboration with water users, federal agencies, and research organizations, will pursue a water adaptation plan that will include:

Scientific investigation. The state is studying the effects of climate change on water resources through the Colorado River Water Availability Study and the Cooperative USGS Snowmelt Timing Study, and is working with federal agencies and water providers to develop regional hydrologic models. While most water resource planning has been based on past hydrology, water users can no longer assume that future conditions will reflect the past.

Analysis of water rights and compacts. As the headwaters state for much of the West, Colorado manages a regional water resource that is subject to pressures from growth and changing availability even apart from climate change. Interstate compacts and state water law add to the challenges of adapting to changes in water availability. To respond, the state will develop for each major river basin a mechanism to deal with potential compact calls. The state will examine climate-induced changes in streamflows and the effects on the yield of individual water rights and the pattern of calls. Historical water-rights yields and calls can no longer be used to predict future conditions.

Comprehensive drought planning. The state will assist water users to prepare for and adapt to large-scale drought. With climate change, the frequency, duration and severity of droughts are projected to increase, further reducing water supplies and making it hard for water managers to meet growing demands. Colorado may experience drought conditions rarely or never before observed. Current efforts by the state to support drought preparedness include:

- Comprehensive revision of the State Drought Mitigation and Response Plan
- Ongoing drought and water supply assessments
- Development of drought planning and decision support tools for water providers
- Participation in the National Integrated Drought Information System, a new NOAA program
- Ongoing education and outreach to inform stake holders on the importance of drought preparedness in the face of climate variability and change.

Information exchange and education. Colorado has an exceptional group of technical, research and education experts in climate change and water resources policy, which will be utilized to share information statewide. The state will also work with federal and state agencies and water users to set up and maintain a clearinghouse of up-to-date climate projection data.

VII. ADAPTATION

B. Forests

Forests cover approximately one third of our state, about 22 million acres. Over the long term, our forests are carbon neutral, with carbon released from decomposing trees and smaller fires balancing carbon sequestered from growing trees and forest regeneration. Over the short term, however, catastrophic wildfires release tons of carbon that undermine emission reduction goals and delay the regeneration of our forests. This risk is exacerbated by recent bark beetle epidemics, which have impacted almost 1 million acres of forest, and by disease, age and drought.

To reduce these risks, we need to work with the U.S. Forest Service and other stakeholders to restore and improve the health of our forests through better management, including forest thinning, timber cutting, prescribed fire, and replanting critical areas. These fire controls will help to avoid unanticipated carbon emissions, help to safeguard homes and municipal facilities, protect watersheds, wildlife habitat, and air quality, and improve recreation.

To complement these management actions, we should increase use of the resulting forest biomass. The economics are not favorable at present, but we have the technology to convert this biomass to energy for institutional heating and other purposes. Several such projects exist or are planned, including wood pellet plants in Grand County and biomass heating systems in Boulder County, Gilpin County and at CSU and NREL.

The Governor will direct the Departments of Natural Resources and Public Health and the Environment, and the Governor's Energy Office to identify and implement actions to reduce the risk of catastrophic wildfire, promote the use of forest-based biofuels, and otherwise anticipate and respond to the potential adverse effects of climate change on our forests. He will also direct these departments to consider whether to include reforestation and afforestation — the cultivation of new forests — in the agricultural offset program.

VIII. FUTURE ENERGY TECHNOLOGIES AND UNCERTAINTIES

Meeting the 2050 goal of reducing carbon dioxide emissions by 80 percent is tremendously ambitious, but essential for the preservation of a livable climate. Our ability to meet this goal will depend on whether we can refine existing technologies and develop new technologies for producing energy in a manner that is safe, reliable, economic, and environmentally responsible. We must keep an open mind, because we cannot know today where this effort will lead us or what issues we will need to address. In developing these technologies and resolving these issues, we must consider all of the costs and benefits involved, including the protection of our state's environmental attributes and quality of life.

One potential energy source for Colorado and the United States is oil shale. Approximately half of the world's oil shale lies in the Green River Formation on the Western Slope of Colorado, which may create a central role for Colorado in developing this resource. The development of oil shale, however, faces technological, regulatory, economic and environmental hurdles. Of particular concern are the substantial energy and water requirements, as well as impacts to air and groundwater quality that could result from large-scale oil shale extraction. This industry may also require new power plants, which would increase greenhouse gas emissions. Shell Oil and others are pioneering this potential energy source and we look forward to learning more from their research as the technologies unfold.

Another potential energy source is nuclear power, which is widely used in parts of Europe and Asia. Congress has established new programs to accelerate the deployment of safer new technologies for nuclear power. Still, significant obstacles remain, not the least of which are cost and long-term disposal of high-level nuclear waste. No entities in Colorado are currently capable of undertaking the enormous financial and regulatory challenges of constructing a nuclear power plant. Nevertheless, any future nuclear proposals will need to satisfy stringent public safety and environmental protection requirements. Again, we will watch as new technologies unfold in this area.

IX. CLIMATE ADVISORY PANEL

As we said at the outset, climate change issues are complex. There are many, many opportunities for Colorado to transform these challenges into a stronger, more robust and more sustainable economy. We hope — indeed, we anticipate — that as we unleash the creativity of Colorado's entrepreneurs, new and exciting ideas will emerge that will create new opportunities for reducing global warming emissions and strengthening our economy. That is why we also said at the outset that we envision this plan as a living document that will grow and evolve over time.

As a means of continuing to tap Colorado's rich human capital and expertise on the wide array of systems and resources touched by climate change, a gubernatorial Climate Advisory Panel will be established by January 2008. It will periodically convene leaders of local government, business, agriculture, health care, conservation and other sectors in Colorado to collect and review new opportunities for action and to transmit their comments to the Governor. This panel will primarily be comprised of leaders outside state government and will be organized by the Governor's office. We will do this, in part, after reviewing how other states established an institutional framework such as this to help tackle this unprecedented challenge.

X. A CALL FOR LEGISLATIVE ACTION

A. State Legislative Action

We look forward to continued strong efforts by the Colorado General Assembly to address climate change and expand the New Energy Economy in the 2008 session. The Governor's office will continue work with legislators to support sound policy approaches.

B. Federal Action

While Colorado is committed to doing its share to tackle global warming, it is abundantly clear that the U.S. Congress and the President are key to setting a course for strong and effective action on climate change. Although the states are leading today, we call upon the federal government to step up to its obligation and provide national leadership on this front.

This is a short list of measures the federal government should take, and take soon, to advance the national effort to reduce emissions of greenhouse gases:

- Establish a national emissions trading program. Fragmented regional efforts will never be as effective.
- Establish a national renewable energy portfolio standard for utilities.
- Provide funding and loan guarantees to research clean coal technologies that capture CO_2, and move from the pilot phase to full-scale commercial use. Utilities are encountering significant challenges in raising the capital needed to rapidly deploy these new technologies.
- Take a leadership role in developing geologic sequestration technology associated with clean coal efforts.
- Fund and launch a comprehensive assessment of the sequestration potential of cropland, range land, grassland and forests to create a robust offset market on a national scale.
- Expand funding for the key federal scientific research institutions in Colorado (National Renewable Energy Laboratory, National Center for Atmospheric Research and National Oceanic Atmospheric Administration) that are working on the cutting edge of climate change research.
- Fund research and development for biofuels, particularly cellulosic ethanol.
- Increase Corporate Average Fuel Economy (CAFE) standards.

Whenever possible, we want to work with the federal government on matters where our combined efforts accomplish more than either of us acting alone. We will pursue efforts to partner with the federal government to support new initiatives, foster research and development on new technologies, and forge public and private financial partnerships to support our national fight against global warming.

XI. Appendix

2007 Legislative Achievements Related to Climate Change:

• Renewable Portfolio Standards (HB 1281): Doubles the state's renewable portfolio standard to 20% by 2020 for investor-owned utilities. Rural electric associations and municipal utilities must meet 10% by 2020.

• Clean Energy Fund (SB 246): Provides a steady stream of revenue to the Governor's Energy Office for the purposes of advancing energy efficiency and renewable energy throughout the state.

• Renewable Resource Generation Development Areas (SB 91): Establishes a 16 member task force to map resource zones and load centers for the purposes of planning transmission capability to meet increasing demand and renewable energy supply from our rural areas.

• Energy Resource Zones Transmission Development (SB 100): Establishes energy resource zones to incentivize investment in transmission and allow for cost recovery by utilities for building transmission to rural resource areas.

• Clean Energy Authority (HB 1150): Establishes a state funding mechanism to leverage bond proceeds and provide government backed loan guarantees through a public authority for the purposes of building transmission capacity for renewable resources.

• Concerning Energy Efficiency (HB 1037): Directs the Colorado Public Utilities Commission to require jurisdictional electric utilities and local gas distribution companies to develop and substantially expand energy efficiency programs. Requires investor-owned utilities to provide energy efficiency programs for their customers, ensuring that they are cost-effective for the utilities.

• School Energy Efficiency (HB 1309): Helps state public buildings become more energy efficient through a process called "performance contracting," generally done in concert with energy service companies. This bill earmarks funds to be committed to achieving similar energy efficiency gains throughout our K-12 school system.

• Concerning Energy Efficiency (HB 1146): Raises the baseline for local building codes to the 2003 International Energy Conservation Code. This will ensure buildings in our communities will be more energy efficient and help us reach our goal of 20 percent efficiency statewide by 2020.

• Energy Conservation and Sequestration Studies (HB 1203): Provides funding for Colorado State University to conduct county-level appraisal of carbon stocks and an assessment of carbon sequestration and greenhouse gas mitigation potential by March 2009. Provides funding for the University of Colorado's Law School to provide a profile of Colorado's energy resources, current and future.

• Tax Credits for Renewable Energy (HB 1279): Extends the sales tax exemption on manufacturing equipment to renewable energy generation.

• Wind for Schools (HB 1087): Creates a grant program to place wind turbines on schools.

• Concerning Renewable Energy (HB 1228): Requires biofuels be used in state fleet vehicles.

XI. Appendix (cont.)

- High Performance State Buildings (SB 51): Requires that state buildings and those buildings constructed with state funds meet a high performance building standard equal to or exceeding the Leadership in Energy and Environmental Design (LEED) standards set by the U.S. Green Building Council

- County Spending Authority for Environmental Spending Measures (HB 1379): Allows boards of county commissioners to place programs in their county budgets to improve environmental sustainability within their counties.

- Local Incentives for Renewable Energy (SB 145): Gives statutory cities and counties the authority to provide incentives for renewable and energy efficient investments.

- Funding for the Collaboratory (SB 126): Establishes support for the research consortium between the Colorado School of Mines, the University of Colorado, Colorado State University and the NREL.

- Renewable Resource Development on Public Lands (HB 1145): Requires the State Board of Land Commissioners to examine land under their control and identify land suitable for development of qualifying renewable energy resources.

- Bioscience Research Grants (HB 1060): Expands support for biofuel research projects.

- Interconnection Standards for Cooperative Electric Associations (HB 1169): Eliminates the opt-out provision for Rural Electric Associations (REAs) for net metering provisions for qualifying projects/customers.

- Sustainable Resource Economic Opportunity (HB 1288): Increases existing solid waste disposal and waste tire fees to fund recycling and waste management programs in the Colorado Department of Public Health and Environment and the Department of Local Affairs.