Governor's Energy Office

Annual Report of the Governor's Energy Office
Fiscal Year 2008 (July 1, 2007–June 30, 2008)

Advancing Colorado to a New Energy Economy

Introduction

There is perhaps no better example of Governor Bill Ritter Jr.'s New Energy Economy than the South Routt School District in Oak Creek, Colorado, near Steamboat Springs.

The district's middle school still used a coal-burning furnace for heating. It had been installed in the 1970s and the infrastructure was crumbling. The holes in the pipes were leaking coal dust into the air throughout the school and the process of burning the coal was so labor intensive they couldn't keep maintenance workers in the job. Clearly, they needed a solution for the future.

The Governor's Energy Office teamed up with the private-sector company McKinstry Industries, the Department of Local Affairs, and the Department of Education along with the local community to replace the coal furnace with a biomass furnace. The furnace would use wood pellets from a nearby pellet plant that was using beetle-kill trees to make the pellets. The resulting project reduced greenhouse gas emissions by 90%, improved the air quality in the school, helped a local business, and reduced the forest health risks and fire dangers associated with the beetle-kill epidemic on the state's Western Slope.

That is what the New Energy Economy is about: increasing energy security, environmental security and economic security for the next generation of Coloradans.

2007 was a watershed year for renewable energy in Colorado. Governor Ritter took office after a campaign in which he laid out a vision for a "New Energy Economy," a proposal espousing the belief that not only can the great challenges of climate change be met with commitment and perseverance, but also that we could benefit economically by aggressively pursuing the emerging industries that would help the world meet this great challenge of our generation.

In 2007, Governor Ritter re-created the Governor's Office of Energy Management and Conservation (originally established in 1977) as the Governor's Energy Office (GEO) to implement his vision of a New Energy Economy for Colorado.The energy office works with the Office of Economic Development and International Trade to attract businesses to Colorado and in partnership with the Department of Local Affairs to help communities develop sustainable energy strategies. The GEO works with the state's electric utilities to provide incentives and programs to increase energy efficiency and renewable energy development. And the GEO partners with local governments and community nonprofits to provide services for citizens and businesses.

That is what the New Energy Economy is about: increasing energy security, environmental security and economic security for the next generation of Coloradans.

In 2007, Colorado became one of only six states in the country to have over 1,000 MW of installed electricity generation from renewable resources. Our pursuit of renewable energy industries led to Vestas, the world's largest wind turbine company, establishing its North American manufacturing center in Colorado—including the world's largest wind tower manufacturing facility in Pueblo, Colorado. Just this one company, from one industry in one sector of the New Energy Economy, will provide nearly 2,500 jobs for Coloradans and represents over $700M of investment in our economy.

But the examples don't stop there:

- Conoco-Phillips will locate its alternative energy headquarters in Colorado
- Siemens located its Research and Development Headquarters in Boulder
- Renewable Energy Systems relocated its headquarters from Austin to Broomfield
- Abengoa, the Spanish renewable development company, established its North American headquarters in Lakewood
- AVA Solar, Ascent Solar and Primestar Solar all announced they will open manufacturing facilities in Colorado
- Dragon Wind opened a blade-manufacturing facility in Lamar
- SunCorps/Lignor announced a cellulosic ethanol facility in Grand Junction

This represents just the tip of the iceberg of opportunity for Colorado in the New Energy Economy. Colorado continues to dominate the world stage for our coordinated and calculated effort to establish the policies and strategies that will allow the New Energy Economy to thrive.

Yet even with the economic success of our New Energy Economy, we still need programs that will advance efficiency and renewables in neighborhoods and communities throughout Colorado. This Annual Report for Fiscal Year 2007–08 will outline the programs the GEO has developed and the goals it has established to ensure that all of Colorado shares in the promise and prosperity of the New Energy Economy.

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Colorado's New Energy Economy

While global warming presents us with many significant challenges, Governor Bill Ritter Jr. believes that those challenges offer Colorado a tremendous opportunity to become a national and international leader in the next generation of energy technologies. By seizing this opportunity, we can simultaneously strengthen our energy security, economic security and environmental security. Governor Ritter has called this new opportunity in these emerging markets the "New Energy Economy."

New Energy Economy opportunities are based on the **reduction of energy use** through conservation and efficiency, **production of clean renewable energy** through the development and use of plentiful renewable-energy resources, and the **development of new jobs and technologies** through support of small businesses, attraction of industry leaders to Colorado and investment in commercialization of the latest innovations coming from our world-class research institutions.

Since Governor Ritter took office in January 2007, we have seen this New Energy Economy vision become a reality. But still, we have just scratched the surface of opportunity. The Governor's Energy Office (GEO) works in partnership with communities, utilities, private and public organizations, and individuals to promote renewable energy and energy efficiency and lead Colorado to fully realize the promise of the New Energy Economy.

What is the New Energy Economy?

The New Energy Economy is that portion of the energy industry not specifically focused on fossil fuel development for energy production. It includes conservation and efficiency efforts as well as the production, distribution and use of clean renewable energy.

Renewable Standards and Energy Economics

Twenty-seven states in addition to Colorado have adopted renewable portfolio standards that define the amount of energy distributed by utilities in the state that must be generated using renewable energy. Renewable portfolio standards have driven down the cost of utility-scale renewable energy resources by providing a market for widespread deployment of renewable technologies. In Colorado, we also have a portion of our standard that is dedicated to installation of solar generation. These policies have driven innovations and technological breakthroughs, which, in turn, continually exert downward pressure on the cost of renewable energy resources. We are witnessing this decrease in the cost of renewable energy technologies at a time when the costs of conventional energy are rising.

Aspen Highlands Patrol Headquarters, a small, sustainably built building located at the top of Loge Peak, the highest lift-serviced point at Highlands (11,675 ft.). Photo: Aspen Skiing Company.

Until recently, traditional energy generation resources were presumed to represent the least-cost option for consumers in Colorado. This conclusion was based on a presumption of unlimited supply of inexpensive and easy-to-access fossil fuels, no costs associated with their emissions and other environmental impacts, and government subsidies. This situation is changing as fossil-fuel resources increase in cost and as their emissions are increasingly considered unacceptable byproducts of energy generation. These factors are making the economics of clean energy and energy efficiency more competitive.

Colorado's leadership has taken a particularly strong stand on the issue of energy efficiency in the form of a significant and long-term financial investment. This investment will be measured in billions of dollars over the next decade, and will help Colorado's major utility, Xcel Energy, achieve the greenhouse gas-emission reductions outlined in the Colorado Climate Action Plan. When the direct and indirect financial benefits of reduced energy use are added to the equation, this represents an unprecedented investment in Colorado and a major business opportunity that is one of the drivers of the New Energy Economy.

Colorado has seized this opportunity and has positioned itself as a leader, a hub of clean-energy technology and implementation. This has a multitude of benefits, from creating clean-energy jobs in Colorado to lowering the costs and increasing the availability of clean energy in the state. Colorado is a logical place to set up shop if you are a renewable-energy or energy-efficiency company because of the state's clear leadership in and commitment to a New Energy Economy. Additionally, Colorado is home to significant intellectual resources with our collaborative research institutions, the University of Colorado, Colorado State University, the Colorado School of Mines and the National Renewable Energy Laboratory. Colorado is also blessed with plentiful renewable energy resources and forward-looking policies that have and will continue to encourage large-scale investment in renewable energy and energy efficiency. When taken together, these create an attractive opportunity for businesses to grow and thrive in Colorado while safeguarding the environment for future generations.

What is the Clean Energy Fund?

The 2007 Colorado Legislature provided funding to the Governor's Energy Office (GEO) to create the Clean Energy Fund. The Clean Energy Fund provides funding for the purposes of advancing energy efficiency and renewable energy throughout the state.

GEO Strategy

The GEO is pursuing the following strategies:

- Promote research and development of technologies related to the New Energy Economy in all key economic sectors, including industrial, agricultural, commercial, residential and academic.
- Attract leading businesses in efficiency and renewable technologies to Colorado.
- Encourage the development of markets and infrastructure for end users, allowing easier access to renewable energy and increasing the pathways to reduce energy consumption.

Results

Fiscal Year 2008 has seen success on multiple fronts. The GEO, in partnership with the Office of Economic Development and International Trade, has attracted international companies to Colorado. Simultaneously, we are helping to grow new companies and expand the capacity of existing businesses working in the New Energy Economy.

The GEO supports renewable energy and energy-efficiency innovation by offering small grants and by funding large business attraction and retention efforts.

Small Grants

The GEO's Small Grants Program specifically helps small businesses, government agencies, schools and universities participate in the New Energy Economy. The purpose of these grants is to bring investment to places where a small injection of capital will have a significant benefit. The environmental benefits have yet to be achieved, but the economic-development investment in terms of leveraged financing is captured in the graph on page 3. The geographic diversity of this funding should also be noted.

New Energy Economic Development (NEED) Grant

The GEO created the New Energy Economic Development (NEED) grant to invest in emerging technologies, grow the market penetration of well-established technologies and attract New Energy Economy investment to Colorado.

NEED Grant Recipients include:

Bardwell Consulting, Denver—electronic home-audit software

Black Hawk Transportation Authority, Black Hawk—community biodiesel production (no website available)

Boulder Innovation Center, Boulder—accelerates green company start-ups

City and County of Denver, Denver—green business development program

Community Energy Systems, Monte Vista—installing biomass heating systems in veterans' homes

Cool Energy, Boulder—develops solar–thermal combined heat and power systems

Coolerado, Arvada—solar-powered air cooling demonstration unit

Costilla County, San Luis—community-owned biodiesel production

Czero, Colorado Springs—vehicle hydraulic hybrid retrofit

Denver Zoological Foundation, Denver—biomass gasification from animal waste

Hybrids Plus, Boulder—developing plug-in hybrid vehicles

Mountain Parks Electric, Granby—biomass heating at utility headquarters

New Community Coalition, Telluride—supports several renewable energy technologies

Office of Resource Efficiency, Crested Butte—maximizes local renewable-energy resources

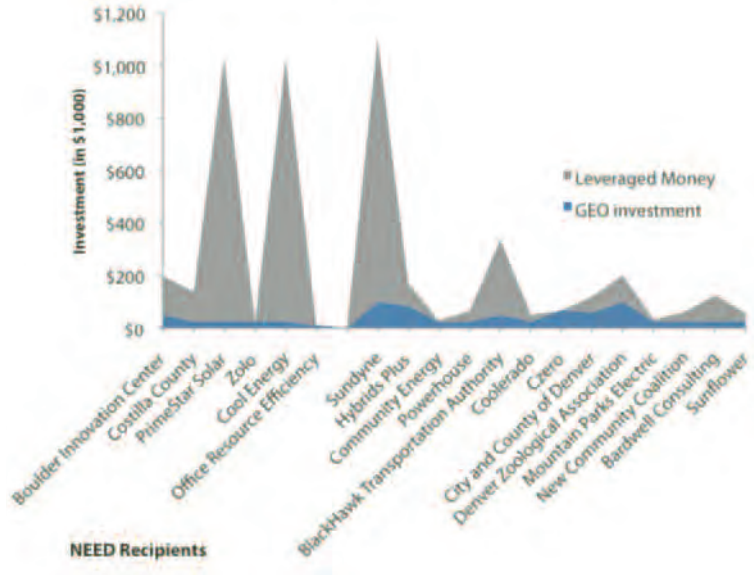
Powerhouse Enterprises, Rifle—green modular housing company

Primestar Solar, Golden—pilot thin-film solar manufacturing facility in Colorado

Sundyne Corporation, Arvada—develops turbo generators using natural gas pipelines

Sunflower Corporation, Boulder—interior day-lighting devices

Zolo Technologies, Boulder—increases efficiency and reliability of coal power plants



Solar Innovation Grants

As part of its work to support renewable energy innovation in Colorado, the GEO allocated $350,000 from the Clean Energy Fund to fund a series of Solar Innovation Grants. The Soar Innovation Grant was designed to support innovative programs that can demonstrate a strategy and implementation plan for breaking down financial, educational, political and technical barriers to greater penetration of solar electric and solar thermal technologies in the residential and commercial sectors.

Twenty-seven applications were received, requesting a combined total of $1.2 million. All awards were contingent upon a 100% match from the applicant, allowing the GEO to directly leverage at least $350k in additional funding.

As of the end of FY 2008, a total of $231,995 had been awarded to five projects with more to be confirmed. Awarded projects include:

SIG Funding Summary		
Applicant	**Summary**	**Award**
Red Rocks Community College	Develop a training program that will prepare students and professionals to sit for existing state and national solar certifications.	$50,000
Habitat for Humanity—Metro Denver	Develop and implement a solar installation pilot that would result in 11 new homes with solar, with the goal of including solar on all new homes by 2010.	$42,000
Millennium Energy, LLC	Monitor and assess 5 solar water heating installations for energy and peak load (DSM) savings and other economic benefits to the utility	$49,995
United Power	Develop a co-op solar farm to provide customers with expanded options and benefits utilizing solar technology while providing lower costs, and to provide the necessary funding to indefinitely sustain the program without direct rebate money from the utility or the Governor's Energy Office. This program could provide the model for other utilities and communities to encourage customers' use of solar technology	$50,000
New Energy Options	Develop a report focusing on finance and development models for large (greater than 400 kW) photovoltaic (PV) solar projects, particularly in rural Colorado and with Colorado's rural electric associations (REAs), and particularly with consideration of local ownership (e.g., "community") opportunities.	$40,000
	Total	**$231,995**

"Green Jobs" Study

Another component of the small grants funding has been investment in a "green jobs" study being conducted by the ASES (American Solar Energy Society).The ASES study will look at a baseline scenario that takes an inventory of green jobs that existed in Colorado as of December 31, 2007. The study will consider two additional scenarios: the Climate Action Plan scenario and the Climate Action Plan Plus scenario. The Climate Action Plan Plus scenario envisions a Colorado that is under more aggressive greenhouse reduction and renewable energy portfolio standard goals than currently exist. Both scenarios will reflect jobs produced across the green jobs segment. The Colorado study will be completed by late 2008.

Large Business Attraction and Retention

The GEO allocates certain funds to expand current large businesses or attract new large businesses to Colorado. In FY 2008, funds went to two large businesses that have opted to open facilities in Colorado.

Siemens, an international company that works on renewable power generation, among other things, is locating a wind aerodynamics research and development facility in Boulder County. At the outset, the company will be staffed with 50 highly paid technical employees, with the potential for growth, and a facility-wide annual wage well above average. The GEO committed $250K to this project.

Vestas is a wind-energy manufacturing company locating a manufacturing facility in Weld County, Colorado. It is expected to employ 2,450 Coloradans, who will be working on wind turbine towers. The GEO committed $1,150,000 to this project.

In addition, funds are supporting:

Fort ZED, a project of the City of Fort Collins in partnership with Colorado State University and local businesses to create a downtown Fort Collins zero energy district. The GEO committed $250K to this project, leveraging over $5,000,000 in federal investment.

University of Colorado and Colorado State University received a total of more than $500K that was legislatively directed to support New Energy Economy projects dealing with policy and carbon sequestration.

Colorado's New Energy Economy
Total Clean Energy Funds Invested = $3.8 Million

Small Grants & Small Business Programs
NEED Grant Funding Awarded = $798,000
NEED Funding Leveraged = $4,044,000
Solar Innovation Grant Funding Awarded = $300,000
Small Business Funding Awarded = $750,000
Small Business Funding Leveraged = $5 Million

Large Business Attraction and Retention
Clean Energy Funds Invested = $1.4 Million
Number of Large Businesses Attracted to Colorado = 2
Estimated Jobs Created = 2,500

Supporting Colorado Homeowners

Residential Buildings Program

Improving the energy performance of Colorado's residential buildings is an important initiative for the Governor's Energy Office (GEO).

In 2007, the Colorado housing market was in significant need of assistance to address energy performance issues. There was no minimum statewide energy code requirement for new construction. Colorado was not actively supporting a voluntary above-code energy program for home builders, and thus was not considered a top-ranked state in terms of market penetration for national building efforts like ENERGY STAR® New Homes. Further, there were few resources or public assistance programs available to homeowners looking to address their energy-related costs and issues and limited economic support for local contractors to provide these services.

Detail of new home pictured on page 7. Photo: Adam Palmer.

The GEO designed and initiated early stages of implementation on multiple statewide residential energy-efficiency programs during FY 2007–08. For its first year of residential program operation, the GEO focused its efforts on improving the energy performance of Colorado's residential buildings in three distinct sectors—new single-family home construction, existing single-family homes and low-income households. A fourth program sector was established in order to better support House Bill 07-1146, which instructed the GEO to assist with the adoption of a statewide residential energy code.

During FY 2007–2008, the GEO created and funded the following statewide programs, using the proceeds of the Clean Energy Fund passed by the Legislature during the 2007 legislative session:

- Colorado ENERGY STAR New Homes
- Energy Code Training and Support
- Insulate Colorado
- Energy $aving Partners for Low Income Households
- Residential Energy Grants
  - Home Performance with ENERGY STAR
  - Beyond Energy Codes
  - CSU Green Building Program

All the residential programs operated during FY 2007–08 focused on developing partnerships between the GEO and Colorado's local governments, utilities, nonprofits, universities and other regional organizations. To maximize Clean Energy Fund resources, the residential programs leveraged money, usually requiring a financial match from partners. Finally, when establishing these first-year residential programs, the GEO worked to create simple, turnkey programs with the potential to yield high-impact and immediate energy benefits to all participants.

New Construction—ENERGY STAR New Homes

The GEO offers the **ENERGY STAR New Homes** Program, a voluntary program for home builders offered by the US Environmental Protection Agency (EPA). Home builders that choose to construct a new home meeting national standards for energy efficiency can apply to have their home(s) tested. If a home passes, they can then place an ENERGY STAR label directly onto the house. This allows for easy and credible recognition by potential home buyers, while offering numerous benefits to participating home builders.

The EPA evaluates each state's participation in this program by assessing the overall market penetration of the ENERGY STAR label against all new single-family home permits. In 2006, Colorado qualified approximately 7.8% of its new homes for the ENERGY STAR label. As part of its residential program offerings, the GEO has launched an aggressive ENERGY STAR New Home Program effort focused on working closely with local governments and sponsors to become a top-tier ENERGY STAR state by 2010, with more than 20% of its new home starts earning the label.

ENERGY STAR New Home in Breckenridge. Program partner: High Country Conservatiion Center. Builder: Kodiak Enterprises, Inc. Energy rating contractor: Q Consulting, Inc. Photo: Natalie Costello Studio.

ENERGY STAR homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20 to 30% more efficient than standard homes. The home's actual energy performance must be certified by an independent Home Energy Rater (referred to as a HERS Rater), who is responsible for conducting onsite testing and inspections of measures such as insulation, high-performance windows, building envelope, duct systems and efficient heating and cooling equipment.

HERS Raters are certified to comprehensively test and label qualifying ENERGY STAR New Homes for participating builders. HERS Raters are often small to mid-sized businesses that serve as the knowledge base to a local home builder community on all residential energy issues.

By actively training and growing the HERS Rater industry in Colorado, specifically in the Eastern Plains, Mountain communities and Southwestern regions, two primary benefits will result. First, there will be a reduction in costs for participating ENERGY STAR New Home builders due to increased market competition and the ability to hire a local company with reduced travel fees. Second, the development of local experts on residential energy efficiency issues will provide resources to the community far beyond ENERGY STAR certification.

In late 2007, the GEO convened a group of 42 interested stakeholders from across Colorado to discuss the launch of a statewide ENERGY STAR New Homes program. Sam Rashkin, the EPA's national ENERGY STAR New Homes Program Director, attended with his team and helped provide strategic direction and insight for Colorado. The discussion's topics focused on developing partnerships among federal, state and local governments to implement the program. Additional ideas included customizing program strategies to meet the immediate needs of the homebuilding industry in each unique region of Colorado, as well as opportunities for cities and counties to incorporate the program as part of any local energy-focused or green building effort already underway. Finally, the discussion centered on the need to collaboratively build a successful infrastructure of home builders and industry partners that have the resources to construct energy-efficient new homes, an infrastructure that could be accomplished through a statewide ENERGY STAR New Homes Program platform, to be led by the GEO.

Program Implementation

In December 2007, the GEO issued a matching-grant application open to all local governments in Colorado to receive Clean Energy Funds for the local implementation of an ENERGY STAR New Homes program.

In February 2008, the GEO announced its grant funding awards and the formation of 13 regional ENERGY STAR New Homes Programs across Colorado. A total of 50 partners, comprised of counties, cities, nonprofits, utilities and private sector groups, were allocated grants from the Clean Energy Fund to establish programs promoting ENERGY STAR New Homes within each recipient's jurisdiction. **The GEO allocated a total of $224,250 among the 13 regional programs, while receiving pledged matching funding of $354,000 from the applicants, leveraging CEF monies by 158%.**

To ensure appropriate use of grant funds, partners regularly communicate their progress and results to the GEO.

ENERGY STAR New home in Eagle. Program partner: Eagle County. Builder: Adam Palmer. Energy rating contractor: Active Energies. Photo: Adam Palmer.

Implementation of the ENERGY STAR New Homes Program began in March 2008. The GEO facilitates program efforts by providing support to each partner in the following key areas:

- Developing program management and tracking tools
- Assisting outreach to regional home builders
- Providing resources to develop regional HERS Raters
- Delivering training on ENERGY STAR construction practices to home builders
- Establishing regional home builder ENERGY STAR marketing and advertising groups
- Providing training and support for real estate professionals
- Operating a statewide consumer awareness ENERGY STAR campaign

The GEO also guided the applications of five of its ENERGY STAR New Homes Program partners to apply for additional EPA funding to support consumer outreach and ENERGY STAR brand identification. In addition to the GEO's Clean Energy Fund support, all five applicants will now receive an additional $15,000 from the EPA to support their regional ENERGY STAR New Homes Programs.

- City of Aspen
- Colorado Springs Utilities
- City and County of Denver
- Mesa County
- Stapleton Development

Progress and Results

The GEO established the following program goals for the ENERGY STAR New Homes Program:

- 2008: 10% of Colorado's housing completions to be labeled as ENERGY STAR.
- 2009: 15% of Colorado's housing completions to be labeled as ENERGY STAR.
- 2010: 20% of Colorado's housing completions to be labeled as ENERGY STAR.

Less than six months into the program, two Colorado partners, Stapleton Development and Colorado Springs Utilities, were recognized by the EPA as National ENERGY STAR New Homes Partners of the Year, a significant and prestigious award not previously earned by any Colorado program.

Built Green Colorado, operated by the Home Builders Association of Metro Denver, and one of country's most successful green building programs, chose to participate in Colorado's ENERGY STAR New Homes Program by requiring that all its eligible homes earn the ENERGY STAR label. Additionally, after working closely with the GEO, Built Green announced plans to fund and administer rebates to Colorado home builders for the construction of ENERGY STAR New Homes beginning in fall 2008.

As of June 2008, aggressive ENERGY STAR New Home Program activity has begun around the state, utilizing the Clean Energy Funds the GEO has awarded. Chaffee County recently held training for home builders on the program, attracting more than 50 attendees. San Miguel County successfully conducted week-long training for individuals looking to earn their HERS Rater certifications and begin a new business; six participants participated in the intensive course.

Ten new local governments and utilities have joined the city of Fort Collins to become sponsors of the ENERGY STAR New Homes Program for Northern Colorado.

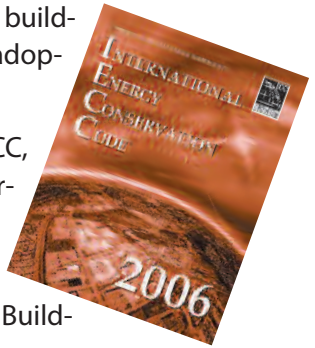
The EPA has published first and second quarter 2008 information for Colorado's ENERGY STAR New Homes Program. During the first six months of 2008, 36 new home builders registered as participating ENERGY STAR Homebuilders, increasing Colorado's total to 173. The EPA registered 441 new ENERGY STAR homes for the first quarter, the state's highest ever first quarter report, and 480 new ENERGY STAR homes during the second quarter, establishing an exceptional market penetration rate of 11.5% for FY 2007–08 despite the overall decrease in new home completions.

New Construction— Energy Code Training and Support

In 2007, House Bill 1146 (HB 07-1146) was passed in an effort to improve the energy efficiency of Colorado's new residential and commercial buildings as part of the New Energy Economy. HB 07-1146 calls for all jurisdictions that have a building code to adopt as a minimum energy code standard the 2003 International Energy Conservation Code (2003 IECC) by July 1, 2008. The Governor's Energy Office is playing a key role in helping localities meet the HB 07-1146 mandate by providing resources to all jurisdictions around the state through the **Energy Code Training and Support** Program.

In November 2007, the GEO commissioned an update on the energy code adoption rate of Colorado jurisdictions. The study demonstrated a clear need for the GEO to create a comprehensive energy training program for the state.

The November 2007 Energy Code study established the following baseline:



- 46 Colorado jurisdictions had no current residential building code and were exempt from the energy code adoption mandate.
- 87 Colorado jurisdictions had adopted the 2003 IECC, 2003 IRC Chapter 11, 2004 IECC, or an amended version of the 2003 IECC.
- 51 Colorado jurisdictions had adopted the 2006 IECC, 2006 IRC Chapter 11, the Reference Uniform Building Code or an amended version of the 2006 IECC.

Program Implementation

In partnership with the GEO, code experts from the International Code Council (ICC) worked to:

- Create a statewide energy code training plan that would provide energy code information to all parts of Colorado.
- Develop Colorado-specific, full-day technical presentations on the 2003 IECC and 2006 IECC.
- Develop Colorado-specific workbooks for code officials on the 2003 IECC and 2006 IECC.

- Provide Colorado-specific ongoing technical assistance to all code officials and building industry parties on the 2003 IECC and 2006 IECC.
- Deliver 30 energy code training seminars on the 2003 IECC and 2006 IECC, presented by code training experts.

Progress and Results

The GEO established the following program goal for the Energy Code Training and Support Program:

- 20 state-sponsored 2006 IECC or 2009 IECC code trainings for jurisdictions in 2008.

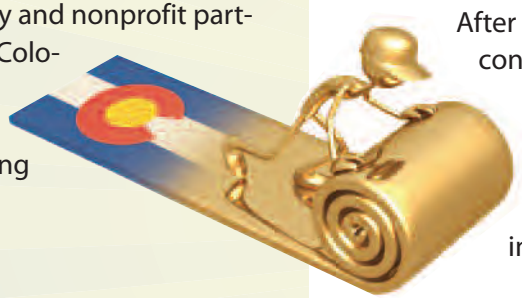
Existing Homes—Insulate Colorado

Small investments in upgrades to existing homes can result in large utility savings for homeowners and carry a substantial cumulative impact relative to Climate Action Plan goals. From a cost/benefit perspective, the addition of insulation to existing homes can generate substantial savings—the EPA estimates a 10 to 20% savings in utility bills for the average home.

The Governor's Energy Office offers the **Insulate Colorado** Program for homeowners who wish to make energy-efficiency improvements to their homes. The program offers rebates directly to qualifying homeowners who insulate and air-seal their attics and exterior walls to the recommended R-Values presented in the 2006 International Energy Conservation Code (2006 IECC).

Program Implementation

Demonstrating the GEO's continued commitment to impacting efficiency on a statewide scale, the Insulate Colorado Program developed a hub-and-spoke model for distributing homeowner rebates. After accepting applications from interested communities, the GEO announced the award of 18 matching grants, forming partnerships representing 43 city, county, utility and nonprofit partners. The total Clean Energy Fund allocation for Insulate Colorado grants is $416,000. As is the case with the ENERGY STAR grant program, total funds pledged by partners exceeded Clean Energy Fund allocations by 38%, totaling over $575,000.



Governor Ritter officially launched the Insulate Colorado Program on Earth Day in April 2008.

The Insulate Colorado Program is administered by local governments. To participate in the program, a homeowner must work with an eligible insulation contractor and reside within a participating partner's official jurisdiction. The contractor must adhere to strict installation guidelines. After the work has been done, the homeowner must complete a rebate request form, attach copies of the contractor's official work invoice and insulation card, and submit them to the participating partner for payment. Approved requests will allow local government to provide the homeowner with a rebate of either 20% of the total qualified insulation cost or $300, whichever is less. Rebates are to be distributed on a first-received, first-paid process, with the program closing when funds are no longer available. All homes that homeowners are issued a rebate for are subject to verification of the completed work. Rebates are limited to one per address.

After issuing funding to local governments, the GEO coordinated and conducted 10 statewide eligibility seminars for insulation contractors interested in offering the rebate to their customers. More than 120 individuals representing more than 70 companies attended to learn how the rebate program works and to better understand proper techniques for installing attic and wall insulation in existing homes.

Progress and Results

On April 22, 2008, Governor Ritter officially launched the Insulate Colorado Program during his Earth Day celebration.

The Insulate Colorado Program anticipates issuing rebates to more than 2,000 Colorado households in 2008. Additional interest from non-participating local governments has allowed the GEO to re-open funding for the program for a round two grant cycle.

Low-income Households—Energy $aving Partners

The GEO offers the **Energy $aving Partners (E$P)** Program to improve the energy efficiency of all low-income residential structures throughout Colorado. Low-income energy consumers represent a unique challenge when it comes to promoting investments in energy efficiency. Due to limited discretionary income, these households are not as able to respond to price signals and incentives. At the same time, the burden of energy costs upon household income is the greatest for these consumers. Thus, the GEO offers free energy-efficiency services through the E$P Program.

The E$P Program's goal is to improve the energy efficiency of households that meet income guidelines at or below 185% of the federal poverty level (FPL), and/or are eligible for assistance through the Colorado Low Income Energy Assistance Program (LEAP). According to the 2000 Census, approximately 350,000 households live at or below 185% of the FPL in Colorado.

The E$P Program was created in 1992 as a result of a funding partnership established between the Department of Energy Weatherization Assistance Program (DOE WAP), Colorado LEAP, and Public Service Company of Colorado (now Xcel Energy). State funding was added to the E$P Program for the first time in 2006 as a result of House Bill 06-1200

HB 06-1200 created a state E$P funding mechanism, sending state severance tax funds to the GEO to make cost-effective investments in energy efficiency in low-income housing. This funding translated into a fivefold increase in the number of households served annually, from approximately 4,000 to nearly 20,000. The E$P Program accomplished this by effectively targeting households for specific services based on utility usage and need. During FY 2007–08, the E$P Program invested over $5 million of state funds in energy efficiency improvements in low-income housing. This figure is in addition to funds provided by the United States Department of Energy, Health and Human Services and Xcel Energy. Cumulatively, the E$P Program managed $18.5 million dollars of low-income efficiency allocations during FY 2007–08. This program does not use any Clean Energy Funds.

GEO Strategy

An average low-income household consumes about 900 therms of gas and about 8,000 kilowatt hours (kWh) of electricity per year. Yet there is significant variability in the consumption levels of low-income households, reflecting factors such as: thermal efficiency of the home, operating efficiency of the heating system, number of occupants, age of appliances and consumption behaviors of the occupants. Recognizing this variability in needs, the GEO has designed more targeted energy-efficiency services.

The underlying objective of all GEO investments in energy-efficiency services is cost-effectiveness. This is measured as return on investment, comparing the cost incurred to deliver the services with the value of the energy not consumed as a result of the service. The GEO strives for all investments to achieve at least a 2-to-1 return on investment over the life of the measure. This positive margin does not include various non-energy benefits resulting from the services (safer and more comfortable homes, less household disruption/homelessness, fewer utility shut-offs, etc.), while also allowing a margin for non-energy related costs (client eligibility documentation, financial management, etc.).

To ensure efficient use of funds, the GEO has designed three levels, or "tiers," of E$P service delivery to respond cost-effectively to low-income energy efficiency needs.

Tier 1

High-efficiency light bulbs and showerheads, combined with consumer education delivered via mail during interactions with utility assistance applicants or through home visits by Youth Corps.

Tier 2

In addition to Tier 1 services, this tier includes focused investments (primarily appliance replacements such as furnaces, refrigerators and freezers).

Tier 3

In addition to Tier 1 and 2 services, Tier 3 includes comprehensive "weatherization" services, generally insulating attics and walls and reducing air leaks in walls, windows and ducts.

Progress and Results

Combining the energy benefits with non-energy benefits such as quality of life and carbon reduction, the investment of $18 million in the energy efficiency of low-income Colorado households will yield returns several times greater than the initial investment over the life of the measures taken. The following table provides an estimate of E$P impacts during FY 2007–08. Final numbers will be available in October 2008 when E$P reports HB 06-1200 results to the General Assembly.

	Installations	Therms Saved (over life of measure)	kWh Saved (over live of measure)
Tier 1			
Mailed Kits	7,579	0*	1,273,272
Kits Mailed to Business Response Card Respondents	1,575		1,370,250
Direct Installation of Measures	2,931	2,931	4,396,500
Tier 2			
Furnace Installations—82% Efficiency Rating	395	679,400	
Furnace Installations—92%	676	1,811,680	
Boiler Installations—92%	13	34,060	
Refrigerator Replacements	1,433		15,304,440
Tier 3			
Insulation and Air Leakage	3,492	426,024	1,086,012
Multifamily	440	1,044,000	1,355,040
Totals			
Total Energy Savings		3,995,164	24,785,514
CO_2 Reductions Metric Tons		19,976	19,270

*The mailed kits resulted in 0 therms saved. This is because high-efficiency CFLs (compact fluorescent light bulbs) give off very little heat, resulting in an increase of therm usage of approximately 10 therms per year. Installing low-flow showerheads resulted in a decrease of approximately 10 therms per year. This resulted in a net therm saving of 0.

The E$P Program conducted extensive pre and post utility bill analysis over the last program year to determine cost-effectiveness of the various approaches, particularly with regard to the mailed kits and direct installation of Tier 1 measures. The results showed that when the kit was requested through a business response card, the benefit-to-cost ratio was an impressive $4 to $1. This was clearly the most cost-effective Tier 1 delivery method; therefore, the E$P will be utilizing the business response card as the primary outreach method for the 2008–09 program year, allowing recipients to choose to either receive a standard energy savings kit or be contacted to receive a free home energy audit.

The free home energy audit will be conducted by many of the same entities that delivered direct install services in 2007–08, including Colorado Youth Corps groups. The direct install method, which was widely employed in 2007–08, was only marginally cost-effective; however, two weatherization subgrantees performed pilots in the last program year that trained the local youth corps to conduct a short "mini audit" to assess whether the home had further energy savings potential through appliance replacements and/or additional insulation. The information they collected and forwarded to the weatherization agencies developed into "hot leads" for the higher energy savings impacts of Tier 2 and 3 services, while keeping the costs of finding those clients relatively low for the weatherization agency. This approach also strengthened the "green collar jobs" training component of the youth corps program. Because of the success of these pilots, the GEO has designed a standardized Tier 1 audit, as well as a Tier 1 audit training and certification curriculum, and has begun the process of connecting weatherization agencies with youth corps, nonprofit organizations, and workforce groups. The ultimate goal will be to offer Tier 1 audit services statewide through a wide array of new partners by the end of 2008–09.

The Energy $aving Partners Program will continue to develop a network of partner agencies that serve Colorado cost-effectively while saving the largest amount of energy possible. The GEO will release a competitive solicitation in January 2009 to select the partner agencies to perform E$P services. By virtue of this competitive approach the GEO will connect with every region of the state to deliver low-income services.

Residential Energy Grants—Home Performance with ENERGY STAR Program

The GEO actively supports the implementation of Colorado's **Home Performance with ENERGY STAR** Program, which includes the training of contractors to become "whole-house" energy experts who can conduct comprehensive testing and multiple measure recommendations to address energy and comfort issues in existing homes.

Home Performance with ENERGY STAR is a national program administered by the US Environmental Protection Agency and the US Department of Energy, and offers a comprehensive, whole-house approach to improving energy efficiency and comfort at home while helping to protect the environment. Certified Home Performance contractors can help homeowners cost-effectively improve their home's energy efficiency. These specially trained contractors evaluate homes using state-of-the-art equipment and recommend comprehensive improvements that will yield the best results. They can also help homeowners take advantage of federal tax credits for energy efficiency improvements.

In May 2008, Fort Collins Utilities and the GEO launched a jointly funded rebate program for homeowners that offsets 20% of the cost of energy improvements, with a $500-per-homeowner maximum. Rebates are available to homeowners who have energy improvement work completed through contractors qualified under Colorado Home Performance with ENERGY STAR (CHPwES). The GEO allocated $25,000 of Clean Energy Funding for this program.

Residential Energy Grants—Beyond Energy Codes

Working in partnership with the GEO, The Southwest Energy Efficiency Project (SWEEP) was allocated $20,000 of Clean Energy Funding to support Colorado cities and counties with the development and adoption of high-performance homes programs and energy efficiency policies.

Key tasks associated with this program include:

- Development of a model green building code with templates for residential and commercial codes. The model codes include suggested energy-efficiency criteria and options for achieving higher performance levels.
- Targeted technical assistance to help local governments develop and adopt model programs and policies that promote high-performance residential building practices, including enhanced building codes, green building programs and builder incentives and training programs.
- Documentation of the process and steps involved in establishing a high-performance homes program and conducting outreach to additional municipalities.

Case Study: Residential Energy Grant—CSU Green Building

The Institute for the Built Environment (IBE), Colorado State University, received $10,000 in Clean Energy Funding to help establish the **Green Homes Certificate Program**. IBE works through Colorado State University Continuing Education, which is a self-supporting unit of the university. Funding was allocated to make this unique offering available for businesses and citizens in the Mountain West. This effort works to increase the level of green home performance in communities throughout Colorado. Grant funds were directed toward the following:

- Curriculum development to include research, writing and discussion involved in developing a curriculum that offers a summary of the best practices, strategies, and tools for sustainable residential construction and remodeling.
- Presentation development: IBE used funding to offer an honorarium to leading experts in the region for their investment of expertise and time to develop the course content.

Local Energy Efficiency: The GEO is establishing relationships with Colorado's towns, cities and counties to jointly support residential energy efficiency, develop and implement effective energy-saving programs with local leadership driving regional implementation, and better leverage state dollars.

Statewide Technical Infrastructure: The GEO is focused on building Colorado's technical infrastructure of residential energy efficiency experts by dedicating funding to home builder trainings, Home Energy Rater development, and home-buyer education.

Reducing Household Energy Consumption: The GEO's Residential Buildings Program provides environmental benefits to Colorado by helping to reduce overall energy consumption by Colorado households, thereby reducing the need for combustion of fossil fuels and the resulting harmful emissions.

Supporting Local Markets: The GEO's Residential Program provides benefits to Colorado's local economies by generating a range of jobs in local home-services industries, which increases the tax base in communities throughout the state and indirectly supports other jobs.

Homeowners: In addition to reducing energy usage, the GEO's Residential Program helps homeowners realize reductions in water consumption and accompanying water and sewer fees, improve home comfort and health, and increase their property's value and/or resale value.

Home Builders: The GEO's Residential Program assists home builders through market differentiation and recognition as well as increased revenue and customer satisfaction.

Utilities: The GEO's Residential Program helps reduce utilities' costs for bill collection and service shut-offs, as well as addressing home safety and combustion air issues, reducing utility emergency calls.

Residential Buildings Program
Total Clean Energy Funds Invested = $762,250

ENERGY STAR New Homes
Clean Energy Funds Used = $224,250
Number of Regional Matching Partners = 13
Total Amount of Matching Funds = $345,000
Number of New ENERGY STAR Home Builders = 36
Number of New ENERGY STAR Labeled Homes = 921

Energy Code Training and Support
Clean Energy Funds Used = $122,000
Department of Energy Funds Used = $95,000
Number of Workshops Coordinated = 30
Total Number of Attendees Statewide = 787

Insulate Colorado
Clean Energy Funds Used = $416,000
Number of Regional Matching Partners = 18
Total Amount of Matching Funds = 575,000

Energy $aving Partners
Clean Energy Funds Used = $0
House Bill 06-1200 Funding = $5,000,000
Partner Funding Used = $13,595,807

Buildings for a Better Tomorrow

Commercial and Public Buildings Program

During FY 2007–08, the Governor's Energy Office (GEO) developed and began implementing a comprehensive array of commercial buildings programs. The GEO focused on executing energy retrofits in existing buildings through a Performance Contracting Program and improving design and construction practices in new facilities through a High Performance Design Program. In addition to providing the public sector with access to these programs, the GEO created a program specific to Colorado's K–12 schools as a result of House Bill 07-1309, which requires the GEO to improve energy efficiency in all Colorado schools. HB 07-1309 directs the Colorado Department of Revenue to use funds from the oil and gas severance tax for programs that increase energy efficiency in public schools.

During FY 2007–08, GEO created and/or funded the following statewide commercial buildings programs:

- Performance Contracting
- Renewables in Performance Contracting
- High Performance Design
- K–12 School Energy Program
  - ✓ Performance Contracting in K–12 Schools
  - ✓ High Performance Design in K–12 Schools
  - ✓ Additional K–12 Energy Program Services
  - ✓ SEP Funds
  - ✓ The Energy Hog Campaign

During FY 2007–08, the GEO's Commercial Buildings Program completed initial design and partnership phases and successfully began program operations. In total, these programs allocated $701,276 in Clean Energy Funds.

Performance Contracting

Existing commercial buildings provide a significant opportunity for energy and greenhouse gas emission savings. By implementing a whole-building retrofit approach through a model called "performance contracting," owners of existing buildings can achieve energy and cost savings and use those savings to invest in new energy-efficiency and renewable-energy equipment.

Energy-efficiency improvements at the GEO office, Denver.

Performance contracting provides a way for building owners to make upgrades quickly—with no up-front capital—and pay for them through the resulting energy savings. The benefits are immediate: new equipment, expertise from energy service professionals, ongoing maintenance services, achieving sustainability goals and the ability to accomplish many projects at once. Best of all, the energy savings are guaranteed.

The GEO built on the success of a previous performance-contracting program, Rebuild Colorado, by enhancing its powerful set of tools and expertise with new support and initiatives to improve the effectiveness and reach of the program. The GEO assembled a team of performance-contracting specialists, state and local government partners, and private Energy Service Companies (ESCOs). The GEO's new Performance Contracting Program was launched in July 2007.

GEO Strategy

The GEO's **Performance Contracting Program** provides expert assistance to state agencies, higher education, local governments and private building owners to help them successfully navigate the performance-contracting process. The GEO also provides these services to K–12 schools through the K–12 School Energy Program. The program is designed to ensure the timely, successful completion of comprehensive efficiency improvements.

The GEO facilitates the performance-contracting process by:

- Forming effective partnerships with state and local governments.
- Defining roles and responsibilities in a memorandum of understanding with partners.
- Recognizing partner efforts through success stories, presentations and case studies.
- Annually pre-qualifying ESCOs to ensure that the companies provide quality services and understand program goals while streamlining the selection process for partners.
- Offering ongoing assistance to help partners successfully achieve comprehensive efficiency improvements. This assistance includes project feasibility assessments, savings verification, financing advice, education and outreach, sample contracts, energy-efficiency management best practices, monitoring and verification planning, and providing networking opportunities for program participants.
- Assisting with generating additional capital for projects by locating and facilitating grant applications for programs offered by organizations like the Colorado Department of Local Affairs and the Colorado Department of Education, and by requiring pre-approved ESCOs to apply for utility incentives.

The Performance Contracting Program provides support as needed, ranging from about $5,000 to $30,000 per project, with $8,000 to $12,000 being typical. The support is more focused on the initial phases of the process (feasibility, audit, contract and construction), with lower levels of funding for the annual guaranteed savings review, which verifies that the agreed-upon level of energy and cost savings is being met. This year the GEO spent $195,000 in Clean Energy Funds on the Performance Contracting Program, $71,945 of which was to fund a contract with Trident Energy Services, Inc., to serve as the GEO's third-party consultant and service provider for the program. Trident Energy's responsibilities include providing savings calculations, project feasibility assessments, savings verification, financing advice, education and outreach, sample contracts, energy-efficiency management best practices, and monitoring and verification planning.

TRIDENT ENERGY SERVICES

Progress and Results

The GEO's Performance Contracting Program is demonstrating significant initial success, including:

- Forty-one facility owners have signed a memorandum of understanding with the GEO to begin the process of executing a performance contract.
- For Colorado state buildings and higher-education institutions combined, performance contracts valued at an estimated $165 million have been completed or are currently in progress. This will result in an estimated 75,797 metric tons of avoided CO_2 emissions.
- For every $1 of GEO contractor support, program partners secured an average of $400 in capital improvements. These improvements were made using a combination of annual utility bill savings resulting from efficiency measures and grant funds rather than capital funding. The Performance Contracting Program partners, including both active and completed projects, include nine state departments, 14 institutions of higher education, 29 cities or counties, and 32 school districts (see the K–12 Schools Energy Program section below for more detail) representing small and large entities across the state.

The GEO Performance Contracting Program has seen a number of success stories. Below are two case studies resulting from the program:

- Department of Human Services, **"On the Fast Track to Better Buildings & Energy Savings"**
- Eaton School District, **"Turning Energy Savings into a Better Learning Environment"**

Because of its work in performance contracting, the GEO has been recognized as a leader by the Energy Services Coalition, a national nonprofit organization composed of experts from a wide range of organizations working together at the state and local levels to increase energy efficiency and building upgrades through energy savings performance contracting.

The GEO will continue to develop resources in an effort to assist more state and local governments in achieving their sustainability and economic and environmental stewardship goals through performance contracting.

Renewables in Performance Contracting

The GEO's **Renewables in Performance Contracting Program** works to reduce the cost of incorporating renewable energy into a performance contract. By tying these funds to performance contracts, the GEO can ensure that all practical efficiency opportunities have been implemented prior to investment in renewable energy.

Prior to the inception of this program, it was uncommon for renewable-energy technology to be included in performance contracts, primarily because the payback period for the systems tends to be longer than the payback period for the performance contract.

GEO Strategy

The Renewables in Performance Contracting Program offers grants to organizations that are actively engaged in a performance contract. Grants are capped at $25,000 and organizations apply using a grant application. Applications are reviewed by GEO staff, including in-house engineers, to ensure that the systems are properly designed and priced, and that they will offer a reasonable payback period. The grants are focused on directly offsetting installation and hardware costs.

Progress and Results

In FY 2007–08, $123,276 in Clean Energy Funds were awarded to four applicants, leveraging over $400,000 in grants, rebates and capital investment. Those awards funded:

- A solar hot water and solar electric system for the Lafayette Recreation Center
- Two solar electric systems in Jefferson County Schools
- A solar electric system in Colorado Springs School District D-11
- A biomass boiler in the South Routt School District, which replaced the next-to-last coal-fired boiler in a Colorado school **(see case study in the Biofuels Program section)**

Because this program primarily serves public buildings such as schools and government facilities, these systems are typically highly visible, and in many cases can serve as a public demonstration of technology and as an educational resource. Additionally, most of the projects funded are not eligible for federal tax incentives because they are tax-exempt entities, which makes it more difficult for them to incorporate renewable energy into their projects. This makes GEO's Renewables in Performance Contracting Program an effective pathway to the installation of renewable energy in public buildings.

The Renewables in Performance Contracting Program directly addresses the objectives of the Clean Energy Fund. The program will save 83,632 kWh of electricity and 12,995 therms of natural gas per year while avoiding 1107 metric tons of carbon emissions per year.

High Performance Design

New commercial building construction offers the best opportunity in terms of energy and greenhouse gas savings. Too often, low- to no-cost energy-efficiency alternatives are either overlooked, never considered or are removed from a project due to short-term budget constraints. Considering the energy performance of the building throughout the entire design process allows building project managers to make strategic energy-saving decisions that will translate into long-term reductions in operational costs for the building.

GEO Strategy

In FY 2008 there were no public building projects obligated to meet the requirements of the High Performance Certification Program. This will change in the next fiscal year and the GEO has identified four areas where the HPCP can make the most impact:

1. Work with state agencies such as the Department of Local Affairs (DOLA) to ensure adequate support structure and funding mechanisms are in place,
2. Consult early in the design and planning stages,
3. Provide education and training for facility owners and design professionals, and
4. Develop best practices for Colorado projects.

Senate Bill 07-51 was signed by Governor Ritter in 2007 and requires that new buildings or major renovations larger than 5,000 square feet and receiving at least 25% of their capital construction budget from the state comply with the Office of State Architect's (OSA) High Performance Certification Program (HPCP), a dynamic program designed in partnership with the GEO. The HPCP has established a minimum target of gold certification through the US Green Building Council's Leadership in Energy and Environmental Design (LEED®) certification program.

Progress and Results

In FY 2008, the GEO worked with the OSA to develop the process and procedures for public buildings that will be complying with the HPCP. The OSA has administrative responsibility for state agencies and institutions of higher education, but this is not the case for buildings funded by grants from the Department of Local Affairs (DOLA). The GEO and DOLA have agreed to work together to provide the resources and support to the municipalities and counties that will design and build high-performance buildings.

In FY 2009, the GEO will contract with a high-performance design consultant to engage with public building projects early in the planning and design stages. This direct service to public agencies will provide great value to the facility owners and decision makers faced with tight budgets, new requirements and a desire to build sustainable, energy-efficient buildings.

K–12 School Energy Program

In most school districts, utility costs are second only to salary as the district's greatest expense. The GEO created the **K–12 School Energy Program** to help schools reduce energy costs and reallocate the energy dollars saved toward improved facilities and academics through energy-efficiency programs. In addition to the economic benefits of energy efficiency, schools also can benefit by improved learning environments.

In 2007, Governor Ritter signed House Bill 07-1309, requiring the GEO to improve energy efficiency in all Colorado schools. HB 07-1309 directs the Colorado Department of Revenue to use funds from the oil and gas severance tax for programs that increase energy efficiency in public schools. Severance tax payments were originally collected on a quarterly basis and were modified by

this bill to be collected monthly. The differential in interest earned on these payments is allocated to the Public School Energy Efficiency Fund to be appropriated by the GEO for use in four key areas:

1. Assisting school districts in financing energy-efficiency upgrades through energy-performance contracts.
2. Assisting in the design of new public schools so that they are more energy efficient.
3. Assisting school districts in increasing the effectiveness of their utility budget management.
4. Providing energy-efficiency training and resources to school districts.

Stone Mountain Elementary School, Highlands Ranch, opened in January 2008. Energy-efficient design throughout the school is a joint venture of Hutton Architecture Studio and RB+B Architects. Photos: Paul Brokering.

In May 2008, Governor Ritter signed House Bill 08-1335, known as the Building Excellent Schools Today (BEST) bill. HB 08-1335 represents the most substantial commitment of state resources to school construction in Colorado history. BEST uses a portion of the annual income from Colorado's School Trust Lands[1] to help local school districts repair, replace and renovate dilapidated public schools. A board will be created that will first complete a needs assessment of all the school facilities in the state and then determine how to appropriate the funds to local districts.

GEO Strategy

- Provide district-level support for performance contracting and high-performance design in K–12 schools.
- Establish an integrated high-performance design process that incorporates all stakeholders.
- Assist with third-party certification for high-performance design, including LEED®.
- Develop a Colorado-specific, high-performance, third-party certification process.
- The GEO will identify school buildings that are poor energy performers and provide a way to direct state services to the school buildings that need the most help.

The GEO has developed the K–12 School Energy Program to offer support and guidance to school districts working to increase energy efficiency through performance contracting and high-performance design. In addition, the program offers three grant opportunities for schools to receive funding for energy efficiency and renewable-energy projects. The goal is to assist Colorado's 178 school districts, with special considerations for districts located in areas that are socially or economically impacted by fuel or mineral extraction or processing.

[1] The bill was designed to consolidate some existing construction funds and add about $30 million a year from the state school lands trust fund plus voter-approved local district matches to create a new fund. That money is planned to pay off the lease-purchase agreements that would provide construction money. The program will not tap existing tax revenues or require new state taxes. Advocates estimate the program could generate up to $1 billion in five years for construction and renovation.

Performance Contracting in K–12 Schools

The new K–12 School Energy Program has greatly increased the GEO's capacity to offer its expert services to school districts throughout the state. The GEO has dedicated a full-time employee to work specifically with performance contracting in K–12 schools.

As one of many energy-efficient upgrades in Eaton School District's Performance Contracting project, Eaton High School now uses a solar hot water system to heat its swimming pool water. Photo: Eaton School District RE-2.

The GEO has assisted 23 school districts with the performance-contracting process already and 14 additional partners have signed on this year. The GEO will help these 37 school districts to engage the GEO's pre-approved ESCOs and begin the process of reducing their energy and water use. The GEO also helps the school districts leverage funds from additional sources, including grants from the Colorado Department of Education, the Department of Local Affairs and rebates from utilities.

High Performance Design in K–12 Schools

The GEO assists K–12 schools in building new facilities that enhance learning, reduce operating costs and conserve important natural resources and meet the directives of HB 07-1309 through the OSA's High Performance Certification Program (HPCP). The GEO provides the following direct services to help schools achieve their high-performance design goals:

- Outreach services for town meetings, school committees and the school design team.
- Support services to assist the design team with the integrated design approach.
- Technical support for energy modeling, renewable energy and life cycle cost studies.
- Grants ranging from $20,000 to $30,000 for early integrated design, energy modeling and strategies that drive energy efficiency. The GEO ensures that these projects capture all available rebates or incentives from utilities and other organizations.

The GEO's K–12 School Energy Program works to ensure that the HPCP helps school projects design and construct high-performance buildings that are compatible with national standards while maintaining regional values, priorities and requirements. To this end, the GEO is creating Colorado's own K–12 high-performance building certification program called the **Colorado Collaborative for High Performance Schools (CO-CHPS)**.

CO-CHPS will help schools design, construct and certify their buildings for optimum performance in Colorado's climate while maximizing energy efficiency and reducing operating expenses for school districts.

GEO has partnered with CHPS to organize a technical advisory committee and draft the CO-CHPS criteria. The participants for this committee represent the best and brightest in the school design and construction community. The allocation of House Bill 07-1309 dollars to develop this program will help streamline the high-performance design process for Colorado's future schools.

Stone Mountain Elementary, Highlands Ranch. Below, media center; right, cafeteria with no electric lights on, only tubular day-lighting devices. Hutton Architecture Studio and RB+B Architects. Photo: Paul Brokering.

Additional K–12 Energy Program Services

In FY 2007–08, the GEO selected a vendor that will track and store utility use data for all state buildings, including K–12 schools, through a software program called uBills. In FY 2008–09, the GEO will provide matching grants to school districts to enable them to participate in the uBills program. This will allow the districts, as well as the GEO, to easily identify buildings that are poor energy performers and direct state services to the buildings that need the most help.

The GEO is partnering with the Colorado Association of School District Energy Managers (CASDEM) to implement energy training and education. The GEO's goal is to provide all school districts that participate in the uBills program with a dedicated CASDEM professional to promote energy management in schools, share information on energy management issues, and to provide opportunities for cooperative efforts related to energy management among school districts. This partnership will serve as a technical resource for training and support.

SEP Funds

In addition to the funding provided through HB-1309 and the Clean Energy Fund, the GEO is administering several Supplemental Energy Program (SEP) funds. SEP funding is the result of a legal settlement through which an industry is required to pay for energy efficiency and renewable-energy measures in a negatively impacted area. The GEO is developing energy-efficiency programs with six school districts eligible for SEP funds. The goal is to leverage these funds to have a large carbon reduction impact, primarily by utilizing them within a performance contract for the school district.

Energy Hog

In conjunction with the Alliance to Save Energy and Energy Outreach Colorado, the GEO provides The Energy Hog program free of charge to Colorado elementary school teachers interested in bringing energy education into the classroom. The Energy Hog program includes a mascot costume of a "dastardly, energy-wasting" Energy Hog, and a game-show-format skit that makes learning about energy interactive. This program is focused on changing behavior at school and at home.

Progress and Results

By leveraging HB 07-1309 and Clean Energy Funds, the GEO has dramatically increased the number of school districts participating in performance contracting, leading to substantial reductions in energy use, water use, operation and maintenance costs, and three new renewable-energy installations.

In FY 2007–08, 14 school districts began the performance-contracting process with the GEO's assistance, a program participation increase of 58% compared to FY 2006–07. This brings the GEO's partnerships with Colorado school districts from 13% to 21%. Because these projects are in the beginning stages, their full impact is unknown as of this report. By comparing the present energy use of the 14 school districts to other districts that have completed performance contracts, the following estimation of their cumulative impact can be made.

In FY 2008, the GEO has listened to the concerns of school districts as well as design and construction professionals regarding their efforts to create high-performance schools. The GEO has identified the need to provide on-the-ground project consulting and to develop Colorado-specific tools and resources for high-performance design. The development of CO-CHPS and the FLEX Energy guidelines will provide valuable design tools for Colorado schools. In FY 2009, the GEO will contract with a high-performance design consultant to engage with public schools early in the planning and design stages. The GEO consultant will work with schools to identify available resources, develop project goals, ensure that the design team is capable of meeting the owner's expectations and guide the project to success.

ENERGY IMPACT

- On average, performance contracts can save facility owners up to 20% on their utility bills.
- The GEO's programs are designed to leverage and promote utility demand-side management programs.

- The High Performance Design (HPD) program will strive to achieve an energy performance standard of 30% above code.
- The GEO's FLEX Energy guidelines will ensure that new facilities are prepared to adapt to new energy scenarios, including fossil fuel scarcity, changing utility rate structures, availability of solar and renewable technologies and widespread electric vehicle use.

ECONOMIC IMPACT

- For every $1 of GEO contractor support, program partners secured an average of $400 in capital improvements.
- By continuing to pre-approve energy service companies to work in Colorado's public sector, the GEO builds the capacity within our state to implement energy-efficiency projects in the public and private sectors.

- The GEO's Performance Contracting and HPD programs will stimulate the green jobs market in Colorado, resulting in a wide range of employment opportunities and capital investment in the state.
- All Clean Energy Fund investments are designed to be cost effective within a reasonable payback period. By reducing the utility costs in the public sector, more funding will become available for other projects

SOCIAL IMPACT

- While the GEO's programs focus on saving energy and capital resources, the end result of these projects is better facilities. This results in improved comfort, productivity and quality of life for building occupants.

- High-performance schools built with GEO assistance provide exceptional learning environments for Colorado's children, including ample natural light, fresh outdoor air and materials that are safe and non-toxic.

Case Study: Eaton School District

Eaton, a small rural school district in Weld County, used the K–12 School Energy Program's Performance Contracting Program to undertake a comprehensive facilities improvement project that increased comfort, reduced utility costs and improved the learning environment. The GEO provided contract support of $11,000 over two years to help the district learn about performance contracting, select an ESCO and negotiate a performance contract. As a result, the district signed a performance contract for $3.5 million. The GEO performance-contracting team worked with the district and helped district personnel apply for and secure five Capital Construction Grants totaling $2.2 million as well as $500,000 in Energy and Mineral Impact Assistance Grant funding. Eaton also received $50,000 in rebates from Xcel Energy for their lighting upgrades. This supplemental funding allowed Eaton to increase the scope of the project dramatically and incorporate additional efficiency measures such as new windows, several boiler replacements and a solar hot water system for their swimming pool. **Click to read the whole case study.**

Before: This old, inefficient boiler was used year-round to heat both the swimming pool water and the swimming pool room at Eaton High School. Photo: Eaton School District RE-2.

After: New, more efficient boiler system heats the room, while a solar hot water system heats the swimming pool water. Photo: Eaton School District RE-2.

Commerical and Public Buildings Program
Total Clean Energy Funds Invested = $318,276

Performance Contracting
Clean Energy Funds Used = $195,000
Number of MOUs Signed by Non-K–12 Partners = 26
Number of MOUs Signed by K–12 School Districts = 15
Number of Pre-qualified Energy Service Companies = 13
Estimated Value of State and Higher Ed Performance Contracts = $165,000,000
Estimated Avoided Carbon Emissions for State and Higher Ed Performance Contracts = 75,797 metric tons

Renewables in Performance Contracting
Clean Energy Funds Used = $123,276
Funding Leveraged with Partners = $400,000
Electricity Saved = 83,632 kWh per year
Therms Saved = 12,995 therms per year
Amount of Carbon Emissions Reduced = 1107 metric tons per year

High Performance Design
Clean Energy Funds Used = $0
K–12 School District Partners = 19
Non-K–12 School District Partners = 6

Leading by Example

Greening Government

As of June 2008, Colorado state government employs approximately 50,000 full-time and 30,000 part-time employees, approximately 60% of whom work in higher education. In an October 2007 survey of state employees, 95.6% of the respondents indicated they have a desire to reduce their impact on the environment through their actions at work.

Two executive orders issued in 2007 created a framework enabling both individual state employees and their respective organizations to lead by example through actions that reduce the energy intensity and environmental impact of state government operations. The Governor's Energy Office (GEO) Greening Government Program facilitates this effort through policy development and by providing technical expertise.

Executive Order D 011-07 set ambitious goals to reduce energy, water, petroleum and paper consumption; include environmental specifications in state procurements; and divert waste from landfills. The first step toward meeting reduction goals always involves acquiring data. Program activities to date include the formation of the Greening Government Coordinating Council and developing baselines, strategies and work plans for implementation. Many initiatives are in the early phases of implementation, but extensive progress toward program goals has been accomplished with FY 2007–08 expenditures of less than $40,000.

At the close of FY 2008, the Colorado Department of Personnel and Administration was in the process of achieving Leadership in Energy and Environmental Design (LEED®) certification for the Colorado State Capitol Building. Colorado's will be the first state capitol building to be LEED® certified. Photo: Rick Ciminelli.

The Greening Government goals Colorado state government seeks to achieve by June 30, 2012, are as follows (the baseline year is FY 2005–06):

- 20% reduction in energy use
- 20% reduction in paper use
- 10% reduction in water consumption
- 25% volumetric reduction in state vehicle petroleum consumption

Additionally, Governor Bill Ritter's Climate Action Plan, issued November 2007, sets a target of 75% waste reduction from state operations by 2020.

The Built Environment

The GEO addresses energy savings through a multi-pronged approach involving design and construction, operations management, energy performance contracting and plug-load management (management of electricity used by computers, appliances, etc.).

Building Design and Construction

The Office of the State Architect (OSA), pursuant to Colorado Revised Statute 24-30-1301–1307, establishes standards that govern the design and construction of state-assisted facilities (facilities constructed or renovated using state funds), including new buildings and substantial renovations. These standards form a policy that covers the entire building process, from initial facility master planning to final, long-term operation and maintenance of buildings. The policy is designed to be compatible with national standards while maintaining regional values, priorities and requirements. The OSA implements this policy, in partnership with the GEO, through the Colorado High Performance Certification Program (HPCP).

Controlled maintenance projects and similar narrowly focused repair projects are exempt from the HPCP policy, but each project's design and construction are expected to comply with policy goals. The GEO works in conjunction with the OSA to facilitate this process using the latest in efficient building standards. These guidelines are based on the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) certification program. The HPCP is discussed further under the **Commercial and Public Buildings Program**.

The Colorado Department of Labor and Employment building in Denver was the state's first LEED®-certified building.

The differences between a typical commercial building and a LEED®-certified building are substantial. In addition to being more energy- and water-efficient, LEED® buildings are comfortable and healthy work environments because they use materials that are less harmful to humans than comparable products, harvest daylight, and improve ventilation to maximize occupant comfort. State buildings account for approximately 20% of all Colorado LEED® certifications. Thirteen state facilities are currently LEED® New Construction (NC), Existing Building (EB), or Commercial Interiors (CI) certified.

- Colorado Department of Labor and Employment Building (NC)
- State of Colorado Human Services Building (EB)
- Colorado State Services Building (EB)
- Colorado Judicial and History Museum Complex (EB)
- University of Colorado Memorial Center, Boulder (EB)
- University of Colorado ATLAS Building, Boulder (NC)
- Colorado State University Guggenheim Hall Classrooms (CI)

- Colorado State University Transit Center (collaboration with the City of Fort Collins) (NC)
- University of Colorado Wolf Law Building (NC)
- Department of Military and Veterans Affairs, Colorado Army National Guard Buckley Army Aviation Support Facility (NC)
- Western State College Borick Business Building (NC)
- University of Colorado Leeds School of Business, Boulder (NC)

The Borick Business Building on the Western State College campus in Gunnison opened for classes in fall 2007 and received Silver LEED® Certification in June 2008. Photo: Jason Dunning, Western State College.

Operations and Maintenance

The state's utility budget is in excess of $154,000,000.[1] A 20% reduction in energy and water use will result in avoided annual costs and mitigate the future impact of escalating energy prices. State-owned buildings consume a tremendous amount of energy and carry an obligation to use that energy as efficiently as possible. The plan to reduce energy consumption in state buildings will contribute nearly 3% of the statewide energy-efficiency goal, per Governor Ritter's 2007 Climate Action Plan.

[1] Office of the State Architect.

Initiating a process aimed to reduce utility expenditures, in January 2007 the Greening Government Coordinating Council members developed energy- and water-management plans specific to their organizations. These plans act as a template for agencies to put energy policy into action so they can work toward meeting or exceeding energy- and water-reduction targets.

To assist agencies in successfully reducing energy and water expenditures, the GEO is using Clean Energy Fund dollars to purchase a utility-management software tool that will track, monitor and benchmark energy and water use for state agencies. This web-based tool is available to all colleges and universities, local governments and K–12 schools through a preferred state price agreement. The software will help the GEO and state energy managers identify and correct errors in bills as well as analyze and improve the efficiency of each building's energy and water systems. Buildings that need improvements will be considered candidates for an energy performance contract.

Energy Performance Contracting

Energy performance contracting enables state government and other organizations to invest in energy-saving equipment and controls, using future utility cost savings (or avoided costs) to pay for the improvements. An energy performance contract begins with a feasibility study, performed by the GEO with the support of the Office of the State Architect and the agency's energy manager. Using analytical tools, the feasibility study identifies the building's energy and water use inefficiencies through a comparison with similar buildings.

If the facility is identified as one that will benefit from energy and water upgrades, the agency is referred to the GEO's list of pre-approved Energy Service Companies (ESCOs). An ESCO is a private firm that oversees the engineering and installation of energy- and water-saving improvements, arranges for long-term financing for those improvements, and guarantees the energy and water savings over the life of the agreement, generally 12 to 15 years.

Given the discrepancy between building repair and maintenance needs and available funding, state agencies have embraced performance contracting and are reaping the benefits. The GEO estimates the value of the currently active state government and higher education institution performance contracts to be $167,463,310 in capital improvements, with potential annual avoided utility costs of $20,417,411.

Plug Load Management

While energy performance in the built environment has traditionally focused on the building's orientation, envelope and systems, the GEO's Greening Government Program also targets energy conservation through reduced "plug and process" loads to reduce electrical consumption. The following programs aim to conserve energy within state buildings.

Google Climate Savers Initiative

In early 2008, Governor Ritter announced Colorado government's participation in the Google Climate Savers Computing Initiative, a national effort created by Google and Intel to promote development and use of highly energy-efficient computer equipment. Colorado joined 170 corporations, institutions and agencies working together to reduce the energy consumption of computers by 50% by the year 2010.

Efficient Data Centers

According to a report from the Center for Digital Government, in the near future, the cost of energy to power and cool information technology equipment is expected to consume half of an organization's information technology budget. The GEO and the Governor's Office of Information Technology are partnering to explore options to improve the energy efficiency of the design, construction and operation of physical data centers, including the incorporation of renewable energy sources.

Refrigerator Replacement Program

As of June 2008, the GEO replaced 39 refrigerators in state facilities. Whereas each of these old refrigerators consumed electricity in the range of 1,300 to 2,700 kilowatt hours (kWh) per year, each new refrigerator uses 383 kWh per year—a reduction of 78%. The old appliances were decommissioned and the parts recycled. The GEO's Greening Government Refrigerator Replacement Program will reduce energy consumption in state buildings by 53,162 kWh per year and reduce carbon emissions by 75,797 metric tons per year.

Due to the high level of interest in the program (190 applications received), the GEO hopes to continue to offer additional replacement appliances in the future.

Energy and Water Savings in Leased Space

State agencies that lease, rather than own, office space will strive toward a 10% reduction in energy consumption by creating employee awareness and encouraging building owners to undertake energy conservation measures.

The GEO's Greening Government Program supports these efforts by providing resources and expertise to state employees. The GEO's website includes information regarding the toxicity of office products, avenues for exploring energy requirements of office equipment and other methods that not only minimize environmental impact but also contribute substantially to the health of the indoor environment.

Greening Government and Materials Management

Environmentally Preferable Purchasing (EPP) is the purchase of products and services that have a lesser or reduced effect on human health and the environment when compared to competing products and services. The comparison takes into consideration the "life cycle costs" of the product, such as raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, disposal, energy efficiency, product performance, durability, safety, the needs of the purchaser and cost.

All levels of government have enormous purchasing power. Recognizing this, governments across the country, including the State of Colorado, are implementing EPP to improve the quality of life in Colorado through:

- Resource conservation
- Energy efficiency
- Reduced toxic materials in the waste stream
- Reduced landfill use
- Improved air and water quality
- Recycled products markets

Greening Government and the State Purchasing Office contracted with Green Seal, Inc., to provide training for state purchasing agents to implement EPP. The scope of this training included the caveats behind House Bill 07-1220, identification of environmentally preferable products including a conversation regarding lifecycle analysis, and reporting procedures. This training helped fulfill the mandate of HB 1220 prior to the statutory June 30, 2008, compliance date. Clean Energy Funds paid $4,050 of the related expense. The State Purchasing Office, using funds available through the Western States Contracting Alliance, paid the balance.

Waste Reduction and Recycling

Reducing waste and recycling what waste is generated provides both economic and environmental benefits for Colorado and state agencies. A strong waste-reduction and recycling program can reduce the extraction of natural resources and minimize the associated environmental impacts. In this arena, the Greening Government Program delivered rapid results in 2007, funding the purchase of 144 commingled recycling containers throughout the Capitol Complex while setting baselines for paper consumption allowing for reduction measurements. Some examples of what state agencies are doing to reduce and recycle waste include:

- The **Department of Corrections**, through the Colorado Correctional Industries (CCi), offers recycling and composting services at many of its locations around the state. In addition, the Department's Colorado Surplus Property Agency (CSPA) manages the disposal of all surplus property for the state (except for real estate). Disposal options for excess, serviceable items no longer needed range from redeploying property to other state agencies, to offering items for sale and auction. CSPA also recycles computers, monitors, laptops, printers, etc., for a nominal fee.
- **The State Purchasing Office (SPO)** is currently assessing state price agreements to determine the environmental and sustainable profiles of products and services offered. SPO agents are involving the purchasing agencies and end users in this process as well as documenting best management practices in place around the country.
- The SPO has established paper consumption baselines for the state. The data indicates a decline in paper expenditures of approximately 10% between 2005 and 2007. While the amount spent on all types of paper declined from $2,132,843 to $1,893,201 during the two-year period, the amount spent on recycled-content paper increased from $470,337 to $1,013,245.
- Effective February 1, 2008, each of the 280 copiers at the Integrated Document Solutions (IDS) State Copier Program was supplied with 30% post-recycled content paper. Previously, the program used virgin copier paper. Recycled content now represents 62% of all paper expenditures by the state.
- According to the Environmental Defense Fund's paper calculator, this change is the equivalent of eliminating the annual carbon emissions of ten automobiles. All this is possible while still providing state agencies with the lowest price per copy and highest quality of equipment and supplies.

Greening Government and Transportation

According to the US Environmental Protection Agency, driving a car is the single most polluting action most individuals do. The Greening Government Program's goal is to reduce petroleum consumption in state fleet vehicles by 25% by June 2012. By commissioning a state fleet audit and survey of state employee commuter patterns in late 2007, Greening Government was able to establish baselines and determine trends, paving the way for a maximum return on investments aimed at achieving petroleum reductions and lessening the impact of commuter patterns. The following is a summary of the audit findings:

Results of Transportation Efficiency Audit (TEA) Colorado State Fleet Petroleum Usage as of FY 2005–06 and Reduction Target	
Number of Non-exempt State Fleet Vehicles	3,821
Vehicle Miles Traveled	44,391,364
Gallons of Unleaded Gasoline Consumed	2,555,734
Reduction Target for Gasoline Consumed	approximately 640,000 gallons
Average Fuel Efficiency per Fleet Vehicle	17.4 miles per gallon

Although law enforcement, highway construction, and road maintenance vehicles are exempt from the executive orders, State Fleet Management, the Greening Government Program, the Colorado State Patrol and the Colorado Department of Transportation will continue to work together to reduce the environmental impact of the exempt vehicles, primarily through the use of biofuels, including E85, a bridge transportation fuel.

As a result of the audit, the Greening Government Program recommended replacing 125 fleet vehicles with hybrids. The Office of State Planning and Budget and the Joint Budget Committee approved this recommendation at no additional cost to the state, and the vehicles will be purchased during state fiscal year 2008–09. No Clean Energy Fund dollars were used to add these hybrid vehicles. The estimated impact of the 125 additional hybrid vehicles over the expected eight years of state ownership is as follows:

- 50,471 gallons of unleaded fuel saved annually (1.9% reduction annual fuel usage)
- 445 metric tons of CO_2 avoided annually

As of July 2008, the State Fleet expects to have a total of 131 hybrid vehicles in service, with an additional 216 to 250 added during state fiscal year 2008–09.

Employee Commuting

The Greening Government Executive Orders ask state employees to take a position of leadership by reducing their impact on the environment. Commuting is perhaps the most direct work-related impact individuals have on the environment. With this in mind, the Greening Government Coordinating Council is looking for ways to help employees reduce their number of single-occupancy vehicle commutes.

In order to assist state employees with reducing their vehicle miles traveled, the Greening Government Program and multiple state agencies and colleges have taken the following steps:

Eco Pass

- The GEO, the State Purchasing Office, and multiple state agencies and colleges completed the 2008 RTD (Regional Transportation District) Eco Pass renewal process. **Eco Pass** is an unlimited access pass program that RTD provides to employers. The number of organizations participating in this year's program increased to 44, from 36 in 2007. The potential impact of the increased availability of the Eco Pass program is an annual savings of almost 90,000 gallons of gasoline and 782 tons of CO_2.[2]
- The Greening Government Program is working with Colorado Department of Transportation transit programs to improve employee access to public transit outside RTD boundaries.

Last fall, 4,486 state employees responded to an employee-commute survey.

- 67% of the respondents drive to work alone. The national average is 77%.
- Employees said they would give up their single-occupancy commute if public transportation were more convenient, if the State paid all or a part of the cost of public transportation or if they could telecommute part time.
- The average length of a state employee's commute is 16.4 miles one way in a vehicle with efficiency of 21.2 miles per gallon.
- Roughly 29% of the respondents use public transportation at least one day per week.
- Approximately 10% carpool or vanpool at least one day per week.
- 11% bike or walk to work at least one day per week.
- 11% telecommute at least one day per week.
- 69% said they were aware of Governor Ritter's Greening Government Executive Orders and had a desire to reduce their environmental impact at work.

[2] This assumes that 50 individuals from each agency switch their commuting method from driving to using public transportation an average of three days each week.

- The Greening Government Program referred 250 interested parties to the Denver Regional Council of Governments to coordinate car- and van-pooling efforts.
- The Department of Personnel and Administration's Division of Human Resources (DHR) provides technical guidance to implement flexible work arrangements in state agencies, colleges and universities. These flexible work arrangements include job sharing, flexible work schedules and telework, or flex place. The Greening Government Program works with DHR and the Office of Information Technology to develop the programs and infrastructure necessary to grow flexible work programs, thereby allowing employees to reduce their commutes and related environmental impacts.

Given the size of the state workforce and difficulty in identifying individual commuting patterns, it may be difficult to precisely quantify the impacts of these efforts. However, given the amount of overall gasoline consumption and the associated impacts, a reduction of one commute day per employee per week would generate an annual gas savings of 6.788 million gallons of gasoline.

Greening Government Education

While investments in infrastructure, equipment and supplies provide the ability to directly quantify progress toward the goals of the Greening Government Executive Orders and the Climate Action Plan, the benefits of spreading knowledge and creating awareness are invaluable. To promote such education, the Greening Government program employs e-newsletters, "Green Team" meetings to track agencies' progress toward efficiency targets, and recognition of state employees for their contributions toward Greening Government goals.

Summary

The strength of the GEO's Greening Government Program, as indicated by the breadth and extent of its achievements over the past year, lies in coordination and organization. Matching ESCOs with interested agencies, compiling LEED®-based policies, providing Eco Pass access to interested individuals—none of these demand large financial investments to be successful. They require only the perseverance and passion of individuals dedicated to making progress toward sustainability.

The progress that has been made toward each of the Greening Government goals outlined above was accomplished with 2007–2008 fiscal expenditures of less than $40,000. The Greening Government Program plans to invest an additional Clean Energy Funds during the next fiscal cycle.

The balance of FY 2008–09 expected investments will involve:

- Further addressing state government energy and water usage.
- Developing and refining methods for reporting state greenhouse gas emissions to The Climate Registry.
- Initiating green-bag lunch education sessions with state employees.
- Providing outreach to county and municipal governments to help them achieve green reduction targets.
- Investing in methods that will contribute to a reduction in the environmental impacts of employee commutes.

The Greening Government Program presented a status report to Governor Ritter in June of 2008. **Access the report on the GEO website**.

In alignment with the Climate Action Plan's directive, "Enact 'Bridge Strategies' that immediately reduce GHG (greenhouse gas) emissions while we pursue technologies to generate cleaner energy," the Greening Government Program targets emissions through many channels. These range from promoting greater efficiency in building design, construction and operation to better managing computer usage and materials, to addressing state employee commuter patterns and state fleet fuel efficiency, including advocating for the use of biofuels and E85, a bridge transportation fuel to cellulosic ethanol.

The Greening Government Program advocates the following Climate Action Plan directive: "Provide leadership to ensure that long-term solutions, such as renewable energy and clean-coal technologies, are fully developed and broadly implemented."

The program implements strategies and policies that will allow state government to meet the budgetary challenges associated with volatile energy prices and the effects of climate change.

Colorado state government leads by example in adopting energy efficiency and renewable energy technologies, contributing to the long-term economic viability of these technologies.

The Greening Government Program takes action on the Climate Action Plan's call to "prepare the state to adapt to those climate changes that cannot be avoided."

Partnering with the Colorado Correctional Industries (CCi) to develop correctional industries focused on the manufacture of environmentally friendly products provides a societal benefit to the Colorado prison population, prison staff, and end users that come into contact with these products, while providing correctional inmates with skills that can prepares them to gain New Energy Economy employment when they reenter society. During state fiscal year 2007–08, the Greening Government Program introduced a Colorado-based print cartridge remanufacturing company to CCi. These introductions ultimately lead to a joint venture in which Department of Corrections inmates will assist in the remanufacturing of used toner and ink cartridges. This manufacturing method removes used cartridges from the waste stream and reduces the cost to the State for replacement cartridges.

With an estimated annual savings of approximately $5,000 per employed inmate in reduced custody costs, CCi also reduces the burden placed on Colorado taxpayers by $6,000,000 annually.

Greening Government initiatives also educate state employees to think about how climate change will impact the needs of Colorado citizens and businesses, how state government programs and services must anticipate and actively prepare to meet those future needs, and how climate change will impact their personal lives. The program helps state employees anticipate and actively prepare for the future.

Greening Government
Total Clean Energy Funds Invested = $36,050

Google Climate Savers Initiative
Clean Energy Funds Used = $0
Potential to save 14,700,000 kWh of energy per year
Potential to save 13,240 metric tons of carbon
Potential to save $1,078,980 on utility bills

Refrigerator Replacement Program
Clean Energy Funds Used = $30,000
Replaced 39 inefficient refrigerators
Will save 53,162 kWh of energy per year
Will reduce emissions by 47.88 metric tons of carbon per year

Hybrid Electric Vehicles Added to State Fleet
Clean Energy Funds Used = $0
Replaced 125 state vehicles with hybrid electrics
Potential to save 50,471 gallons of fuel per year
Potential to avoid 445 metric tons in carbon emissions per year
Potential to avoid $167,000 in fueling costs

Employee Commute Outreach
Clean Energy Funds Used = $0
4,486 state employees responded to survey
67% of the respondents drive to work alone
Potential to save 6,788,000 gallons of fuel
Potential to save 59,802 metric tons of carbon

Capitol Complex Recycling Containers
Clean Energy Funds Used = $2000
Added 144 comingled recycling containers

Green Seal Training
Clean Energy Funds Used = $4050
Trained 85 State Purchasing Agents

Partnering to Advance Common Goals

Electric Utilities Program

Colorado's 57 electric utilities touch the lives of all Colorado's 4.7 million residents and millions of visitors. Currently, the majority of the fuel used to generate electric power comes from coal and natural gas, but the electric utility landscape is changing. Global competition, fuel supply, escalating costs and potential carbon regulation are having an impact on utilities and their customers.

As of 2007, Colorado's electric utilities provided approximately 51,000,000 megawatt hours (MWh) of energy to the state's residential, commercial and industrial customers.[1] It has become apparent that electric power generation has environmental consequences, including continuously releasing harmful emissions such as carbon dioxide into the atmosphere and using a significant amount of a finite and shrinking water supply. In 2005, emissions from Colorado's electric utility sector amounted to 36% of the state's total CO_2 emissions.[2]

As a hedge against these challenges, and in keeping with the goals of the New Energy Economy, the Governor's Energy Office (GEO) advocates conservation, Demand Side Management (DSM), acceleration of renewable-energy installations, distributed generation of renewable energy and the expansion of high-voltage transmission to connect renewable energy to the electricity markets.

Guiding Principles

The principles set forth in Colorado's Climate Action Plan (CAP) and recent state legislation serve as the GEO's guiding principles for developing thoughtful regulatory and utility strategies in response to the industry's challenges.

The GEO's Utilities Program focuses on the following areas to assist the utility industry in participating in Colorado's New Energy Economy:

- Demand Side Management
- Transmission Infrastructure
- Electric Resource Planning
- Renewable Resource Mapping
- Renewable Energy Standards
- New Energy Economy Conference

The Utilities Program serves as an informational resource to provide support to all three categories of Colorado utilities: Investor Owned Utilities (IOUs), Rural Electric Associations (REAs), and municipal utilities (munis).

[1] Energy Information Administration Colorado Electricity Profile.

[2] Ritter, Bill Jr., "Colorado Climate Action Plan, A Strategy to Address Global Warming" (Denver: GEO, 2007) page 15.

Demand Side Management

As Governor Ritter has said, the cheapest kilowatt-hour is the one we don't have to produce. Before building new power plants or purchasing new power from a supplier, the GEO advocates that utilities deploy the least expensive and more readily available resource—Demand Side Management (DSM). DSM is a term used to represent the customer's side of the meter, or the customer's demand for power. Examples of DSM measures include providing incentives for installing energy-efficient lighting and appliances, properly insulating walls and attics, and installing automatic shut-off features to appliances like air conditioners. A recent PUC order mandated Xcel Energy to spend nearly $1 billion over the next 10 years on DSM. This amount is much lower than what would be needed to build new power plants to meet demand. Effective DSM also results in reduced emissions.

GEO Strategy

- Encourage an increase in the proportion of DSM within each utility's energy portfolio
- Work with utilities to incorporate increasing percentages of DSM into their Electric Resource Plans

While supporting Investor Owned Utilities with their DSM plans through intervening at the PUC and one-on-one consultation, the GEO is working with REAs and munis to develop ways DSM can be implemented in their territories. The GEO also works with utility customers to develop strategies that leverage their providers' DSM incentives in the most effective manner.

Transmission Infrastructure

Colorado's current transmission infrastructure is not adequate to meet the projected load growth or handle the state's wind and solar energy-generation potential. One study suggests that, without increases in energy efficiency, by 2025 Colorado will need 4,900 MW of new electric generating capacity to power the equivalent of nearly 4 million homes.[3]

Without improved transmission infrastructure, Colorado will remain unprepared for the coming increases in fossil-fuel costs and demand. The lack of adequate transmission also represents a lost economic-development opportunity for early action to connect Colorado's vast renewable resources to the electric market.

Electrical cooperative Sangre De Cristo, with help from a local energy expert, is partnering with the GEO to provide solar and wind incentive programs for its members and has installed a small wind turbine and solar-electric demonstration on its property.

Progress and Results

The GEO is actively involved in every major Colorado-based and regional forum addressing our transmission challenges. In FY 2007–08, the GEO provided the necessary leadership to convene and complete the work of the Senate Bill 07-091 Renewable Resource Generation Development Areas Task Force.

GEO Strategy

- Identify where high-voltage transmission lines are needed to support Colorado's growing demand for electric power and encourage their construction.
- Connect Colorado's vast renewable resources to the markets

The GEO works closely with the Colorado Coordinated Planning Group (CCPG)[4] and the Colorado Long Range Transmission Planning Group (CLRTPG). As a result of the GEO's advocacy, the CLRTPG used the findings of the SB 07-091 report as a guide in their plans for state transmission in 2015 and 2018.

[3] The Colorado Energy Forum, "Colorado's Electricity Future" (Golden: CEF: September 2006).

[4] The Colorado Coordinated Planning Group (CCPG) is a joint, high-voltage transmission-system planning forum for the purpose of assuring a high degree of reliability in the planning, development and operation of the high-voltage transmission system in the Rocky Mountain Region, in accordance with the Joint Transmission Access Principles and the Electric Transmission Service Policy Statement dated December 16, 1991.

The GEO is also a participant in Public Utilities Commission (PUC) activities regarding the PUC's "Investigatory Docket on Electric Transmission," and provides administrative support and guidance to the Clean Energy Development Authority (CEDA). CEDA was created by House Bill 07-1150 to help finance and refinance clean-energy infrastructure. CEDA has been granted bonding authority by the legislature and is currently defining its scope and financing capability to help build high-voltage transmission projects necessary to integrate renewable energy into the grid.

Additionally, the GEO is a member of the Colorado Coordinated Planning Group, the Executive Committee of the High Plains Express, and the Steering Committee of the Western Governors' Association's Western Renewable Energy Zones Project.

Electric Resource Planning (ERP)

Colorado's two Investor Owned Utilities, Xcel Energy and Aquila, are required by PUC rules to identify their future "supply side" and "demand side" electric resources and file a resulting "Electric Resource Plan" for approval. The PUC's public process presents an opportunity for interested parties to formally intervene and present views on how the IOUs should acquire electric generation resources. Once the PUC rules on these applications, the utilities are obligated to acquire and provide services according to the approved plan.

GEO Strategy

The GEO intervenes in the ERP proceedings at the PUC to ensure that they advance Colorado's Climate Action Plan and New Energy Economy goals. The GEO also communicates the Governor's positions to the PUC in advance of regulatory decisions. This involves filing testimony from GEO witnesses, who articulate policy reforms emphasizing the need for renewable resource deployment, transmission expansion, DSM, and incentives that align the utilities' financial success with public interest.

Progress and Results

During FY 2007–08, the GEO intervened in several dockets, including a major future electric resource planning case, a utility regulatory incentives case, and a transmission incentives case. The GEO's intervention helped the PUC with its decision to develop forward-looking plans for DSM and increased renewable energy development.

Renewable Resource Mapping

The State Senate, under Senate Bill 07-091, commissioned a report on Colorado's renewable energy resources and the state of the transmission structure surrounding those resources. The GEO worked with geographic information-system experts to obtain this information and the National Renewable Energy Laboratory provided expertise in the production of maps and analysis of the findings. The resulting report will help the GEO and others determine how and where to direct renewable generation and transmission investment.

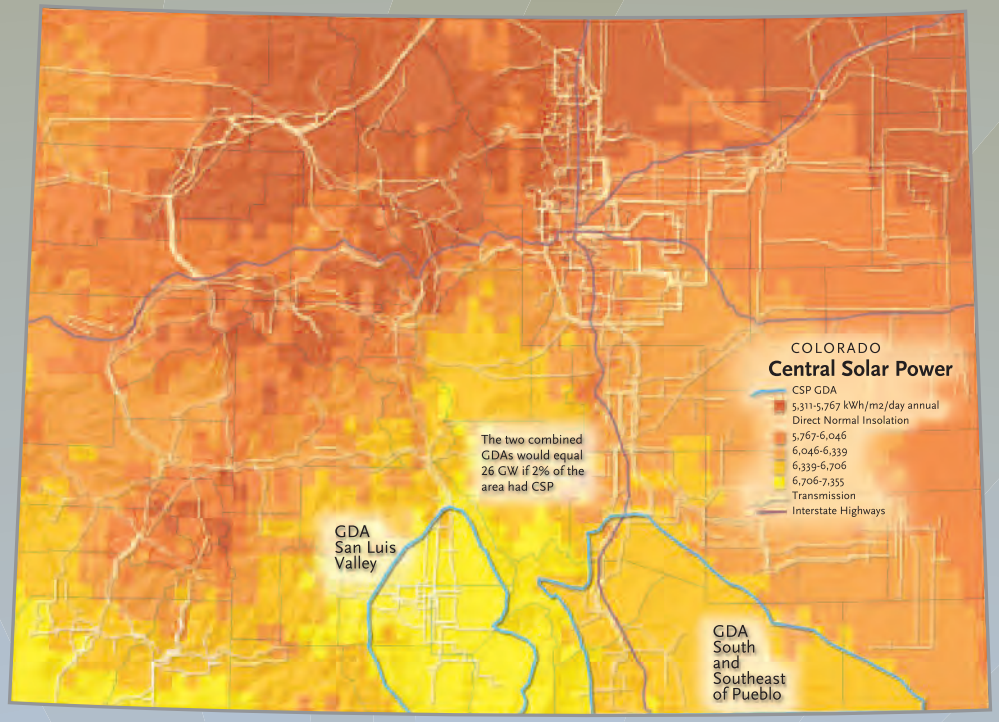
Progress and Results

On December 27, 2007, the GEO delivered the SB 07-91 task force report to the Colorado General Assembly and Colorado Governor Bill Ritter. ***Connecting Colorado's Renewable Resources to the Electric Markets*** identified vast renewable energy resource potential areas within Colorado.

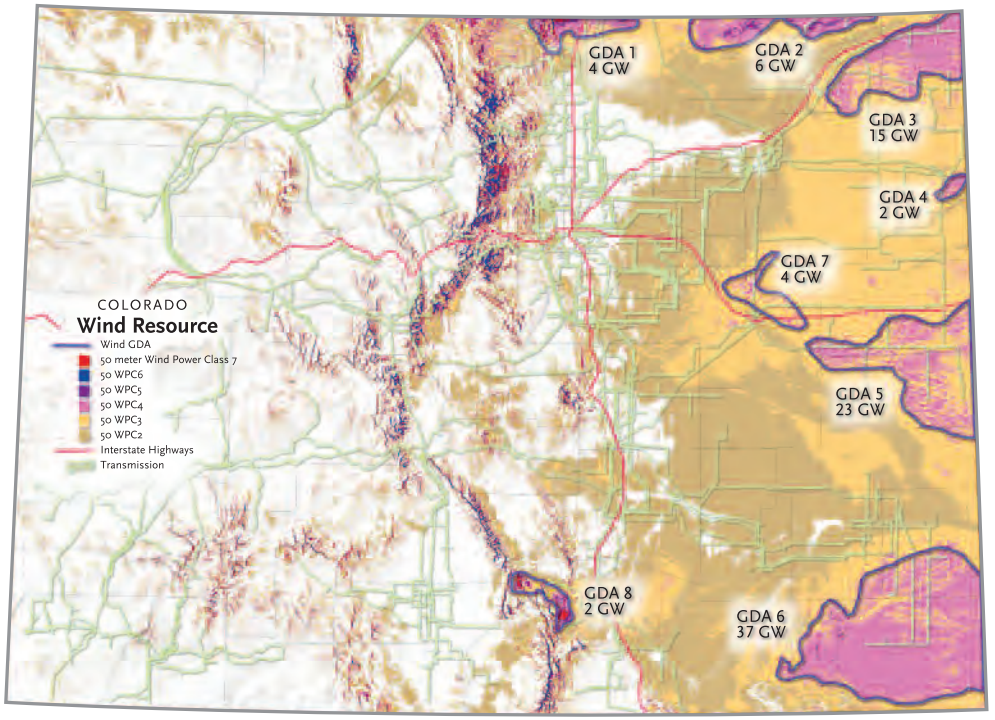
The report's findings confirmed that over 96,000 MW of wind capacity and 26,000 MW of solar energy capacity exist within 11 "generation development areas" (GDAs) in Colorado, primarily on the Eastern Plains and the southern portion of the state. The report concluded that significant expansion of Colorado's high-voltage transmission system is required to deploy these rich renewable-energy resource areas. In total, the report concludes that Colorado's GDAs are capable of hosting 122,000 MW of renewable capacity. To put this in context, the entire state of Colorado has a peak load of 11,000 MW.

Twin Buttes large wind turbine array, Baca County.
Photo: Rebecca Cantwell.

The report is widely used among transmission and renewable-energy developers. With the publication and distribution of the report, the GEO has confirmed that Colorado has the necessary renewable resources to help supply future electrical demand.



Solar Resource: Using just 2% of the land area in the solar GDAs identified in the SB 07-91 report could provide 26,000 GW of capacity. For perspective, the total peak demand for electricity in the state is approximately 11,000 MW.[5]



Wind Resource: The report identified that Colorado's eight wind GDAs could provide 96,000 MW of power, which is over eight times the entire state's current peak electricity usage.[6]

Renewable Energy Standards

The GEO is committed to helping its partners meet and exceed compliance with Colorado's Renewable Energy Standard. That standard establishes a minimum of 20% of IOUs' electric retail sales to come from renewable energy by 2020, and 10% of large municipal utilities' and all rural electric associations' electric retail sales to come from renewable energy by 2020.[7]

In addition, the GEO will encourage utilities to determine how to best invest in renewable energy and the associated high-voltage transmission. The GEO will explore new opportunities for REAs and munis for small (<1MW) and medium (15–25MW) wind projects that can serve their communities at the distribution level.

Given effective leadership at the utility and community levels, Colorado can position itself to integrate large blocks of renewable power into the electric grid. The GEO will work to leverage financial, intellectual and regulatory resources to tap the large amount of wind, solar and other renewable energy identified by the SB 07-091 report. Going forward, the GEO will explore additional opportunities to provide analytical support to increase the presence of the wind industry in Colorado.

[5] Colorado Senate Bill 07-091 Task Force, "Connecting Colorado's Renewable Resources to the Markets," report submitted to Governor Ritter and the General Assembly on December 21, 2007 (Denver: GEO, 2007), page 12

[6] "Connecting Colorado's Renewable Resources to the Markets," page 6.

[7] See Colorado House Bill 07-1281.

The "Colorado New Energy Economy: The Path Forward" Conference

The GEO, in partnership with the PUC, the Office of Consumer Counsel and Energy Outreach Colorado, developed and held the Colorado New Energy Economy conference in October 2007.

Progress and Results

The conference had 550 attendees and addressed a variety of important topics, including:

- Colorado's generation, transmission and distribution networks
- Demand, supply and price dynamics
- Energy challenges to land use
- The relative costs of fossil fuel supplies versus renewable-energy generation technologies
- Current clean-energy initiatives at the utilities, in the communities, at the GEO and at the PUC

Solar power plant near Alamosa, Colorado. Photo: SunEdison

ENERGY IMPACT

The GEO partners with industry and nonprofit entities to advance increased efficiencies on both sides of the meter and develop renewable-energy projects.

ECONOMIC IMPACT

The GEO promotes energy efficiency and Demand Side Management as effective tools in protecting the utility customer from the likely rise in the cost of finite fossil fuels. Colorado's New Energy Economy is an efficient way to communicate the "why and how" of Colorado's environment-related economic development opportunities, while simultaneously taking responsibility for addressing the climate change threat. The Utilities Program will continue to work cooperatively with the state's utilities and energy decision makers to promote a balance between delivering reliable electric power and providing the power in an economical and environmentally responsible manner.

SOCIAL IMPACT

The GEO provides education and outreach roles to both utilities and their customers to show how energy efficiency and renewable energy can improve air quality and reduce greenhouse gas emissions.

Electric Utilities Program
Total Clean Energy Funds Invested = $50,000

The GEO assisted in efforts that resulted in the Public Utilities Commission calling for Xcel Energy to:

- Achieve energy savings of at least 1,744 GWh (energy) and 421 MW (demand)—the equivalent of two medium-sized power plants—by 2015, via demand-side management (DSM) programs.
- Add 200 to 600 MW of utility-scale solar power to the grid by 2015.
- Add 850 MW of utility-scale wind energy to the grid by 2015.
- Close two older, coal-fired plants to reduce carbon dioxide emissions, citing substantial health and environmental benefits.

Developing Infrastructure to Promote Healthy Communities

Biofuel and Local Fuel Program

Biofuels alone will not ameliorate every consumption and pollution issue associated with the way Americans drive, but they are part of a comprehensive solution. The Governor's Energy Office (GEO) recognizes the role of biofuels, along with electric and hybrid vehicle technologies, improved mass transit and more efficient vehicles, in reducing our oil dependency and decreasing the release of dangerous pollutants into our environment.

Ethanol

Ethanol is one type of biofuel and is currently produced in the US using corn and starchy waste by-products.

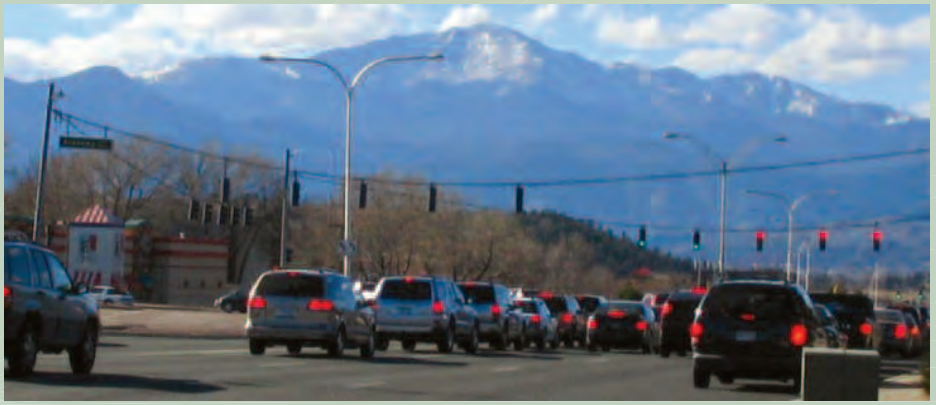
The National Renewable Energy Laboratory and two Colorado companies are leaders in the advancement of ethanol made from feedstock other than corn. Range Fuels and Suncor are each developing technologies to produce ethanol from wood wastes such as urban slash and beetle kill. In the Climate Action Plan, the Governor directed numerous state agencies to promote the use of forest-based biofuels and otherwise anticipate and respond to the adverse effects of climate change on our forests. The work being done by Range Fuels, Suncor and the Governor's Energy Office to promote the use of beetle-kill trees for biofuels will help grow the domestic supply of ethanol, help develop financial opportunities for beetle-kill byproducts, and reduce the number of dangerous dead trees in Colorado forests.

According to the Argonne National Laboratory, the use of ethanol reduces greenhouse gas (GHG) emissions. On a per-gallon basis, corn ethanol reduces GHG emissions by 18% to 28% when the complete life cycle of the fuel is considered. Cellulosic ethanol offers a superior advantage with an 87% reduction in GHG emissions over the life cycle of the fuel.

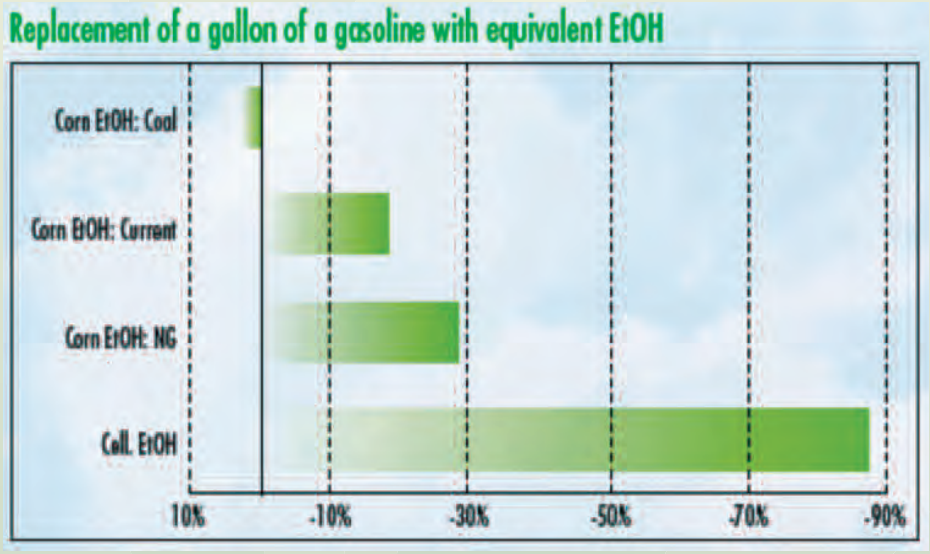
The Energy Information Administration states the following:

- More than 90% of the oil consumed by the transportation sector in the US comes from foreign countries.
- Between 1987 and 2007, the annual average increase in crude oil consumption has outpaced increases in production by 7%.
- The annual rise in consumption has exceeded increases in refining capacity by almost 30%.

The result is a crude oil market plagued by high volatility. Short-term decreases in refining capacity, as evidenced by Hurricane Katrina, translate into high fluctuations in price.



Colorado Springs traffic, 2006. Photo: Steve Garufi.



Reduction of greenhouse gases when a gallon of ethanol (EtOH) replaces a gallon of petroleum. Argonne National Laboratory, "Ethanol, The Complete Energy Lifecycle Picture," March 2007. If you are reading this on line, you may click **here to access the report**.

Biodiesel

Biodiesel is another petroleum alternative. It is a fuel created from organic products such as soy, corn, grasses or animal fats.

Governor's Biofuels Coalition Project

The Biofuel Program within the Governor's Energy Office uses Clean Energy Fund money to advance biofuel technologies into the market and help drive the expansion of ethanol and biofuel resources throughout Colorado. One of the key drivers for this effort is the Governor's Biofuels Coalition (GBC), an organization made up of industry representatives and driven by the GEO.

Senate Bill 06-016 stated that by January 1, 2007, all state-owned diesel vehicles and equipment shall be fueled with a fuel blend of 20% biodiesel and 80% petroleum diesel, subject to availability, and so long as the price is no greater than 10 cents more per gallon than the price of petroleum-based diesel fuel. The greatest obstacle to executing this law has been the lack of biodiesel fueling stations in the state. Like biodiesel, ethanol usage also was lessened by the lack of stations offering the fuel.

In 2005, only 13 gas stations throughout the state were selling E85 (a blended mixture of 85% ethanol and 15% unleaded gasoline) or biodiesel. The severe lack of biofuels infrastructure necessitated the development of a biofuels infrastructure-development program.

The Colorado Ethanol Coalition was established in 2006 to help diversify the supply of fuel and increase the usage of E85. The short-term goals of the coalition were to address the promotion of ethanol, identify barriers to usage and broadly market E85. Early in his term, Governor Ritter announced the transformation of the coalition to include biodiesel and renamed the coalition to the "Governor's Biofuels Coalition" (GBC). The GBC is a program managed by the GEO.

On February 15, 2007, Governor Ritter tasked the GBC with the following goals for the year:

- Add an additional 40 new biofuel stations to complement the state's existing biofuel stations.
- Establish a marketing campaign for education and outreach to drivers.
- Double the usage of biofuels as compared to 2006.

The GBC is comprised of biofuel experts representing Colorado organizations, businesses, government agencies, environmental groups and others that are involved in the production, distribution, promotion and usage of ethanol and biodiesel. These entities collaborate to overcome market barriers, provide accurate data and information on biofuels, and help existing flex-fuel vehicle and diesel drivers become aware of their biofuels options.

An initial allocation of $100,000 from the GEO allowed the Governor's Energy Office to leverage a Department of Energy grant for an additional $450,000. The resulting investment pool of $550,000 was made available to private station owners, nonprofits and municipalities to retrofit existing stations to incorporate biofuels. Via a competitive grant application and stringent proposal review aimed at identifying highly motivated partners and best investment options, grants from the GEO are available for up to 35% of the net project costs' after-tax incentive but no more than $15,000 per applicant for E85 and $10,000 for biodiesel infrastructure. More details on all incentives are available at **Colorado Tax Incentive**; **Federal Tax Incentives**.

Project Outcomes

Governor Ritter at the grand opening of a biofuel station in Fort Collins, March 2008.

In February 2007, 13 stations were selling either E85 or biodiesel. By the end of December that year, the efforts of the GBC and the Governor's Energy Office yielded **40 new biofuel stations open in Colorado.** In conjunction with biofuels infrastructure development, the GBC engaged in active biofuels marketing, education and outreach, resulting in soaring numbers of gallons sold. From February 2007 until December 2007, 2.88 million gallons of biofuels were sold at these stations. In FY 2007–08 (July 1–June 31), a total of 5,867,325 gallons of biofuels were sold to Colorado customers. The progress in 2007 far exceeded Governor Ritter's goal.

In FY 2007–08, a total of $100,000 in Clean Energy Fund dollars were invested in the GBC's efforts. This money was used to leverage a portion of a $450,000 grant from the Department of Energy's Maximizing Alternative Fuel Infrastructure program, an award that the GBC will implement over the course of three years.

In addition to the private sector, numerous municipalities received funding through the GEO. Local government fleets that received fiscal support include the City of Fort Collins, City of Grand Junction, Weld County, City of Littleton, City of Englewood and Jefferson County Sheriff's Department. Further extending biofuels availability throughout the state, two agricultural cooperatives, Holyoke and Poudre Valley, received funding to bring biofuels to their agricultural communities.

ENERGY IMPACT

The "Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model," developed by Argonne National Laboratory, estimates that the number of gallons of biofuels sold in 2007 resulted in a 27.3% reduction in GHG emissions as compared to gasoline. These savings are estimated at **14,111 tons.**[1]

[1] This estimate was made using the EPA Greenhouse Gas Calculator, assuming that 1 gallon of regular gasoline produces .01 metric ton of CO_2e and applying the GREET reduction percentage.

ECONOMIC $ IMPACT

More than 138 million gallons of ethanol per year are produced at plants located in Windsor, Golden, Sterling, Walsh and Yuma. The following are the estimated cumulative economic impacts of those plants on the Colorado economy:

- Building and equipment purchases—$230 million.
- One-time boost to local economy—$480 million.
- Annual expenditures, goods and services—$190 million.
- Created new jobs in ethanol manufacturing and distribution.

SOCIAL IMPACT

- Provide local communities with cleaner-burning, domestic and lower-cost transportation fuel options.
- Increase community engagement with renewable energy through grand opening celebrations and outreach events.
- Assist the community in understanding biofuels technology.
- Increase people's awareness of their transportation's impact on the environment.

Biomass

One source of renewable energy for heating exists in the state's forests. Forests cover approximately one-third of Colorado, translating to nearly 22 million acres. Woody biomass, defined as small-diameter trees, slash, mulch and other "low-value" wood products, is an abundant and renewable energy source in Colorado. Woody biomass can be used to generate electricity and heat and can be bio-refined to make alternative fuels. The most effective and proven application for biomass is to use it to heat space, water or other thermodynamic liquids.

As the bark beetle epidemic has impacted almost 1.5 million acres of forest, combined with age and long-term drought damage, millions of tons of dead trees, low-value wood and slash must be removed to return Colorado forests to a healthy condition. With fossil-fuel energy costs rising, abundant wood supply from the forests and the state's emphasis on renewable energy projects, greater attention is being given to biomass opportunities.

There are numerous advantages to using community wood for heating projects. Bio-heating projects provide alternatives to slash pile burns, wildfire mitigation and prescribed burns, while supporting local wood-fuel markets. In addition, developing a local wood-fuel market helps create local jobs, allowing more money to stay in the community. The Colorado Climate Action Plan is designed to increase the usage of forest biomass while recognizing that not all biomass projects are economical at present.

In order to address this barrier and to advance wood heating projects in Colorado's communities, the GEO included biomass projects in the Biofuel and Local Fuel Program. In November 2007, the Community Biomass for Thermal Usage Program was created. Immediately, the GEO began partnering with biomass experts, forest managers and developers with years of biomass experience.

The GEO completed an assessment of nearly 25 projects to determine the factors that most influence project success. Three universal needs—education, technical assistance and funding—were identified. By addressing these needs, the GEO has witnessed the development of numerous new biomass-heating projects throughout the state.

Community Biomass Programs

The GEO understands that even when communities have local supplies of biomass and are educated and experienced enough for project development, numerous barriers can keep a bio-heating project from being implemented. One of the largest barriers is the project's initial capital cost. Many communities, businesses and organizations are not in a position to pay up-front expenses of a project. As a solution to this problem, the GEO allocated $100,000 from the Clean Energy Fund to implement bio-heating projects.

This program is meant to provide a final push of financial support for a project, not to pay for feasibility studies. In order to receive an award from the GEO, solid financial support from multiple stakeholders must be committed. Funding from this program is awarded after a thorough internal and third party review of the project has occurred. The following projects were awarded funding in 2007:

- South Routt School District—Clean Energy Fund, $50,000.
- Mountain Parks Environmental Center—Clean Energy Fund, $13,000.
- Town of Nederland Ridge Road project—DOE Biomass, project assessment $1860 (Clean Energy Fund); Boulder County, $1000.
- Boulder County Open Space—DOE Biomass, county market transformation analysis, $7,000 from DOE; in-kind match, $12,000.
- CSU Biomass Short Course—Clean Energy Fund, $6,000. Working professionals interested in obtaining technical knowledge relative to biomass and renewable energy projects.
- $5,000 for biomass educational video highlighting the project development implementations and lessons learned.

ENERGY IMPACT

- When the system is fired up for the next school year at South Routt, it is estimated the biomass heating system will save close to 1,000 tons of CO_2 each year, and will provide millions of clean BTUs for the students.
- The Mountain Park Environmental Center project is anticipated to use 52.5 tons of wood each year, displacing nearly 7,500 gallons of propane. MPEC is expecting to save $13,560 per year on heating costs and negate the release of 37 to 62 tons of CO_2 per year.

ECONOMIC $ IMPACT

The GEO anticipates that local woody biomass will provide the following economic advantages to Colorado:

- Additional financial incentives to remove "low-value" wood from local forests will support forest management agencies in their efforts to keep Colorado's forests healthy in an economically viable way.
- Increase local job opportunities for forest industry companies.
- Encourage industry support companies to locate their operations near communities that are actively engaging in biomass projects.
- Promote the newly developed pellet industry through increased demand for biomass products.

SOCIAL IMPACT

- Provide local communities an opportunity to use local wood from area forests to generate heat while reducing risk of forest fire.
- Increase community engagement with renewable energy.
- Assist the community in understanding biomass technology.
- Provide energy service companies, elected officials and industry stakeholders technical assistance and education about a new-to-Colorado industry.
- Increase community understanding of the relationship between forest health and renewable energy opportunities.
- Educate and train Colorado's green workforce through higher-education classes and seminars.

Anaerobic Digestion

Anaerobic digestion (AD) is the naturally occurring breakdown of organic materials by microorganisms when oxygen is not present. During this process, methane gas is created and the gas can be utilized to create heat and power.

Using Clean Energy Funds, the GEO completed high-level assessments of six projects to determine if they merited additional investments of funds. In FY 2007–08, one key feasibility study was completed for a farm in Weld County. Two additional facilities were chosen as potential candidates for feasibility assessments in FY 2008–09.

Case Study: South Routt Schools

Old coal-burning boiler to be replaced at Oak Creek Middle School.

Originally built for the army in the late 1800s, the Oak Creek Middle School was later used as a high school until newer schools were built in 1950. This school was one of two remaining schools in the state burning coal for heat. As the health concerns of coal burning became greater and as the existing heating system began to fail, McKinstry Technologies was hired to redesign and upgrade the building's heating system. Since the school had a boiler room that would facilitate the development of a biomass heating system and had solid fuel-handling capabilities, a biomass system was designed. The GEO provided $50,000 from the Clean Energy Fund for the development of the system.

On May 16, 2007, Governor Ritter and local officials shoveled the last load of coal into the old system and work began on the new, cleaner and more efficient system. When the system is fired up for the next school year at South Routt, it is estimated the biomass heating system will save close to 1,000 tons of CO_2 each year, and will provide a clean, renewable source of heat for the students.

Governor Ritter ceremonially places one last shovel of coal into the hopper.

Case Study: Mountain Parks Environmental Center

The Mountain Park Environmental Center (MPEC), a 501(c)(3) nonprofit environmental education organization based in Pueblo Mountain Park, received $13,000 from the Clean Energy Fund to install of a GARN 3200 biomass boiler to heat the newly renovated Horseshoe Lodge. The lodge is a 12,000-square-foot adobe building constructed in the 1930s by WPA and CCC crews to support recreational development on the adjacent San Isabel National Forest, the nation's very first development of National Forests specifically for recreation and education.

Forest-thinning projects often remove small-diameter trees, which have little or no market value but are ideal as a fuel source for the GARN biomass boiler. The wood boiler will use this renewable, local source of fuel, the product of thinning the forests through fire-mitigation efforts. MPEC will work with the US Forest Service and Colorado State Forest Service to ensure that the wood from area forests that need to be thinned is taken to this heating system. In addition, plans are being made to source potential wood from thinning projects by private landowners and to use wood residue from local sawmills. All of this will contribute to increased local economic development in this rural community.

This project is anticipated to use 52.5 tons of wood each year, displacing nearly 7,500 gallons of propane. MPEC is expecting to save $13,560 per year on heating costs and negate the release of 37 to 62 tons of CO_2 per year.

The porch at Horseshoe Lodge.

Case Study: Town of Nederland and Boulder County Biomass System

The Town of Nederland installed a biomass heating plant in a stand-alone building alongside its community center in 2003. The goal of that system was to use wood chips from town residents to generate steam that would both heat the community center and generate electricity. With town leadership changes and an underperforming system, the project was terminated after one or two years of somewhat unsuccessful operation.

Nederland is in the process of designing a shop facility directly adjacent to Boulder County's Road Maintenance Yard on Ridge Road. The county has a fleet storage and maintenance building on the site that will be expanded in the near future. As a result of the close proximity of these two buildings and the heating needs for both, Boulder County and the Town of Nederland have joined in developing this biomass heating system.

Chad Julian, Boulder County Forester, stands among wood chip piles. Photo: Zachary Price.

The initial step of the project, assessing the original system to determine its functionality, was funded by the GEO and Boulder County. Messersmith, Inc., the original biomass heating system manufacturer, was chosen to evaluate the system to determine what components are still usable and what additional components will need to be replaced or purchased. Messersmith, Inc., provided a report, engineering design and a design plan to Boulder County, the GEO and the Town of Nederland. These documents will be used to implement the project. Project costs totaled $2,860 and resulted in $250,000 in project savings through utilization of existing equipment.

Biofuel and Local Fuel Program
Total Clean Energy Funds Invested = $190,860

Governor's Biofuels Coalition
Clean Energy Funds Used = $100,000
Federal Funding = $450,000
New Biofuels Fueling Sites Brought Online = 68
Gallons of Biofuels Sold in Colorado = 5,867,325

Anaerobic Digestion Feasibility
Clean Energy Funds Used = $15,000
Completed 6 High Level Assessments
Completed 1 In-Depth Feasibility Study

Community Biomass Programs
Clean Energy Funds Used = $75,860
Completed 2 Projects
Carbon Emissions Reduced = 1037 metric tons
Assisted With the Design of 2 Future Projects

Making Solar Energy Accessible

Residential Solar Program

The Governor's Energy Office's (GEO's) Residential Solar Program is promoting two distinct solar technologies. The first is solar domestic hot water (SDHW), a technology by which heat from the sun is collected by solar panels, absorbed by water and stored in insulated storage tanks for later use in the home. The second involves the installation of photovoltaic (PV) systems, which convert sunlight into electricity using semiconductor materials. The GEO's program is designed to complement existing legislation, expanding the reach of both technologies to promote micro-scale economic development and provide rebate access to as many Colorado residents as possible.

Investor Owned Utilities and Customer-sited Solar Systems

While Colorado's Investor Owned Utilities are required by legislative mandate to offer incentives to homeowners for compliance with the state's renewable portfolio standard (RPS), the legislation has different requirements for smaller rural and municipal utilities. The law places a premium on the integration of solar technologies into rural and municipal portfolios by offering a 3-to-1 compliance credit for solar but does not explicitly require rebate programs. The design of the Residential Solar Program offers photovoltaic system rebates outside IOU service territory. At current prices, each system potentially saves $387 in annual utility costs and prevents the release of 3.6 metric tons of carbon.

Through the educational and informational resources offered via its website, publications, meetings, events and partnerships, the GEO supports both sides of this equation—the homeowners installing these systems and the IOUs connecting with them.

Photovoltaic solar installation on an extremely energy-efficient home in Nathrop, CO. Architect: Keith Krebs. Utility: Sangre De Cristo. Installation and photo: Standard Renewable Energy.

Solar Domestic Hot Water Incentives

In early 2008, the GEO offered solar domestic hot water (SDHW) incentives statewide since this was not included in Amendment 37/HB1281. The potential energy savings of these systems, coupled with relatively low costs and economic development, demonstrate the benefits of Colorado's New Energy Economy. Each of these systems produces an annual average utility savings of $351 (depending on the fuel source), keeping 3 metric tons of carbon from the atmosphere each year. Therefore, the Residential Solar Program and its partners plan to offer these solar hot water incentives statewide within any utility's service territory.

Residential retrofit north of Carbondale. Photo: Scott Ely of Sunsense Inc.

Implementing a Streamlined Solar Program

Implementing a streamlined statewide solar program in Colorado is a challenge because the state has 57 electric utilities, of which 22 are Rural Electric Associations (REAs) and 33 municipal utilities.

The Colorado Solar Energy Industries Association (CoSEIA), a membership organization that represents and serves energy professionals and renewable-energy users, was selected to administer this program. The program's funding was effectively doubled by the GEO's decision to partner with cities, counties, utilities and nonprofit organizations through a matching grant program. These matching grant funds are provided to the selected program partners to assist them with setting up their own local solar rebate programs for their residents.

Goal

On January 15, 2008, the Governor's Energy Office launched the Residential Solar Program as a pilot-phase program, with a goal of extending rebates on residential solar technologies to as many Colorado residents as possible over a broad geographical area.

GEO Strategy

The GEO's Solar Program offers rebates to homeowners involving two solar technologies that are funded separately through different program partners: photovoltaic (PV) and Solar Domestic Hot Water (SDHW). The program reserves PV incentives for those homeowners not served by an IOU and brings SDHW, an industry lagging behind PV, to any interested program partner regardless of utility provider.

This pilot-phase program allows the program partners a high degree of flexibility when designing the local rebate programs so that diverse information can be gathered to inform an expanded program in the future.

Progress and Results

In April 2007, the GEO announced that 22 partners had been selected to participate in the Residential Solar Program. The GEO committed $550,000 of Clean Energy Funds that, along with contributing matching funds from the partners, created a total budget of $1 million to advance solar investment in the state.

Installing a PV system. Photo: Novan Solar.

The program increased the percentage of Colorado Rural Electric Associations offering solar electric rebates from 9% to 50%, and is "energizing" the solar thermal side of the industry. Solar thermal systems typically reduce natural gas and/or propane usage (and sometimes electric as well). As fuel costs rise, these solar thermal systems will reach a cost level below that of fossil fuel sources. With continued and increased support through rebate programs, tax credits, workforce development, and public awareness campaigns about this technology, solar thermal can very quickly become a significant part of Colorado's energy mix.

Prior to the launch of the Residential Solar Program, two Rural Electric Associations (REAs) offered solar rebates. With the launch of the program pilot, half of the REAs (11 total) now offer some form of either photovoltaic or solar hot water incentives with matching funds from the GEO. This is a 41% increase in the number of Colorado REAs offering solar rebates. And five of these now also offer SDHW rebates as well as photovoltaic

Residential ground-mount PV system, South Boulder. Photo: Simple Solar.

Case Study: Town of Mount Crested Butte

The Town of Mount Crested Butte is getting its housing solar rebate program involved during the construction phase of low-income housing. The town is working with local builders to provide incentives to incorporate solar energy into new, low-income housing units during the construction phase, which is the least-cost opportunity to incorporate solar technologies and energy-efficient measures into a building. The GEO is very pleased to see its Solar Rebate Program working well in Mount Crested Butte and hopes to see many more examples of this approach in the near future.

As interest in the program grows, the GEO and the program partners will now have an existing structure and process for responding. The GEO and the partners can supply additional and matching funding to continue these programs and increase the overall number of installations statewide.

ENERGY IMPACT

The solar rebate is a necessary "bridge strategy" between current costs and future grid parity, since newer technologies are often more expensive until they become relatively widely utilized. Infusing incentives into the Colorado solar market will help accelerate solar technology R&D efforts, create attractive system financing mechanisms, and advance the market toward lower-cost, reliable new products with broader accessibility.

More than 300 new solar energy systems will be installed statewide as a direct outcome of this program, resulting in an estimated minimum production of over 1.2 million kWh of clean renewable energy per year. This is equivalent to an annual carbon reduction of 969 metric tons.

ECONOMIC IMPACT

The Residential Solar Energy Program puts money back in the pockets of Colorado residents through increased revenues for local businesses and through energy bill savings for residents. The investment of roughly a half million dollars of Clean Energy Funds into this program will result in at least $4,680,000 in new solar business generated around the state. At today's energy prices, each solar rebate program recipient can expect to save an average of $364 every year for the life of the system. This results in a total group savings of approximately $109,260 per year. Program recipients will recoup the $550,000 investment into this program from the Clean Energy Fund in just over five years. If residents combine this program with other programs, such as efficiency upgrade rebates offered by the GEO, their local utility providers, and the federal government, they can see these annual savings increase dramatically.

It will take time and consistency from programs like the Residential Solar Program to help the Colorado solar market both reach full maturity and solar/fossil fuel cost parity. By continuing to actively work toward the goal of lowering the costs of solar technologies, Coloradans will be protected from future energy cost increases.

Rooftop array in Boulder County. Photo: Sun Volt Solar Electric.

The solar rebate program in Colorado is a testament to the economic stimulus that the New Energy Economy provides, with new companies launched, hundreds of high-quality new jobs created, and millions of dollars in revenue being generated. Expanding this economic opportunity and benefit to all regions of the state will help ensure the development of a stable, long-term renewable energy industry in Colorado. Further funding and growth of this program will lead to the creation of even more jobs across the state. Solar truly can keep America working.

SOCIAL IMPACT

Several collaborative partnerships have been forged among utilities, municipalities and local nonprofit organizations for the design and implementation of local rebate programs. These new partnerships could prove to be a valuable asset to their communities for both this program and in the future, as they are building positive relationships for collaborative work on energy issues affecting their residents.

This program increased the total number of Colorado residents having access to solar rebates by 32%. When combined with the 58% of residents already served through IOU programs and the two existing REA programs, 90% of all Coloradoans are now potentially eligible for a solar rebate. An estimated 300 new solar-energy systems will be installed on Colorado homes as a result of this pilot program.

Case Study: United Power, Photovoltaic (PV) and Solar Domestic Hot Water (SDHW) Program Partner

United Power is an REA that serves residents of the Colorado Front Range from the mountains of Coal Creek and Golden Gate Canyon to the farmlands of Brighton, Hudson and Keensburg. It serves as a prime example of the changes in attitude toward solar rebates and renewable energy in general within many of our smaller utilities. When Amendment 37 was passed in 2004, REA members voted by a significant margin not to participate, effectively denouncing the newly passed amendment and its voter-mandated energy goals for the state. A few short years later, United Power has proven to be one of the GEO's most eager and enthusiastic program partners.

United Power is providing $50,000 in total matching funds to offer both PV and SDHW rebates to its customers. In addition, the REA has opted to forego $8,000 in program reimbursements for overhead costs related to designing and implementing its programs so that 100% of their program funds go directly to customer rebates. United Power also has several energy-efficiency programs in place, which are great complements to its new solar programs.

United Power's members are on board as well. On the date of the solar rebate program launch, June 2, 2008, the United Power rebate program manager found several people standing in line at 7:30 A.M., waiting to submit their rebate applications. The company received 10 applications on the first day of the program.

Workforce training and development are key supporting elements that must accompany any incentive program that strives to foster industry growth. Technical solar training at both basic and advanced levels for PV and Solar Thermal were offered in support of the program launch by CoSEIA and partnering organizations in May and June. Basic courses offered an in-depth introduction to solar technologies, and advanced courses offered continuing education opportunities for those with previous solar experience. Courses were held in both Front Range and mountain locations and total attendance was over 160, including solar contractors, program partner staff, code officials, municipal staff, home builders and homeowners.

Residential Solar Program
Total Clean Energy Funds Invested = $550,000

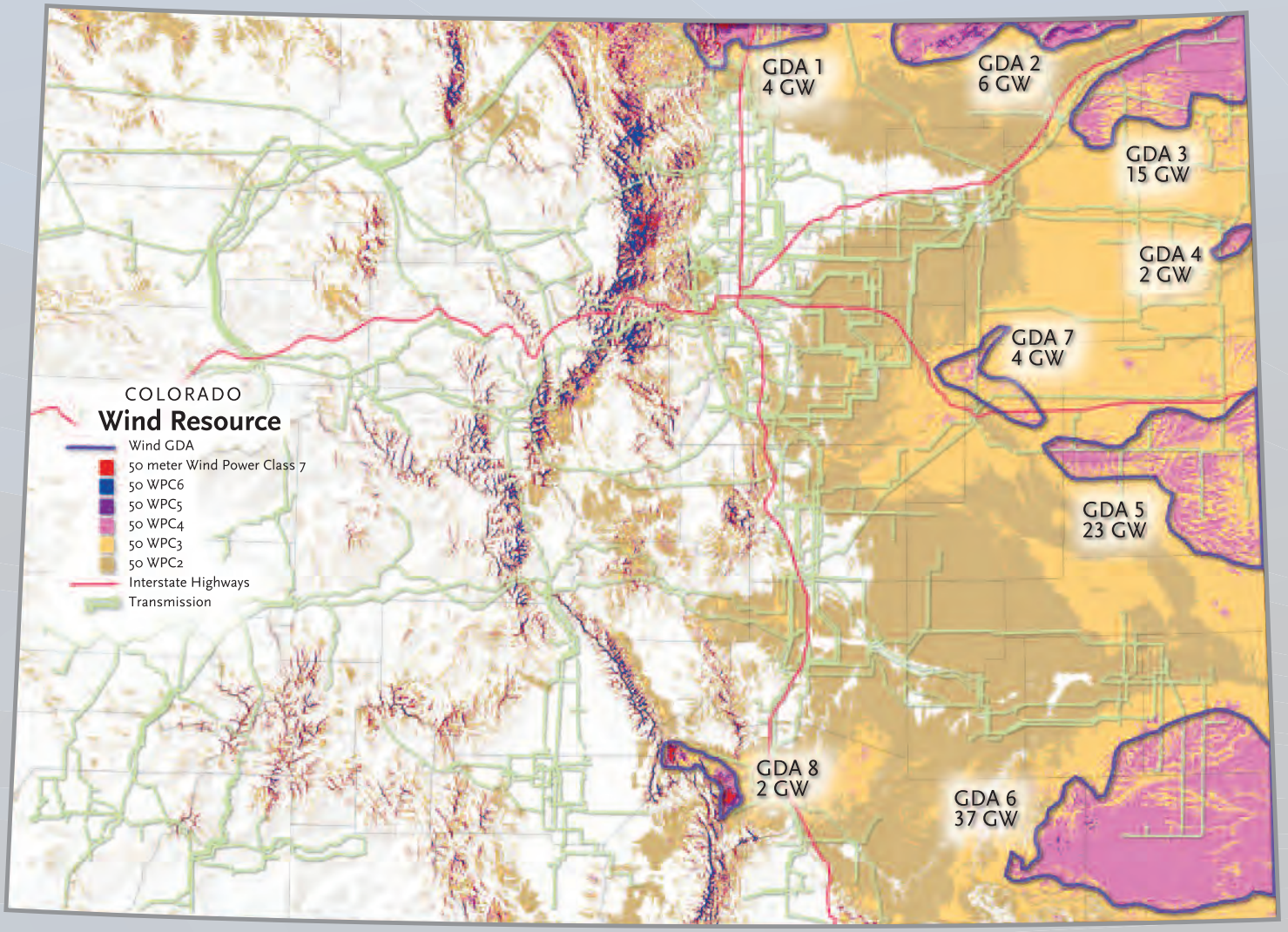
Total Number of Matching Partners = 22
Potential Number of New Solar Energy Systems Installed = 300
Potential Number of kWh Produced from Solar = 1.2 Million
Potential Amount of Carbon Emissions Reduced = 969 metric tons per year

Harnessing Colorado's Wind Potential

Small and Community Wind Program

According to the study of resource potential conducted for the Senate Bill 07-91 report, "Connecting Colorado's Renewable Resources to the Market," Colorado has at least 96,000 megawatts (MW) of wind potential. For comparison, the peak electrical load for the state was roughly 11,000 MW during 2007. According to the 2007 American Wind Energy Association Project, this ranks Colorado 11th nationally in terms of wind potential. Large utilities within the state are capitalizing on this potential to meet the Renewable Portfolio Standards (RPS) mandated by House Bill 07-1281.

While simultaneously working with many of Colorado's utilities on large-scale wind generation and transmission through its Utilities Program, the Governor's Energy Office's (GEO) Wind Program focuses on increasing consumer awareness about small- to medium-sized wind turbines and educating partners about the economic benefits of community wind projects.



Colorado Programs to Support Wind Power

In 2007, the GEO Wind Program developed and implemented the following programs to promote small and medium wind power production and generation:

- The Community Wind Promotion Program
- Small Wind Rebate Program
- Anemometer Loan Program

These programs were developed in connection with the following House Bills: HB 07-1087, HB 07-1169, HB 07-1279 and HB 08-1270. The Energy Policy and Legislation section provides links for reading these documents online.

The Colorado Green wind project near Lamar. Photo: Rebecca Cantwell.

The Wray community wind turbine. Photo: Rebecca Cantwell.

Community Wind Promotion Program

Community wind generally refers to wind turbines that are owned by a group within a community that owns part of a larger wind farm. Community wind projects help keep money in a community; the rewards of the project benefit the owners and the supplemental income helps support farmers who may be feeling financial pressures to sell their farms or their water rights.

For example, a farmer can install a single wind turbine and sell any excess power to the local utility company. Or a farmer can develop a wind farm in partnership with an entity qualifying for federal tax incentives and, after the incentive expires, take ownership of the project and benefit by selling the power to the utility company.

Community and REA Wind Workshops

The GEO held community wind workshops in Wray and Lamar to educate county commissioners, rural electric associations, economic development officers, landowners, and wind developers about the potential benefits of a community-owned wind project. These seminars were held in partnership with the Rocky Mountain Farmers Union, Colorado Working Landscapes and the U.S. Department of Energy.

In June 2008, the GEO, in partnership with the Wind Test Site at the National Renewable Energy Laboratory (NREL), held a workshop to educate rural electric associations about the technology, performance and installation of small wind turbines.

Keynote speaker Dale Osborn, left, talks with participants at a community wind seminar in Lamar. Photo: Rebecca Cantwell.

Small Wind Rebate Program

In order to drive market integration, the GEO developed a Small Wind Rebate Program. The rebate was set at $2 per watt and was offered to potential partners willing to commit matching funds to maximize the program's potential. Four partners were selected: Sangre de Cristo Electric, the Town of Estes Park, The Southeast Electric Association and the Highline Electric Association. Each partner matched the GEO Clean Energy Fund allocation of $25,000, creating a total rebate pool of $200,000. The maximum rebate is $5,000 for individual installations, allowing for a total of 40 rebates.

Given that the average cost of a single 1.8 kW turbine is roughly $14,000, this rebate program has the potential to generate an additional $225,000 in wind investments, bringing the total impact of this program to $350,000.

Wind for Schools Program

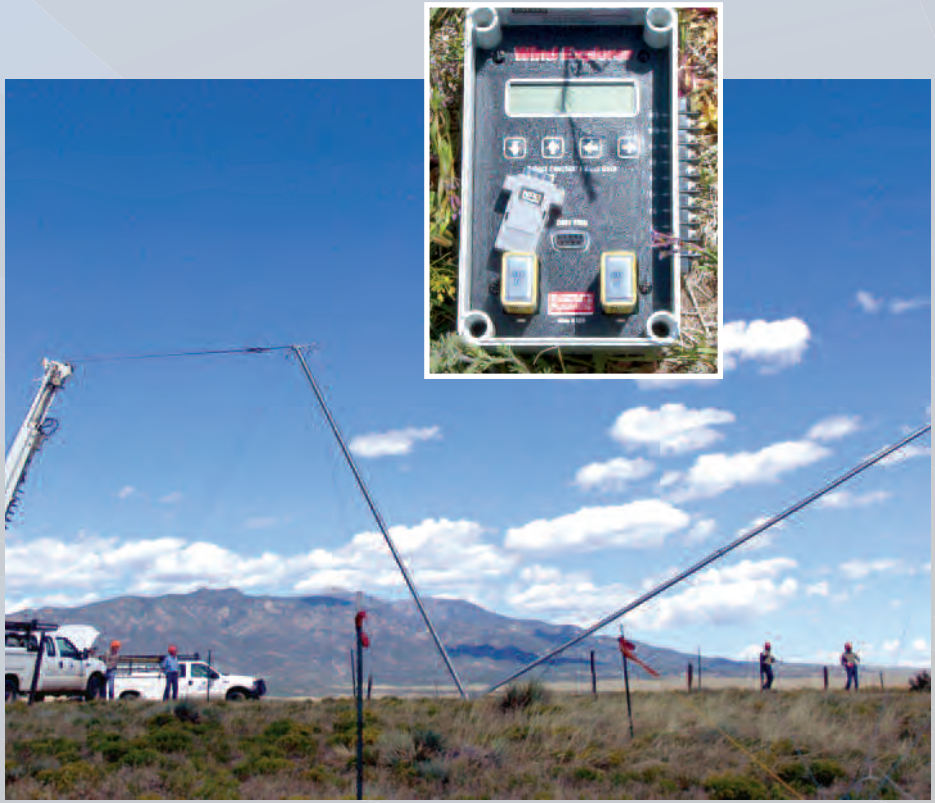
A partnership between the GEO, the Southwest Energy Efficiency Project (SWEEP), and the US Department of Energy, the goal of the Wind for Schools program is to install small wind turbines in rural school districts to offset electricity usage and to educate local communities on the benefits of wind as a power resource. Each small wind turbine also offsets the school's electricity usage, approximately 3600–4800 kilowatts annually, and provides an on-site educational opportunity for students. As part of the program, each turbine is installed with a display that indicates the amount of electricity generated and the amount of carbon offset.

To date, five schools have been identified as potential sites through the Wind for Schools Program, and a number of other schools have expressed interest in the program.

Anemometer Loan Program

In partnership with Colorado State University (CSU), the GEO's Anemometer Loan Program (ALP) supports wind development by assisting organizations with determining the quality of wind in an area. An anemometer gathers wind data for a particular area to indicate its potential as a permanent site for a turbine. Through this program, anemometers are loaned

to interested businesses and residents for a period of 12 months. The program involves CSU students who perform installation and removal of the anemometers as well as collection and analysis of data as part of their coursework, creating the technical expertise vital for students' entrance into Colorado's renewable energy industry. According to CSU's report to the GEO, during 2007, six 20-meter towers, three 30-meter towers and a 50-meter tower are in place and collecting data around the state. The GEO allocated $25,000 for this program. In the coming year, the GEO will follow up with program participants to determine if the program resulted in turbine installations.



San Isabel Electric Association, Inc., installs an anemometer in Huerfano County, 2005.
Inset: Anemometer control box.

Summary

Using wind for small and medium-scale power generation is in its infancy in Colorado. A key focus of the GEO's Wind Program is to provide educational resources at the local level to explain and demonstrate the benefits of wind. As the infrastructure to capture wind is further developed, Colorado will be increasingly better situated to take advantage of technological advances within the industry.

In the upcoming fiscal year (FY 2008–09), the GEO will expand on this program to offer matching grants to utilities, nonprofit organizations, communities and counties to install a demonstration small wind turbine at local facilities throughout the state.

Small and Community Wind Program
Total Clean Energy Funds Invested = $125,000

Community Wind Workshops
Clean Energy Funds Used = $0
Community Wind Workshops Held = 2
Workshop Attendees = 110

Small Wind Rebate Program
Clean Energy Funds Used = $100,000
Investment from Partner Matches = $100,000
Number of Rebates Made Available to Community = 40

Wind For Schools
Clean Energy Funds Used = $0
Identified 5 Potential Schools for a Wind Turbine

Anemometer Loan Program
Clean Energy Funds Used = $25,000
Placed 10 Anemometers in Colorado

Understanding Colorado's Geothermal and Small Hydroelectric Resources

Geothermal and Small Hydro Program

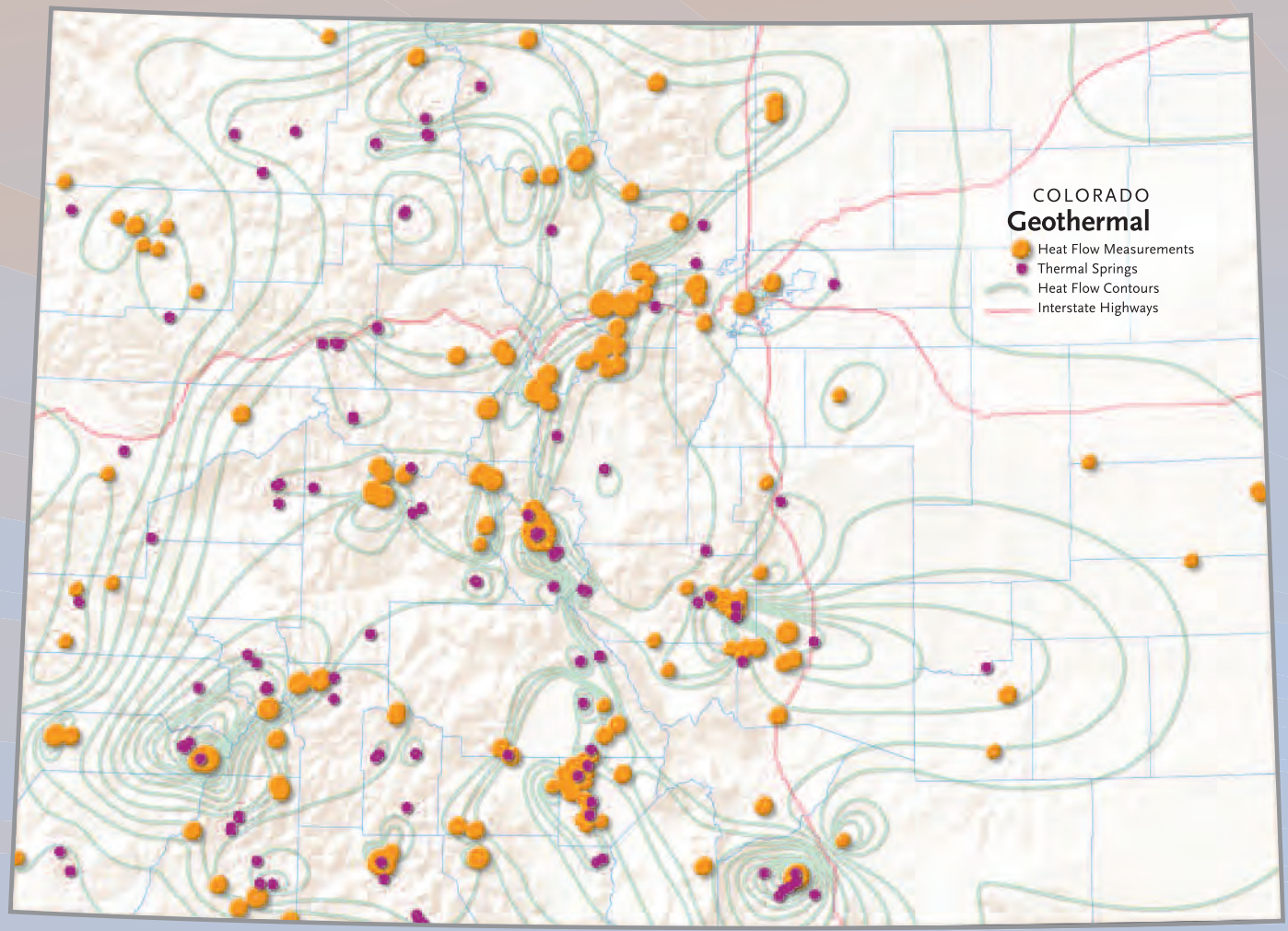
Geothermal Energy

The use of hot water for hot springs resorts, spas and recreation has been an important part of Colorado's rural economic development. The potential of this resource extends far beyond recreation. The Senate Bill 07-91 report identified several geothermal "hot spots" within the state classified as "high potential" for being clean and infinite energy sources.

Geothermal Working Group

The Governor's Energy Office (GEO) is involved with the US Department of Energy (DOE) GeoPowering the West program. The program seeks to address barriers to geothermal utilization and identify opportunities for project development. Colorado is among several Western states that receive support from the DOE to operate working groups to tackle relevant issues and educate a broad audience about geothermal energy applications.

Colorado's Geothermal Working Group is working to explore geothermal technology, assess the state's potential resource, and develop geothermal uses by encouraging private business involvement and providing education.



In FY 2007–08, the group created a strategic plan, the **Colorado Geothermal Strategic Plan**, and established a **2008 Action Plan**, the Geothermal Working Group's 2008 Action Plan.

GEO Strategy

The Colorado Geothermal Working Group's 2008 action plan objectives are to:

- Encourage the development of Colorado's first geothermal electricity production facility
- Increase the utilization of geothermal hot water for district heating and other uses
- Provide education on ground-source heat pumps to improve overall efficiency of home heating and cooling systems

Progress and Results

To create momentum and begin the process of attracting private investment, the Geothermal Working Group held two workshops in 2007, one in Montrose and the other at the Colorado School of Mines in Golden. The GEO also initiated a Request for Information to identify projects, barriers and resources relative to geothermal energy development. The following events are evidence of that momentum:

- The Colorado Geological Survey (CGS) is creating a database on the state's geothermal resources and a bibliography of previous studies to assist developers in project identification.
- The Colorado State Legislature approved hiring a full-time geologist for geothermal resources at the Colorado Geological Survey.
- At the Colorado School of Mines (CSM), professors have been expanding program support for geothermal resources. Three professors from CSM supported a summer program for 12 students at Mt. Princeton to identify resource potential for Colorado's first geothermal electricity project.
- The Department of Water Resources is reviewing its permitting requirements for different projects and the State Land Office is evaluating leasing options for projects on state lands.

ENERGY IMPACT

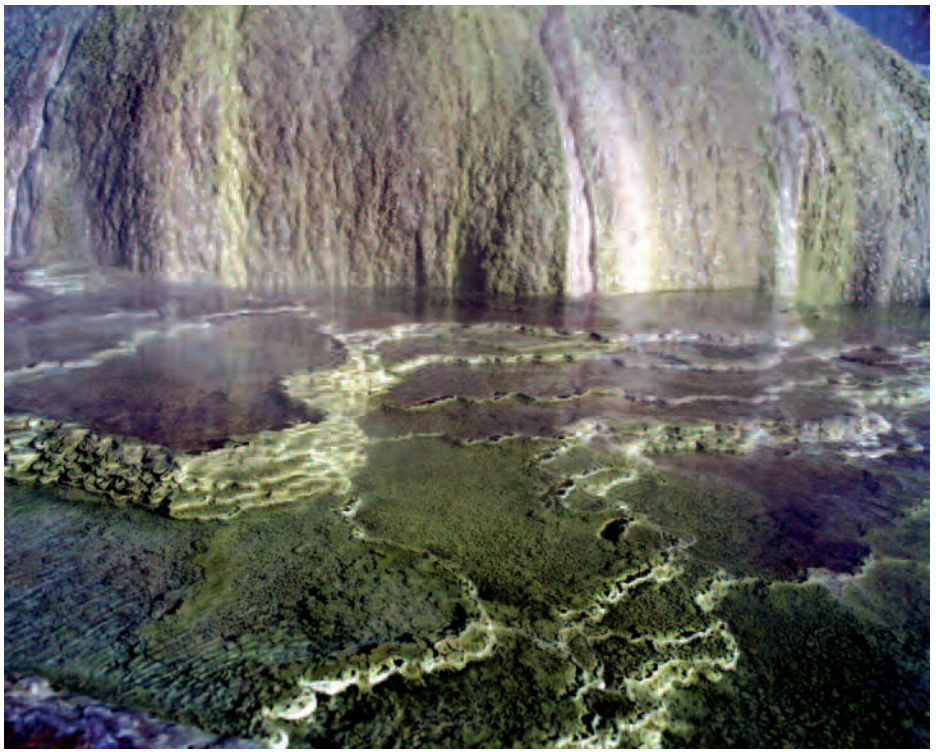
Colorado is at the initial stages of assessing its potential for geothermal energy while enjoying the abundance of hot springs that are surface manifestations of the energy source below-ground.

ECONOMIC IMPACT

Hot springs have long provided economic development in rural Colorado as attractions for tourism and recreation. In addition, geothermal energy can be a sustainable energy source for growing and processing food, heating community buildings and neighborhoods and generating electricity with local power plants sized in the range of 1 to 50 megawatts (MW).

SOCIAL IMPACT

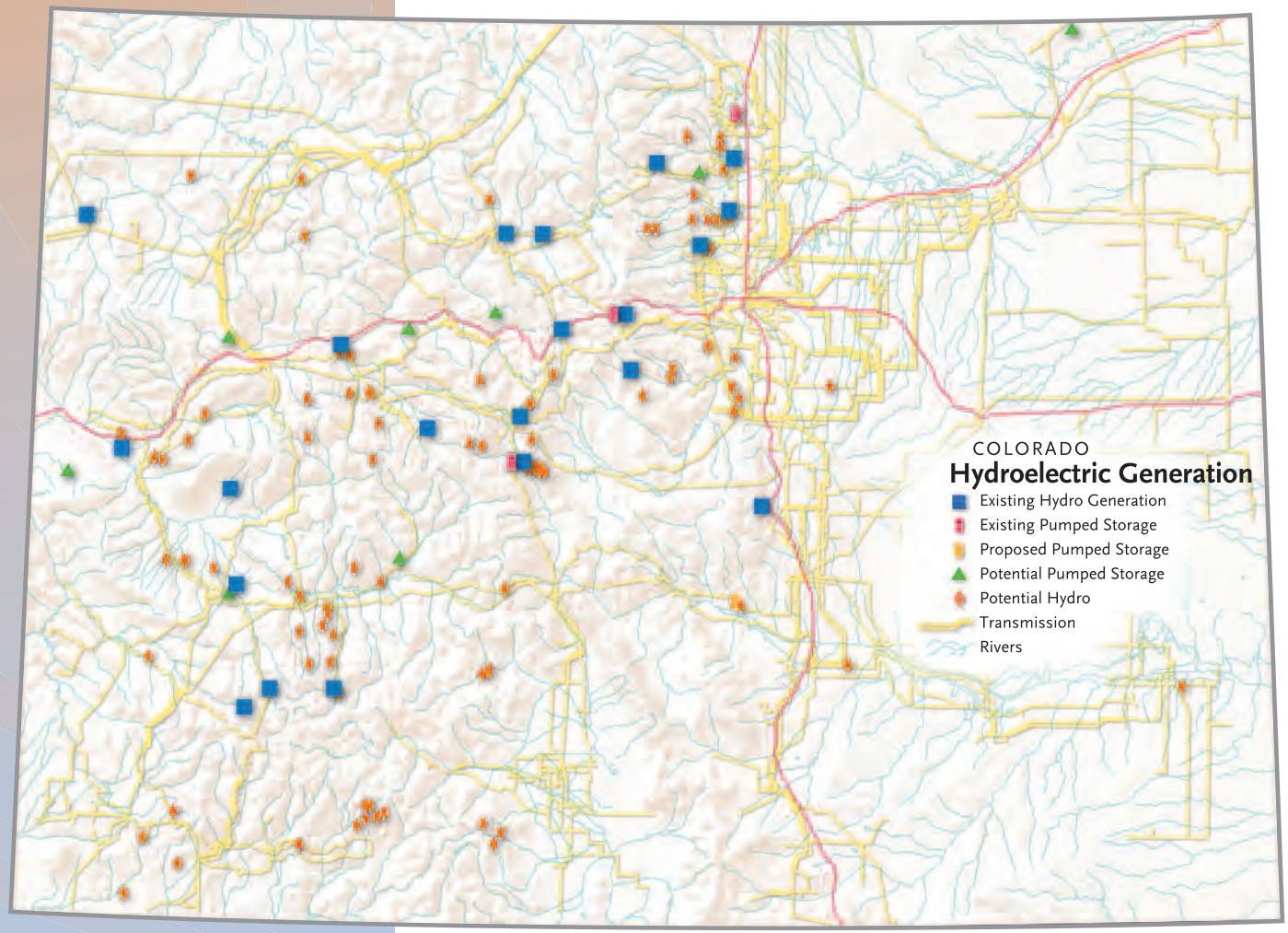
There are 168 geothermal features in 93 locations in the state available for our enjoyment. Our development efforts will continue to provide high quality of life for regions rich in geothermal resources.



Hot spring, Pagosa Springs. Photo: Warren Gretz, NREL.

Small Hydroelectric

Historically, expansion into the Colorado Territory was fueled by the development of a complex water-distribution system to use the water resources in the arid West. Today this system, especially in Colorado mountain communities, can be used as an economic-development tool by generating power locally with small-scale hydroelectric systems. Small hydro systems can be installed on existing infrastructure such as dams, irrigation systems and municipal water supply systems. As the map indicates, several small-scale systems are already on line in the state within the service areas of several rural electric cooperatives, including Holy Cross Energy, Delta Montrose Electric and San Miguel Electric.



Generally, small hydroelectric systems generate less than 1 MW of power and can generate as little as 1–2 kilowatts. The economic viability of these smaller projects varies depending on a number of development issues, including non-consumptive water rights involving beneficial use of the water for power, engineering studies to design the overall power system, the permitting process of the Federal Energy Regulatory Commission (FERC), and the negotiated price and value of the power. For small-scale hydroelectric systems to gain footing in the state, these issues must be facilitated to increase economic competitiveness of small hydro.

The GEO has created a Small Hydro Pilot Program to support small hydro systems that will generate, in total, 5 to 15 MW of power over the next three to five years.

GEO Strategy

The strategy of the Small Hydro Program is to facilitate technology transfer and widespread development of this technology with the expertise of a Small Hydro Working Group

Progress and Results

On January 18, 2008, the Small Hydro Working Group convened at the meeting of the Colorado Renewable Energy Forum (CREF), hosted by Holy Cross Energy. From this exchange, the GEO prepared an action plan for a pilot project focused specifically on the small hydro development process. Additional Clean Energy Fund funds have been committed for feasibility studies and technical support for programming in the next fiscal year.

ENERGY IMPACT

Small hydroelectric capacity in Colorado is 1162 MW, with half of this capacity as pumped storage. While pumped storage is not a renewable resource, it is an effective storage mechanism for renewable and excess electrical generation at times of low demand. According to the SB-91 report, references from Idaho National Labs and others, there are 91 possible hydro development sites, with over 700 MW of potential capacity.

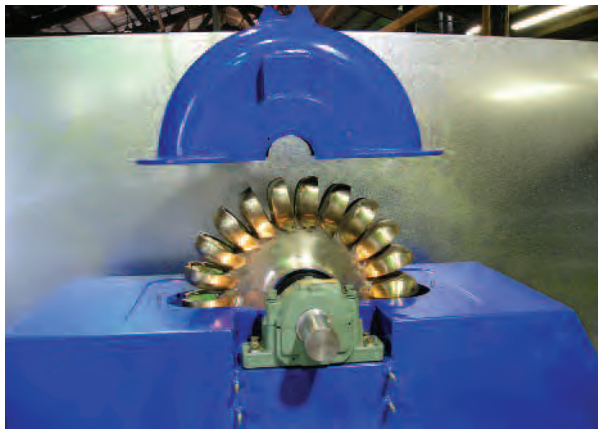
ECONOMIC IMPACT

The first AC (alternating current; the form in which electricity is delivered to businesses and residences) power plant in the US was built near Telluride in 1891 and from then on hydro drove the economies of mining communities. Today these same hydro resources offer an economic-development opportunity for rural mountain areas with jobs creation, engineering expertise, and locally produced clean renewable energy.

SOCIAL IMPACT

Small hydro projects can be developed without major environmental issues. Small hydro will be developed on existing infrastructure, helping us be more productive from systems already built, including existing dams, irrigation systems and municipal water supplies. The SB 07-91 report identified potential generation of more than 700 MW of electricity from this existing infrastructure.

Snowmass MicroHydroElectric Plant, Fanny Hill, Snowmass Ski Resort. In 2008, the plant generated $15,000 in clean energy—over 160,000 kWh. Photos: Aspen Skiing Company.



Turbine and Pelton wheel in the factory.

Geothermal & Small Hydro Program
Total Clean Energy Funds Invested = $0

Geothermal Working Group
Held Two Workshops
Created a Geothermal Strategic Plan
Issued a Request for Information to Identify Potential Projects

Small Hydro Pilot Program
Convened the Small Hydro Working Group
Prepared an Action Plan for Future Progress

We Have The Power

The Colorado Carbon Fund

The Governor's Energy Office's (GEO's) Colorado Carbon Fund (CCF) is a voluntary carbon-offset program being developed to advance the following objectives:

- Develop a funding source for community-based energy efficiency and renewable-energy projects that reduce greenhouse-gas emissions in Colorado
- Provide high-quality, credible offsets for individuals, businesses and government agencies interested in mitigating their carbon footprints
- Support Colorado's clean-energy and climate-change mitigation objectives as described in the Climate Action Plan and Clean Energy Fund

The CCF will be the first state-run program of its kind in the nation and will offer individuals, businesses and institutions the opportunity to purchase carbon offsets to help fund new clean- energy projects in the state. This program will help build credibility for carbon offsets as a viable financing mechanism for new clean-energy projects. The program will tap into the strong voluntary consumer demand that helped jump-start wind energy development in Colorado nearly a decade ago. Colorado's individual and business consumers are willing to pay to support innovative, local clean-energy projects.

Colorado Carbon Fund Projects

The Colorado Carbon Fund will help fund a variety of energy-efficiency and renewable-energy projects that will reduce greenhouse-gas emissions, including solar hot water to heat swimming pools, methane capture- and energy-generation projects on dairy and hog farms, and insulation built to reduce the use of natural gas for heating.

The CCF is also part of a three-step outreach and education strategy that will provide individuals and businesses tips for reducing greenhouse-gas emissions, including:

1. *Measure* emissions from energy use and travel
2. *Reduce* emissions with energy efficiency and renewable energy
3. *Offset* unavoidable emissions through the Colorado Carbon Fund

The Colorado Carbon Fund Website

The **ColoradoCarbonFund.org** website will allow users to enter data about their home energy use, air travel and driving into a carbon calculator. They will also be given information about GEO programs and other resources related to energy efficiency, renewable energy and tips for reducing emissions. After taking personal steps to reduce emissions, individuals and businesses will be encouraged to donate to the CCF to offset the rest of their carbon footprint. The CCF is already playing a pivotal role, assisting the City of Denver in its efforts to provide offset options to event and conference planners in partnership with the Denver Metro Convention and Visitor's Bureau.

License Plate

The Colorado Carbon Fund special license plate will help recognize individuals who donate to offset their emissions. Colorado residents who offset at least 50% of their vehicle's annual emissions or make a minimum $25 donation via ColoradoCarbonFund.org will be eligible to purchase the special license plate. The license plate was authorized by Senate Bill 08-186 and will help raise awareness of Colorado's potential for clean energy. All funds raised by the Colorado Carbon Fund through this promotion will be used to fund new clean-energy projects in Colorado.

Partnering with Communities

Many communities in Colorado are keen to develop local clean-energy projects, but struggle to find funding. To address this challenge, the GEO is developing the CCF in partnership with communities interested in supporting local clean-energy and climate-mitigation projects; individuals, businesses and organizations interested in offsetting their environmental impacts; and developers of emissions-reducing projects seeking financial or community support.

A key benefit of this program is that it will lead to on-the-ground development of real, tangible clean energy and climate-mitigation projects around the state. The advantages for communities include potential economic savings, environmental benefits and educational benefits. In many cases, these will be a community's first local clean-energy projects and will help pave the way for public support for additional projects.

In fall 2008, the GEO will establish an advisory board to develop selection criteria for offset projects and set requirements for third-party certification. The GEO will work with a contractor, **The Climate Trust**, to oversee project implementation and manage revenues from the sale of carbon offsets or donations to the fund. The Climate Trust is a nationally respected 501(c)3 nonprofit group with a decade of experience in developing carbon offsets. Partnering with The Climate Trust enables all donations to the Colorado Carbon Fund to be tax-deductible.

Measuring Success

The CCF's success will be measured by:

- The number of offset projects developed
- The total amount of greenhouse-gas reduction
- The total dollar value raised through offset purchases and donations
- The number of community partnerships
- The total number of individuals and businesses contributing to the fund

Empowering and Educating Colorado

Public Information Program

Empowering and educating Colorado's residents, businesses and local governments to take part in the New Energy Economy is a top priority of the Governor's Energy Office (GEO). Recognizing that communication is an efficient and productive way to reach people statewide, the GEO has developed a strong public-information program that includes media relations, e-newsletters, events, sponsorships and a robust website.

Goal

The Public Information Program's goal is to educate the public, businesses, energy industry and partners about clean energy, energy efficiency, the New Energy Economy, and the programs and opportunities available to them through the GEO.

Media Relations

The GEO educates the public about news, rebates, financial incentives and opportunities in the New Energy Economy through a strong statewide network of broadcast, print and web-based media contacts.

The GEO E-News

The GEO launched a new, monthly e-newsletter in October 2007 in conjunction with a website redesign and launch. The GEO E-News is sent to a subscriber list of more than 2,500 readers. The e-newsletter captures recent and upcoming GEO activities and milestones, events and conferences, funding opportunities from the GEO and other organizations, and links to additional resources.

Education Support

During FY 2008, staff from the GEO hosted or participated in 27 major events throughout the state, not counting speaking engagements, to promote energy efficiency and renewable energy. Events have included biofuel station openings, wind farm dedications, school energy projects, GEO program-related events, and other community energy-efficiency and renewable- and clean-energy events. In addition, the GEO has a sponsorship program to help these events in their outreach, greening and sustainability efforts, and promotion.

Mayor Hickenlooper and Governor Ritter bike to work in video spot.

The GEO Public Information Program also supported the education efforts of dozens of Colorado organizations through funding and technical support. In conjunction with the Environmental Protection Agency's "Change a Light, Change the World" pledge program, the GEO partnered with Colorado schools, energy educators and congregational communities to distribute energy-efficiency information and compact fluorescent lightbulbs (CFLs).

The GEO also launched the "New Energy Economy: Bringing It Home" campaign featuring the Governor and Mayor Hickenlooper promoting energy efficiency and conservation tips for consumers and homeowners.

Website

The GEO has enriched its website to be the resource for Coloradans seeking energy efficiency and renewable energy information.

Website Goals

- Be *the* website for energy information in Colorado.
- Educate and inspire users to participate in the New Energy Economy.

Home page of GEO website.

GEO Strategy

To achieve these goals, the GEO outlined the following objectives:

- Assist the public to easily find information, while being exposed to information they may not realize they need. Connect users with exceptional outside resources when necessary and relevant.
- Incorporate interactive educational tools such as maps, audio and video clips, and an advanced search feature that provides up-to-date information to the site's visitors in an easy-to-use and visually appealing manner.
- Communicate what the GEO offers in terms of programs and services, including funding opportunities and ways constituents can participate. This also includes communicating the GEO program impacts to state officials and constituents.

Public Information
Total Clean Energy Funds Invested = $190,000

Efficient Light Bulbs Distributed Through Change a Light Change the World Campaign: 10,000, through contact with congregations and schools

Educational Events Hosted or Supported = 27
E-newsletter Recipient Increase = 17%
Website Increase in Traffic = 61%
Number of Educational Radio Spots Created and Aired= 3
Number of Educational TV Spots Created and Aired = 1

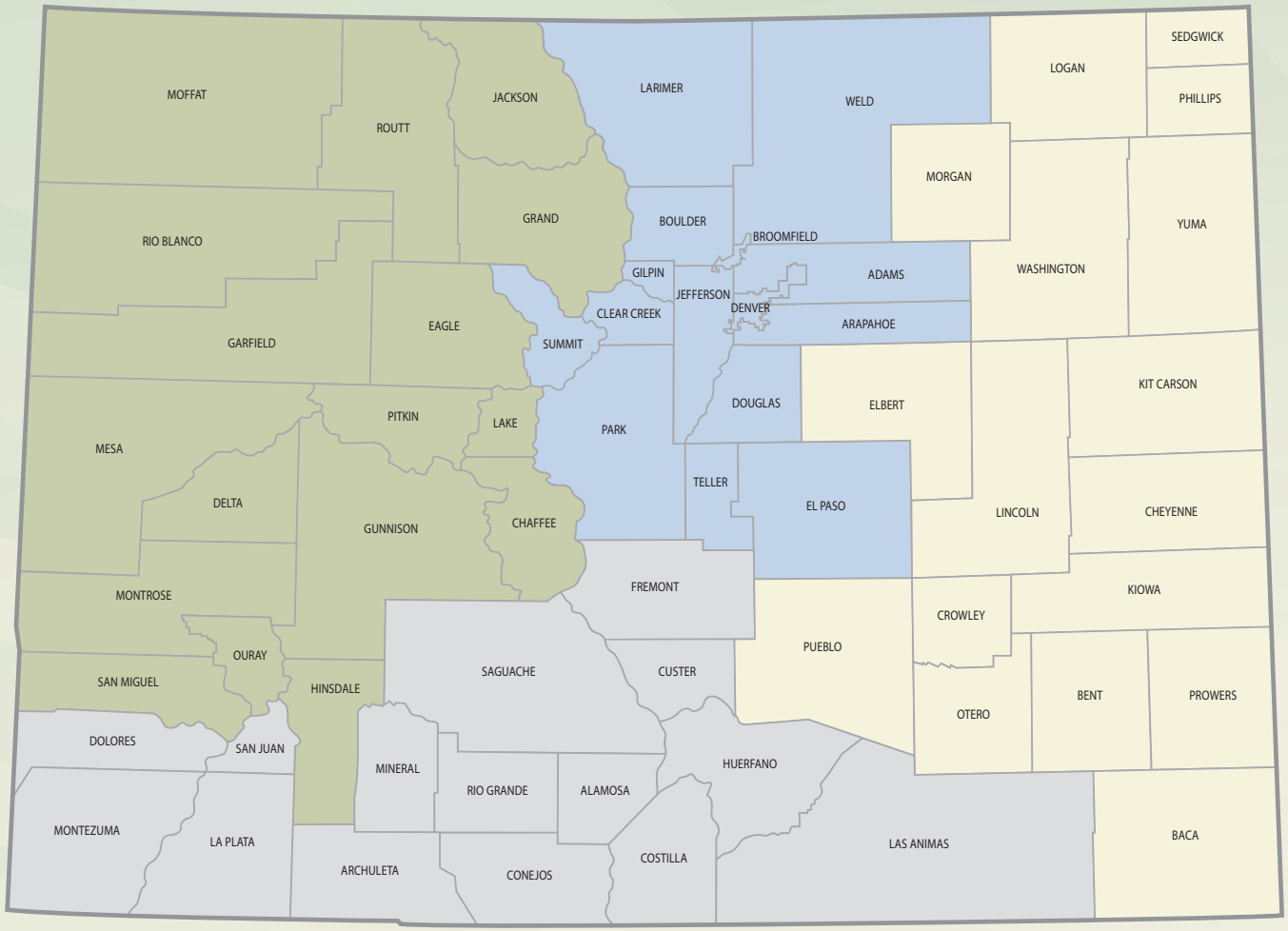
Extending Energy Efficiency and Renewable Energy Statewide

Regional Representatives

Currently home to 4.7 million, Colorado attracts residents and visitors with its beautiful climate, abundant recreational opportunities and the economic prosperity offered by its strong industrial, commercial and academic foundations.

Given the economic and environmental diversity within the state, the transition to a New Energy Economy requires solutions of equal diversity. The Governor's Energy Office (GEO) designs its programs accordingly, seeking maximum applicability across the state to return the most efficient gains possible for each tax dollar invested.

The key to this progress is the GEO's Regional Representatives. The Regional Representatives work at the local level to share information and help officials identify available methods for achieving efficiency gains and understanding renewable potentials that best fit the nuances of their local economies. The regions are divided to best reflect and represent geographic and economic commonalities within the state.



Meet the Representatives

Joani Matranga is the GEO's Western Regional Representative. Covering counties in many of the mountainous and high-elevation areas in the state, she also facilitates the geothermal and small hydroelectric programs at the GEO, as many of her counties have large potential in these resources. Both geothermal and small hydroelectric programs are applicable at smaller scales and ideal for mountain communities that may be isolated from typical energy sources. Many rural electric utility cooperatives furnish power to the region, providing opportunities to advance the goals of the Clean Energy Fund through education and cooperation. Historically, mining has been a key economic driver in Western Slope communities, leading to boom-and-bust economic cycles. Local officials in these counties express ongoing interest in developing long-term renewable resources to help shoulder the impact of such cycles.

To determine who your Regional Representative is and get contact information, visit the GEO website.

The Central Region is home to the Front Range and the majority of the state's population. Mona Newton represents the counties in this region and also manages the Wind Program. The urban and suburban characteristics of the Front Range communities provide significant opportunities for efficiency gains in the residential, industrial and transportation sectors. The Front Range region is served by the state's larger utilities, such as Xcel Energy, which participates in the New Energy Economy by developing Demand Side Management (DSM) strategies to increase efficiency and offering rebates to customers seeking to lower utility bills by installing solar electric systems. Advancement of wind technologies requires cooperation among multiple industries. Consequently, Mona orchestrates cooperation with Colorado State University's Anemometer Loan Program, manages the Small Wind Incentive Program, and works closely with Vestas, owner of the turbine-manufacturing facility in Weld County.

Home to intense thunderstorms and many of the state's 31,000 farms, the counties in the Eastern Region are represented by Robert Mailander. Partnerships between the GEO and a wide variety of interested participants have begun to take hold in the region based on the growing awareness that the New Energy Economy is an opportunity to plant seeds of potential that will lead to a harvest of sustainability and community vitality. Depletion of the Ogallala Aquifer, increased urban demand for water and the possibility of drought induced by climate change have created a conduit for renewables in this area as local officials seek long-term economic vitality. The potential of both wind and solar resources in this region, as demonstrated in the Senate Bill 07-91 report, has attracted intense interest in the area. To date, nine partners from the region are participating in the GEO's wind and solar rebate programs; each partner provided the matching funds necessary to obtain GEO grants.

Funding for the Representatives

Recognizing the importance of reaching communities to help each of them realize the benefits of the New Energy Economy, the GEO funds the salaries of the Regional Representatives with monies directly from the Clean Energy Fund. Their salaries represent the only administrative expense paid by the Fund. The impact of their work during FY 2008 is substantial: In the nine-month period between October 2007 and July 2008, the reps have been in contact with each of the 64 counties in Colorado. To meet the tremendous interest and response from the counties over the past year, the GEO is adding a fourth Regional Representative in the coming year to ensure that the reps' availability meets local demand.

Putting Policy into Action

Energy Policy and Legislation

The major programs presented in this Annual Report have their roots in legislation enacted by the Colorado General Assembly, executive orders issued by the Governor, and other statements of policy, such as Governor Ritter's "Climate Action Plan," published in November 2007.

In this section you will find brief summaries of energy-related legislation that was passed, and policy statements that were released, during Fiscal Year 2008. If you are reading this report online, you can click on the document name for a downloadable PDF. For FY 2007 legislation and executive orders, please see the **GEO website**.

2008 House Legislation

HB-1025 "Governor's Energy Office" (Weissmann/Tupa)

Establishes the duties and powers of the Governor's Energy Office (GEO) within the Office of the Governor.

HB-1160 "Net Meter Mun & Rural Electric Utilities" (Solano/Shaffer & Isgar)

Requires municipally owned utilities and cooperative electric associations to provide net metering for residential and commercial or industrial customers, with system size limits.

HB-1164 "New Solar Energy Technologies" (Solano/Schwartz)

Encourages the Public Utility Commission to fully consider new solar technologies when they are evaluating new power generation construction projects.

To retrofit this 1890s Colorado Springs home for solar energy, the installer was able to satisfy the Colorado Springs Utility, the Historical Society and the Colorado Springs Building Department by placing solar panels on the pergola-type arbor in the back yard. Photo: Thames Solar Electric.

HB-1170 "Electricians Licensing Apprentice Educ" (Soper/Tochtrop)

Increases the qualifications for a journeyman and master electrician licenses to work on electric light, heat, and power, even if the power source is a renewable energy system.

HB-1207 "Procure Envtl Preferable Products" (Kefalas/Bacon)

Clarifies that the analysis of increased cost for state agencies to purchase environmentally friendly products includes the cost of ownership and a life-cycle analysis. Requires the Governor's Energy Office to maintain a list of nationally recognized entities that certify products as environmentally preferable.

HB-1227 "Sunset Continue Public Utilities Commn" (Madden/Tapia)

Extends the Public Utilities Commission (PUC) until 2019. Matters included in this legislation related to the GEO and energy policy: Adds eligibility requirements for Low-Income Energy Assistance (including 185% Federal Poverty Level and citizenship or legal resident requirements). Any utility considering a gas or electric tariff is required to notify the GEO. In the matter of hearings over rates disputes, the PUC is instructed to "consider whether to adopt retail rates structures that enable the use of solar or other renewable energy resources in agricultural applications, including, but not limited to, irrigation pumping." Grants the GEO the power of intervention by right in PUC proceedings.

HB-1270 "CICs Allow Energy Efficiency Measures" (A. Kerr/Tupa)

Extends existing prohibitions on covenants and deed restrictions that limit the use of solar energy devices to include other renewable energy generation devices and energy efficiency measures: wind-electric generators, shade structures, shutters, garage or attic fans, evaporative coolers, energy-efficient outdoor lighting devices, and retractable clothes lines.

HB-1335 "Building Excellent Schools Today" (Romanoff/Groff & Schwartz)

This comprehensive bill restructures the funds and funding processes for public school capital construction projects. The green building standards and energy efficiency guidelines shall be based on "Greening of State Government" Executive Order, as well as additional Executive Orders and the GEO policy directives.

HB-1350 "Financing Renewable Energy" (Madden/Romer)

Local governments and the Colorado Clean Energy Development Authority (CEDA) may issue bonds to finance capital improvements for energy efficiency retrofits and the installation of renewable energy fixtures for private residences and commercial property.

HB-1368 "Tax Prop Used to Prod Renewable Energy" (Buescher/Brophy)

Directs counties to use the same procedures as the State assessor to exclude renewable energy systems from property tax assessments. Offers local governments the option to exempt components used in renewable energy systems from their sales and use tax.

HB-1375 "Long Appropriations Bill" Office of the Governor's Budget Request "$2 Million Solar General Fund Appropriation" (JBC Committee)

Allocates $2 million to the Clean Energy Fund, managed by the Governor's Energy Office, to support investment in new energy technologies.

HB-1387 "Low-Income Energy Assistance Funding" (Buescher/Veiga)

Continues funding for energy-related assistance to low-income households through fiscal year 2011-12.

2008 Senate Legislation

SB-078 "Energy Efficiency Hist Preserv Grant" (Renfroe/Sonnenberg)

Requires the State Historical Fund to allow the use of energy efficient materials and technologies (specifically, energy efficient windows, window assemblies, insulating materials, and heating and cooling systems) by grant recipients, as long as the appearance of the historic property is not affected.

SB-081 "Renewable Energy Authority" (Schwartz/Madden)

Removes the requirement that the Colorado Renewable Energy Authority return to the State 50% of revenues from licensing of any patent, trademark, or copyright, which was in conflict with Federal laws, so that the Colorado Renewable Energy Collaboratory can receive Federal grants.

SB-117 "Limit Local Bldg Permit Fee Solar Panels" (S. Mitchell/McNulty)

Limits building permit fees for solar energy devices in cities and counties statewide to "the lesser of $500 or actual costs in issuing permits" for residential applications and $1000 for nonresidential application.

SB-147 "Increase Energy Efficiency State Bldgs" (Gordon/Hodge & Levy)

Adds low-income housing projects and facilities constructed with severance tax revenue to existing energy efficiency requirements for state-assisted facilities.

SB-184 "Colorado Clean Energy Finance Program" (Romer/Levy)

Creates the Colorado Clean Energy Finance Program within the GEO to provide loans to home owners for "clean energy improvements: any repair of or addition or improvement to residential real property … that improves the energy efficiency of the property or replaces all or a portion of the energy from nonrenewable sources … with energy from renewable sources."

SB-186 "Colorado Carbon Fund Special License Plates" (Johnson/Levy)

Creates a Colorado Carbon Fund special license plate for drivers who make a donation to the Colorado Carbon Fund to offset a minimum percent of their vehicle's annual carbon dioxide emissions.

SB-221 "Bonds Forest Health Watershed Projects" (Romer & Gibbs/Scanlan & White)

Authorizes the Colorado Water Resources and Power Development Authority (CWRPDA) to issue up to $50 million in bonds for the purposes of funding watershed protection and forest health projects.

A horse grazes near the Colorado Green wind project in Prowers County. Photo: Rebecca Cantwell.

The Colorado Climate Action Plan: A Strategy to Address Global Warming

The **Climate Action Plan** was prepared by Colorado Governor Bill Ritter Jr. in November 2007. It established a statewide cross-sector goal for carbon emissions in Colorado to 20% below 2005 levels by 2020 and 80% below 2005 levels by 2050. The Climate Action Plan established a similar goal for the Utility Sector. In 2007, Xcel Energy committed to submit a plan to the Public Utilities Commission outlining their approach to achieving these reductions. The Governor's Energy Office is working with municipal utilities and Rural Electric Associations, which fall outside of the PUC jurisdictional territory, on their plans for achieving these reductions.

The goal of 80% reduction below 2005 levels by 2050 was selected based on the best scientific estimates of the reductions that need to take place to stabilize carbon levels in the atmosphere at a sustainable level. The 2020 goal was established to create an interim target toward achieving the 2050 goal.

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