Annual Report

COLORADO ENERGY OFFICE 2015/2016

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01 Letter from the Director

I am pleased to present our fiscal year 2016 Colorado Energy Office (CEO) annual report.

Our office made significant strides in improving the effective production and efficient consumption of our energy resources focused in three market areas: building and facility energy efficiency, alternative fuel transportation and innovative energy production. The following pages describe CEO's strategies and fiscal year 2016 quantifiable achievements.

Some of our highlights are below:

CEO spearheaded the launch of the Colorado commercial property assessed clean energy (C-PACE) program and facilitated the unanimous passing of legislation that improved the processing of C-PACE assessments. Colorado now has one of the most comprehensive C-PACE programs in the nation.

Our office continued to expand electric vehicle (EV) infrastructure by awarding grants for 53 EV charging stations. This gives consumers greater confidence when driving between fueling stations and when considering an EV purchase. We also facilitated the passing of legislation that will give Colorado consumers alternative fuel vehicle tax credits at the point of purchase.

We strengthened our Colorado Agricultural Energy Efficiency Program by securing a $1.1 million grant from the U.S. Department of Agriculture. Working with approximately 200 producers over a two-year period, the improvements will generate more than $4.5 million in potential savings over five years.

CEO launched the first Low-Income Community Solar Demonstration Project in the nation. The project will serve about 300 income-eligible

families living in homes that are eligible for weatherization services, and will amount to at least 1 megawatt of installed solar capacity. On average, subscribers to each community solar model are estimated to save 40-50 percent annually on their electricity bills as a result of innovative crediting structures developed by each utility partner.

We continued to assess Colorado's energy markets to determine opportunities for further analysis and to assist clean technology developers to bring emerging technologies into the marketplace.

Thanks to all our partners who have been instrumental in our success.

Jeffrey Ackermann

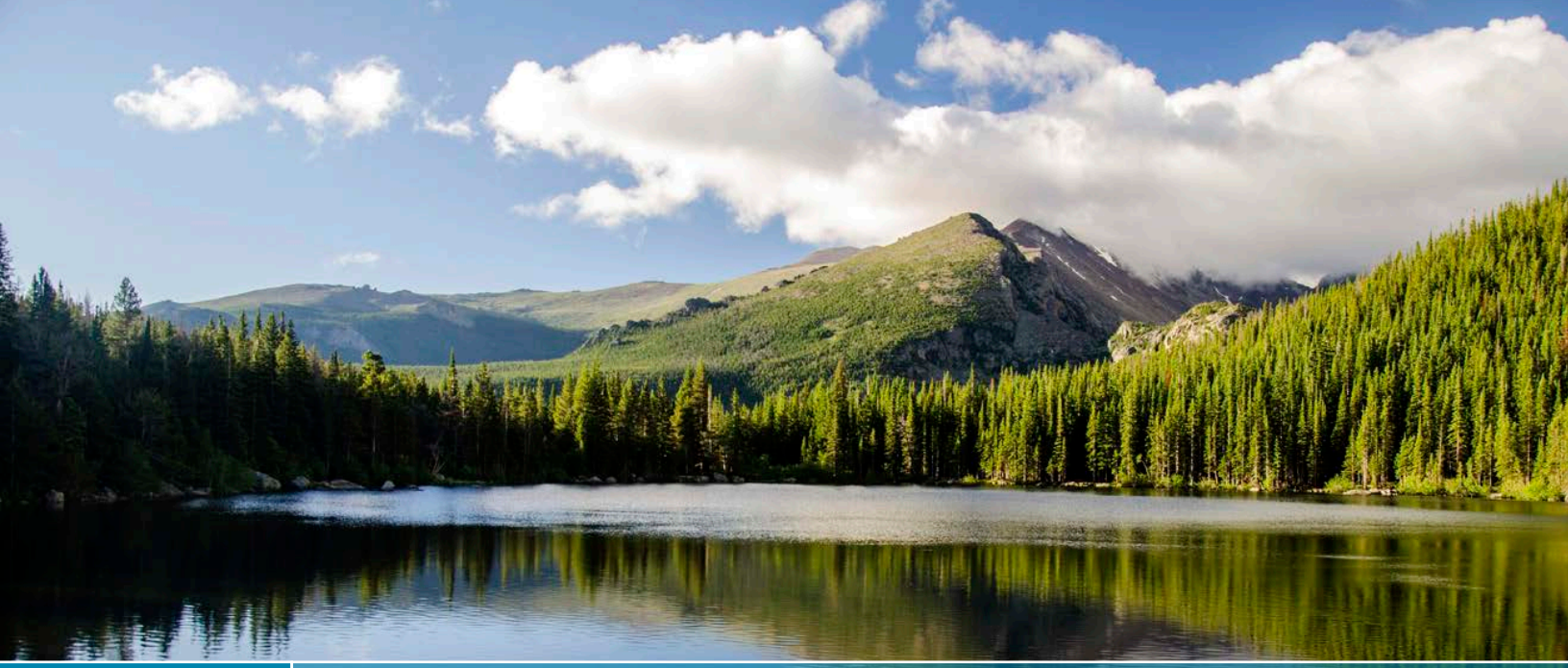
02 Mission & Vision

MISSION STATEMENT

The Colorado Energy Office mission is to improve the effective use of all of Colorado's energy resources and the efficient consumption of energy in all economic sectors, through providing technical guidance, financial support, policy advocacy and public communications.

VISION STATEMENT

The Colorado Energy Office vision is to help Coloradans live more prosperous and healthy lives by promoting innovative energy production and efficient energy consumption practices that are beneficial to the economic and environmental health of the state.



03 Key Successes

- A $1.1 million U.S. Department of Agriculture grant, leveraged with a match by the Colorado Energy Office (CEO), the Colorado Department of Agriculture, and utility and industry partners was awarded to CEO's Colorado Agricultural Energy Efficiency Program, formerly the Colorado Dairy and Irrigation Efficiency Program. The two-year grant period is expected to result in an annual electricity savings of more than 5,250 MWh and 524,000 gallons of water savings annually. In fiscal year 2016, 74 producers were moving through the program with 29 producers implementing projects. The program is expected to expand to 200 producers during the next two years.

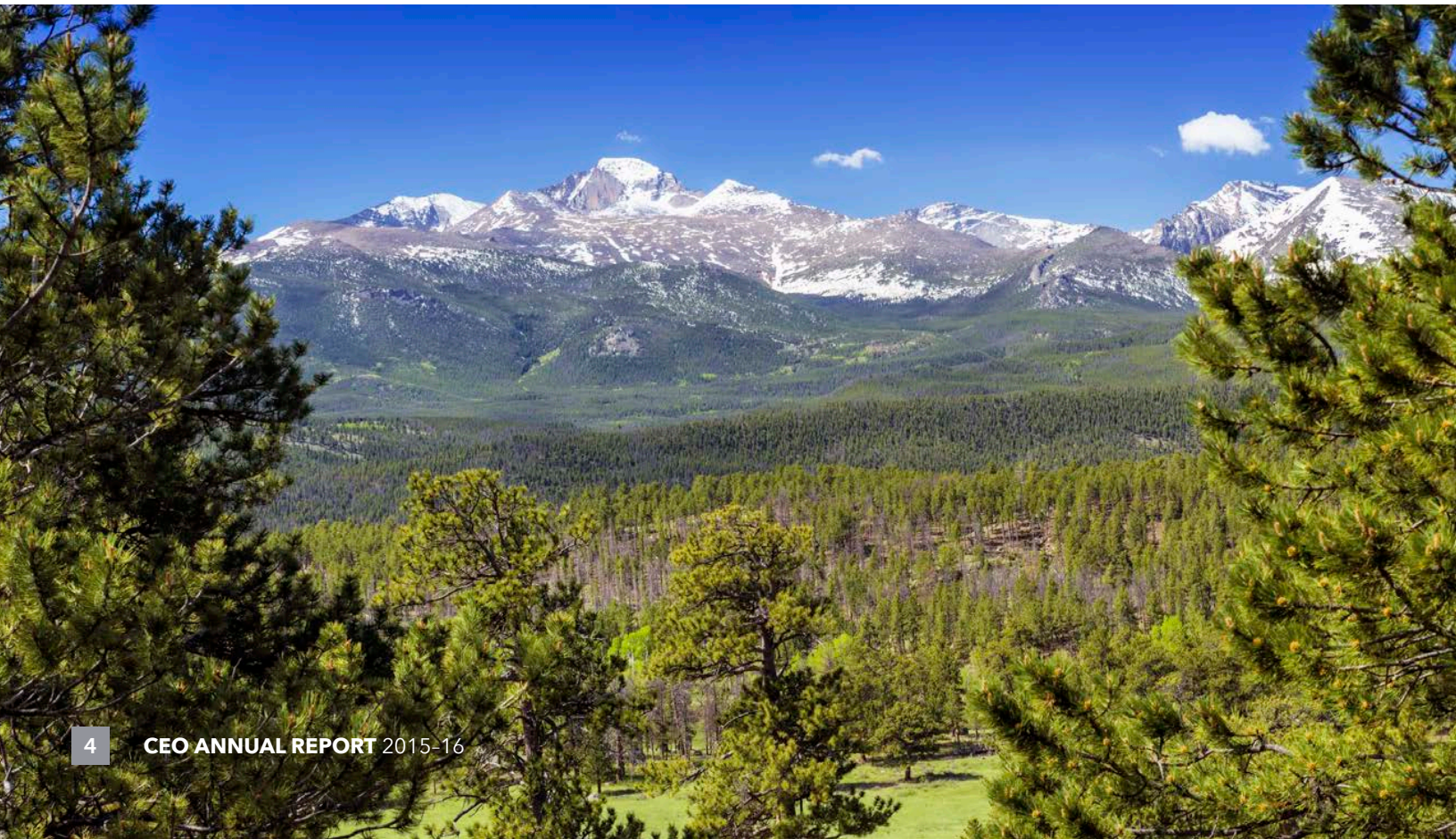
- CEO launched a Low-Income Community Solar Demonstration Project. The project offers low-income households that are eligible for weatherization assistance services affordable community solar options: clean, low-cost electricity from a shared generation resource. Up to 12 community solar models will be developed by CEO through its grant recipient, GRID Alternatives, in fiscal years 2016 and 2017. Cumulatively, the models will serve approximately 300 income-eligible families and will amount to at least 1 megawatt of installed solar capacity.

- CEO spearheaded the launch of Colorado C-PACE, which offers commercial property owners a unique way to finance 100 percent of energy and water improvements to their properties. Owners repay the cost of eligible improvements through an assessment on their property tax bills. CEO developed a bill and worked with the Legislature to unanimously pass the bill to make C-PACE easier for counties to implement after opting into the program. Boulder and Adams counties have adopted resolutions to participate in the program, with several more counties planning to opt in next fiscal year.

- The Colorado Energy Performance Contracting Program has completed 194 projects in communities across 75 percent of Colorado's counties, resulting in the financing of more than half a billion dollars in energy and water-related capital improvement projects. Energy performance has been improved at public schools and university buildings, veterans' facilities, libraries, parks, community centers, wastewater treatment plants, prisons and other government buildings.

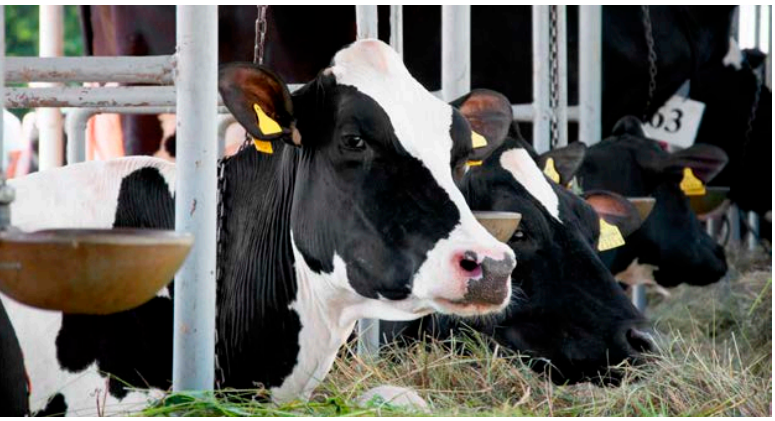
- More than $733,600 in grants has been secured to help Colorado schools finance projects to achieve measurable energy savings and create sustainable energy efficiency programs through CEO's Energy Savings for Schools Program (ESS). More than 21 schools are involved in the ESS program that offers the benefits of lower monthly utility bills and higher classroom comfort and safety.

- CEO awarded grants for the installation of 53 electric vehicle (EV) charging stations. CEO's ALT Fuels Colorado program awarded grants for four new CNG stations and installed five previously funded stations. Colorado's tax credits for the purchase of alternative fuel vehicles were made more consumer friendly under HB16-1332. Colorado's alternative fuel tax credits continue to be the nation's best value.



05 Agriculture

AGRICULTURE



The Colorado Agricultural Energy Efficiency Program, formerly the Colorado Dairy and Irrigation Efficiency Program, was launched statewide in the summer of 2015, building on the success of its 2014 pilot initiative. According to the Colorado Agricultural Energy Market Research Report, prepared for the Colorado Energy Office (CEO) in 2013, Colorado farmers spend more than $400 million annually on energy, equaling 7 percent of the industry's total expenses, with dairy and irrigation farming having the highest energy costs.

CEO created the Colorado Agricultural Energy Efficiency Program, as a partnership, approaching energy efficiency not only as a utility operations strategy, but also as a way of improving the financial standing of Colorado agricultural producers. The program addresses barriers that prevent producers from investing in energy efficiency by bringing existing resources and partners together and leveraging new funding with a turnkey approach. Program participants receive a free energy audit, a preliminary renewable energy assessment, technical assistance, energy coaching, and support for financing and implementing projects.

Program Success to Date:

- 74 producers have been approved for the program.
- 29 producers are in the process of implementing projects and will leverage over $400,000 in U.S. Department of Agriculture (USDA) funds.
- CEO was selected for a $1.1 million USDA award to help finance energy efficiency improvements for Colorado farmers. The award comes through USDA's Natural Resources Conservation Service's (NRCS) Regional Conservation Partnership Program and is matched through a $1.3 million contribution from CEO, the Colorado Department of Agriculture, and utility and industry partners.

The 74 producers currently enrolled have identified over 2,900 MWh of potential electricity savings. The program will expand to 200 producers during the next two years and is expected to generate more than $4.5 million in potential savings in only five years.

The program will help Colorado producers be more competitive by providing efficiency investments with substantial returns on the investments, thus reducing the operating costs for the participants.

Over the next two program years, the efficiency improvements are expected to achieve over 5,250 MWh of electricity savings and 524,000 gallons of water savings annually, and will provide additional environmental benefits to Colorado's agricultural producers.

HIGHLIGHT: USDA Energy Efficiency Grant Award

In April 2016, the Colorado Energy Office (CEO) received a $1.1 million U.S. Department of Agriculture (USDA) grant to help Colorado farmers finance energy efficiency improvements to their businesses.

The award, which comes through the USDA's Natural Resources Conservation Service's Regional Conservation Partnership Program, is matched by CEO, the Colorado Department of Agriculture and utility and industry partners.

Through CEO's Colorado Agricultural Energy Efficiency Program, formerly the Colorado Dairy and Irrigation Efficiency Program, producers receive free energy audits and technical assistance, presenting them with cost-effective investment options to reduce energy and water use and the corresponding operating costs. The available USDA funds give producers a dedicated pool of funding to finance and implement these investment projects. During the two-year grant period, the improvements are estimated to annually achieve 5,250 MWh of electricity savings and 524,000 gallons of water savings.

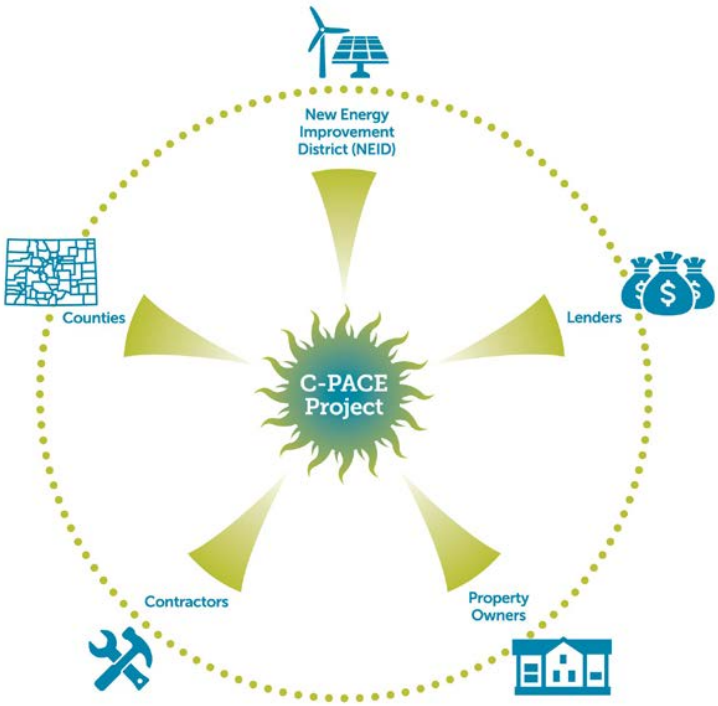
In fiscal year 2016, 74 producers were approved for the program and 29 producers were implementing projects. About 200 producers will be involved in the program during the next two years. More than $4.5 million in potential savings are expected to be generated through the program in five years.

08 Colorado C-PACE

COLORADO C-PACE

Colorado Commercial Property Assessed Clean Energy

Commercial buildings consume approximately 19 percent of Colorado's energy, yet implementing energy efficiency and renewable energy upgrades in commercial buildings can present challenges, including long paybacks and lack of available capital to pursue upgrades. To address these financial barriers, the Colorado Energy Office (CEO) spearheaded the launch of property assessed clean energy (PACE) financing for the Colorado commercial market, a program known as Colorado C-PACE. Colorado C-PACE provides financing structures that are more favorable to commercial clean energy projects and allows for a wide array of eligible energy efficiency, water conservation and renewable energy improvements. The program can pay for new heating and cooling systems, lighting improvements, solar panels, water pumps, insulation, and more for a variety of commercial properties.

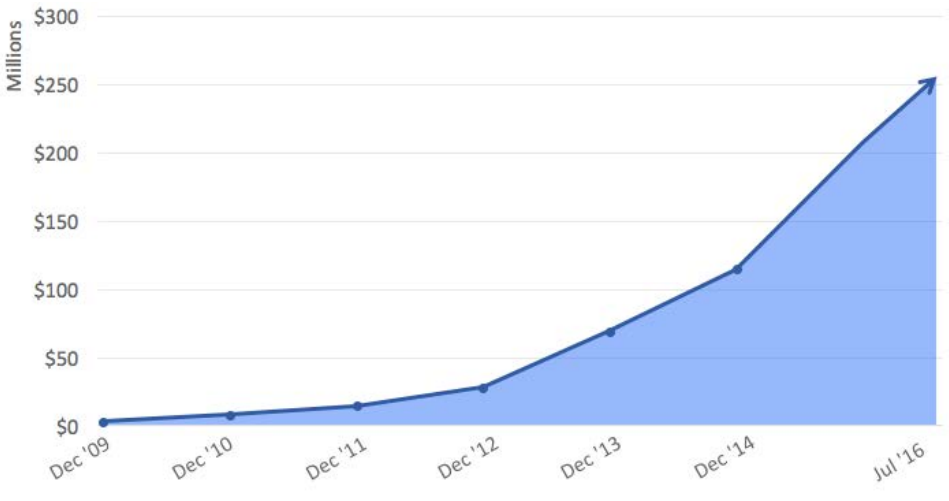


Colorado C-PACE was launched in December 2015 and offers commercial property owners a unique way to finance 100 percent of energy and water improvements for their properties. Owners repay the cost of eligible improvements through an assessment on their property tax bills. The New Energy Improvement District (the district), supported by CEO, oversees C-PACE implementation programs throughout the state.

Since its launch, Boulder and Adams counties have adopted resolutions to participate in the program, with many counties planning to opt in next fiscal year. As counties opt into the program, the demand for PACE financing will grow accordingly. Throughout the next fiscal year, the state can expect to see an increasing number of property owners choose to make building improvements by using PACE financing.

The district is a statewide, voluntary special assessment district into which each county has the option to participate through a resolution by the county's board of county commissioners. Once a county opts into the program, commercial business owners in that county can apply to the district to receive financing from private lenders for eligible energy and water improvements.

National Cumulative Commercial PACE Financing



Source: PACENation.us

10 Low-Income Energy Services

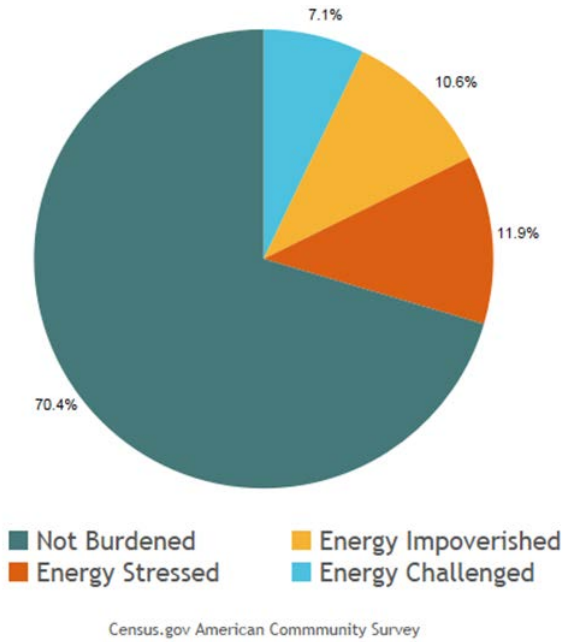
LOW-INCOME ENERGY SERVICES | Weatherization Assistance

Energy Burden

The Colorado Energy Office (CEO) is addressing household energy burden (the amount of household income spent on energy costs) of low-income residents statewide. While average Colorado households spend 1–3 percent of income on home energy, low-income households often pay more than 4 percent household income on energy costs and some are experiencing "energy poverty," spending more than 7 percent on home energy. To effectively address energy burden, both home heating and electricity costs must be reduced. Through effective utility partnerships and a return-on-investment based approach to low-income energy services, CEO is reducing low-income household energy burden. This includes the CEO Weatherization Assistance Program (WAP) and low-cost renewable energy projects.

CEO has taken leadership roles as part of the White House Community Solar Partnership and the U.S. Department of Energy's Better Buildings Clean Energy in Low-Income Communities Accelerator to advance the national conversation on addressing energy burden.

Energy-Burdened Households in Colorado



Census.gov American Commmunity Survey

History

This year, the CEO WAP celebrates 40 years of providing energy efficiency services to income qualified households. On August 14, 1976, President Gerald Ford signed the Energy Conservation Production Act, which established the WAP on a national scale. The primary intent of the WAP is to increase the energy efficiency of low-income households, reduce their total residential energy expenditures, and improve home health and safety, especially for vulnerable populations. Over the past 40 years, the national WAP has served over 7 million low-income families throughout the nation, provided $340 million in total household energy cost savings, reduced greenhouse gas emissions released each year by over 7 million metric tons (equal to 7,800 cars taken off the road for a year), and supported 8,500 jobs annually.

Accomplishments

In fiscal year 2016, the CEO WAP delivered service to 2,969 eligible households throughout the state. The installed measures saved clients a combined $600,000 on their energy bills, over 371,000 therms of natural gas, and more than 1.8 million kWh of electricity. These savings are achieved through site-specific auditing and the installation of measures such as insulation, appliance replacement, and air sealing. Installed weatherization measures save residents an average of $300 per year on energy costs, bringing low-income customer utility payments closer to parity with their non-income qualified counterparts.

CEO partners with eight local agencies throughout the state to provide weatherization services. Local service providers include Arapahoe County Weatherization Division, Boulder County Housing Authority's Longs Peak Energy Conservation, Energy Outreach Colorado, Energy Resource Center, Housing Resources of Western Colorado, Northeastern Colorado Association of Local Governments, Northwest Colorado Council of Governments, and Pueblo County Department of Housing and Human Services.

LOW-INCOME ENERGY SERVICES | Weatherization Assistance

Weatherization Income Eligibility Chart

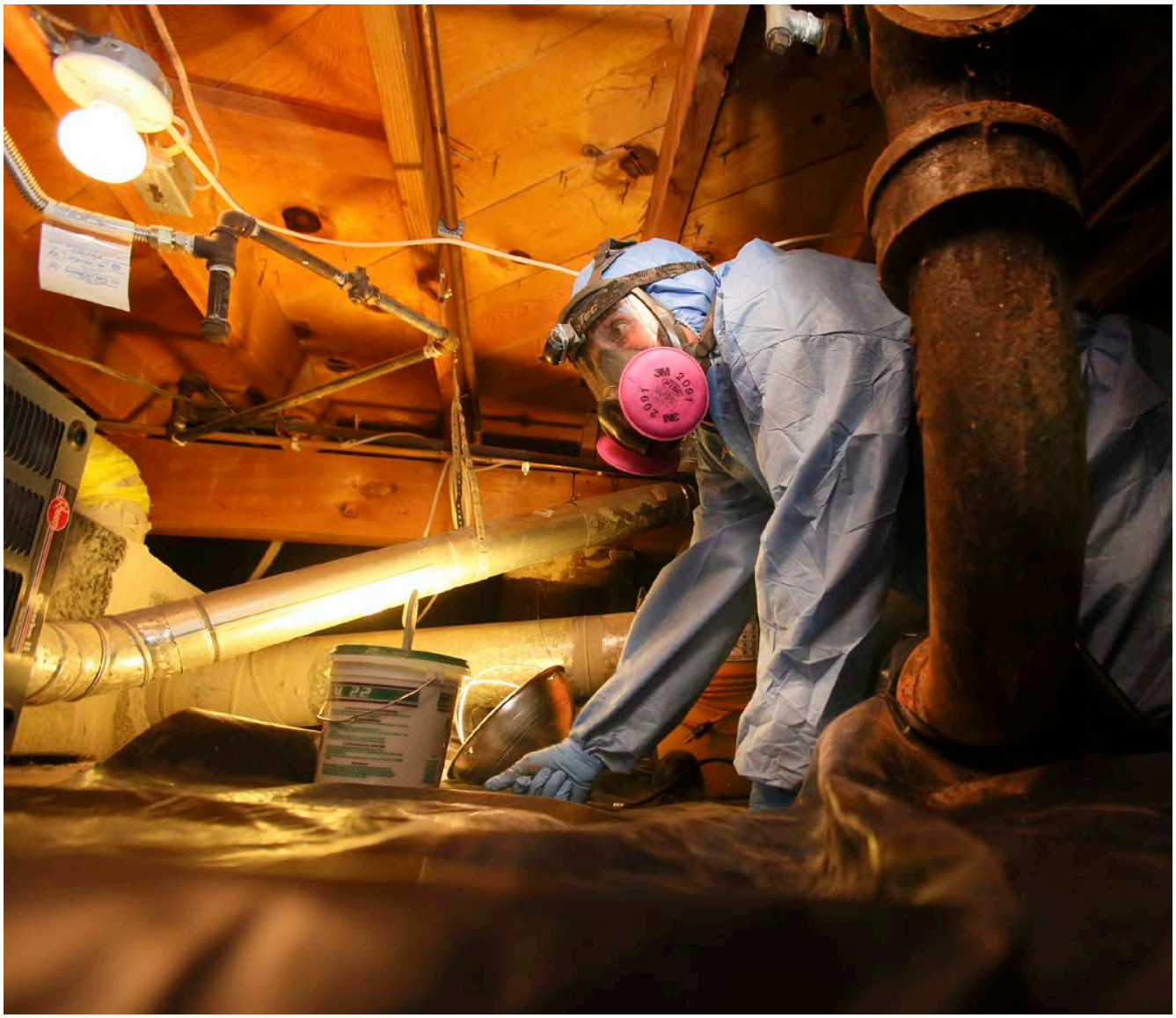
Number of Household Members	Gross* Annual Household Income
1	$23,760
2	$32,040
3	$40,320
4	$48,600
Each Additional Person**	$8,320

* Gross income means before tax.

**Add $8,320 income per year for each additional person above four in the household.

FY15/16 Weatherization Measures

Insulation Installed	Over 2.25 million square feet
Furnaces Replaced	Over 930
Water Heaters Replaced	Over 350
Refrigerators Installed	Over 890
Low-Flow Showerheads Installed	Over 1,500
CFL Light Bulbs Installed	Over 19,700
LED Light Bulbs Installed	Over 10,335



HIGHLIGHT: Housing Services of Western Colorado

The Colorado Energy Office (CEO) works with eight governmental and nonprofit organizations throughout the state who offer low-income energy services (weatherization) to their communities. Weatherization serves to address energy burden (the portion of a home's income spent on energy in low-income households) by reducing heating and electricity costs.

Housing Services of Western Colorado will celebrate its 40th anniversary as one of these agencies in 2017. The agency serves Mesa, Delta, Gunnison, Montrose, San Miguel, Ouray, Hinsdale, Dolores, San Juan, Montezuma, La Plata and Archuleta counties.

According to Katie Bowman, the agency's executive director, the majority of the organization's clients belong in at least three of these four categories: energy burdened households, elderly, disabled, and people with children five years old or younger. The energy burden averages $400 per year per client, she said. The citizens in these western Colorado counties have modest incomes. According to the 2010 census, Mesa County's median household income was less than $40,000 per year.

"Our organization's goal is to provide self-sufficiency one home at a time," Bowman said. "We provide education long term. To see things as a hand up, not a hand out, is our philosophy."

Housing Services of Western Colorado has worked with CEO and GRID Alternatives on a solar demonstration project for low-income communities in Colorado. The organization provided marketing support for the Grand Valley Power Project in Grand Junction and the Delta Montrose Electric Association project in Montrose, part of the first community solar demonstration project in the nation.

"We are really focused on getting our self-help clients to participate in the program," Bowman said. "We have 90 homes in Grand Valley Power who qualify for the program."

LOW-INCOME ENERGY SERVICES | Low-Income Community Solar

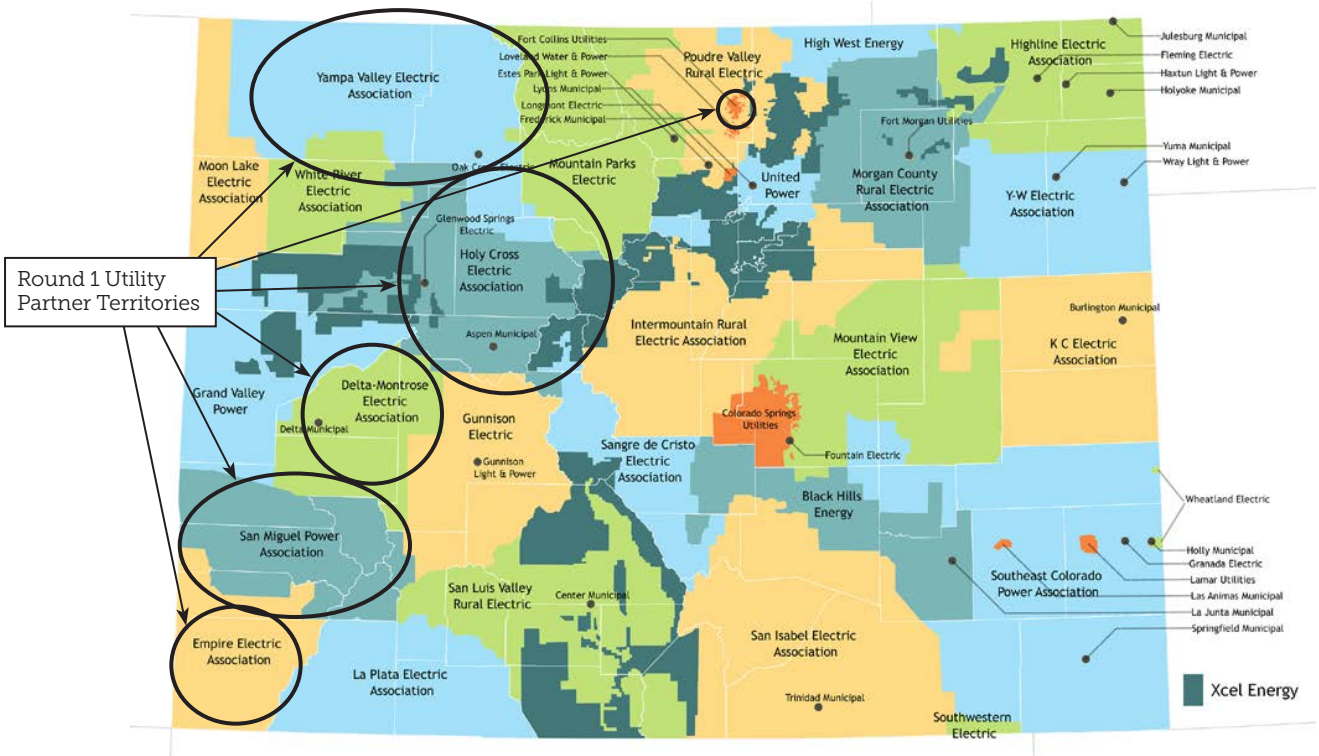
While the average household in Colorado is fortunate to spend less than 3 percent of household income on home energy needs, low-income households are usually "energy burdened," spending 4 to 10 percent. And too frequently these households are in "energy poverty," spending well in excess of 10 percent of household income on energy needs.

The Colorado Energy Office (CEO) dedicates a significant portion of its effort to delivering cost-effective energy efficiency services (weatherization) to these households, directly reducing household energy burden and mitigating the impacts of energy poverty. Weatherization is particularly effective at reducing home heating costs, through tightening and insulating homes and improving furnace efficiency. The emerging challenge identified by CEO is having a comparable impact upon home electricity costs.

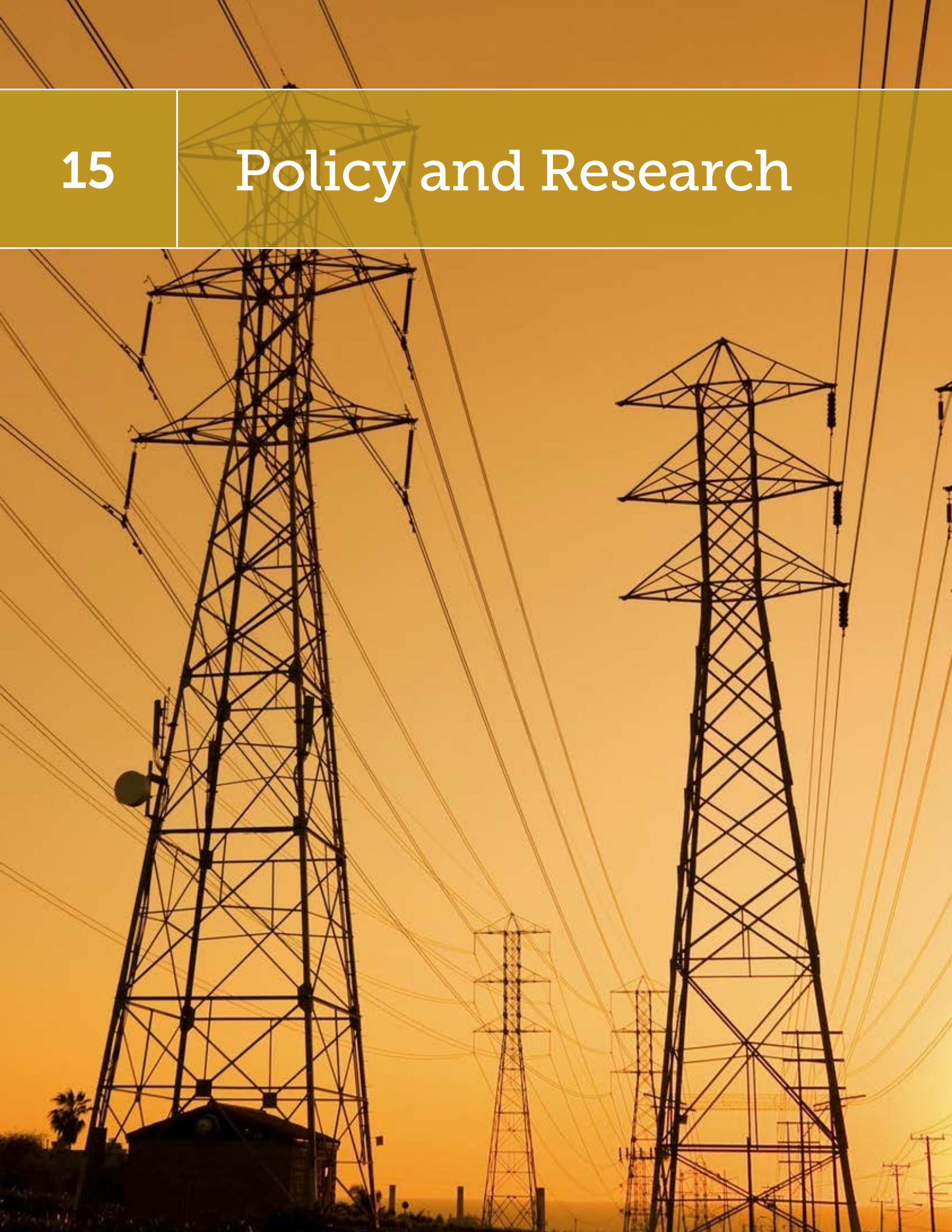
As part of an effort to more effectively address electricity costs of low-income customers, CEO launched the Low-Income Community Solar Demonstration Project in 2015. The project offers affordable community solar options to the same households that are eligible for weatherization assistance services. Up to 12 community solar models will be developed by CEO through its grant recipient, GRID Alternatives, in fiscal years 2016 and 2017. Cumulatively, the models will serve approximately 300 income-eligible families and will amount to at least 1 megawatt of installed solar capacity.

CEO currently is working with six utility partners to create distinct community solar models. Each will test a different approach to cost recovery, pricing and customer selection. Partners include Empire Electric Association, Delta Montrose Electric Association, Holy Cross Energy, San Miguel Power Association, Yampa Valley Electric, and the City of Fort Collins Utilities. On average, subscribers to each community solar model are expected to save 40–50 percent annually on their energy bills as a result of innovative crediting structures developed by each utility partner.

Colorado Electric Utility Service Territories



15 Policy and Research



POLICY AND RESEARCH | Legislative Summary

During the 2016 legislative session, the Colorado Energy Office (CEO) monitored and analyzed a wide range of bills related to energy production, electric utilities, energy efficiency, renewable energy, and alternative fuel transportation, and provided technical subject matter support to legislators. CEO worked collaboratively with the General Assembly to pass its two department bills, HB16-1332 and SB16-171. CEO's success was due to the strong leadership from the bill sponsors, support from broad stakeholder coalitions, and overwhelming bipartisan support. These bills are directly connected to CEO's performance plan, and will assist CEO in achieving its goals to increase electric vehicle market share and reduce energy use for Coloradans.

SB16-171–Clarification of the New Energy Improvement District Statutes

Sponsors: Sens. Martinez Humenik and Scheffel and Reps. Tyler and J. Becker

The New Energy Improvement District (NEID) administers Colorado's Property Assessed Clean Energy (C-PACE) program, which allows commercial buildings to finance energy and water improvements. That financing is repaid through a voluntary special assessment placed on the property. In crafting this legislation, NEID and CEO worked with county treasurers, assessors, and attorneys to identify how to make PACE special assessments function more like other special assessments administered at the county level. This legislation, passing with unanimous support from both chambers, made changes to NEID statutes that county treasurers, assessors, and attorneys requested to improve the processing of PACE special assessments. These statutory changes have already resulted in additional counties planning to opt into Colorado's C-PACE program.

HB16-1332–Modifications to Alternative Fuel Vehicle Tax Credits

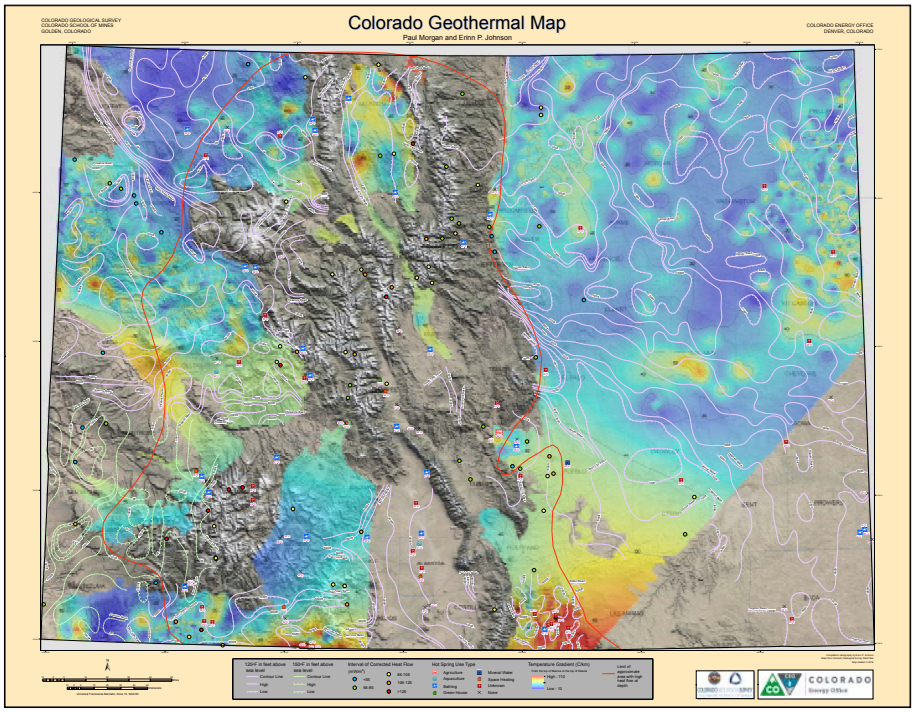
Sponsors: Reps. Duran and Rankin and Sens. Scott and Johnston

Colorado offers income tax credits for the purchase of alternative fuel vehicles. The credit applies to a wide range of vehicles from passenger cars to semi-trucks, and to a wide range of fuel types, including electric, natural gas, propane, and hydrogen. This legislation, passing nearly unanimously, streamlined and simplified the tax credit calculation and provided a voluntary option for credit assignability during vehicle financing. These changes will make it easier for consumers to understand, simpler for dealerships to promote, and clearer for the Colorado Department of Revenue to administer.

Colorado is home to numerous geological formations that represent a potentially significant renewable energy resource: "geothermal energy." These resources would be ideal for various direct uses including heat pumps or electricity generation. Colorado ranks high among western states in the number of potential geothermal project sites.

The Colorado Energy Office (CEO) promotes geothermal resource development, and has focused on making resource data and feasibility studies available for local communities wanting to develop geothermal projects. During fiscal year 2016, CEO completed an economic assessment on geothermal for the town of Rico, and updated the state's geothermal heat gradient maps, illustrated below.

Rico is a town of about 250 residents that has suffered economic challenges since mines producing silver, zinc and lead closed their doors, along with the closure of a local sulfuric acid plant. With these job losses, the town residents are looking for a way to invigorate their economy through tapping this resource.



The presence of hot water deep below the earth's surface may be a pathway to the rebirth of this small mountain town. The resource is warm enough to support a variety of direct uses that could provide Rico with opportunities for economic development and growth.

CEO partnered with the Colorado School of Mines to perform an economic assessment of the geothermal resource in Rico. The assessment identified three potential direct-use projects. All three are supported by local residents and by the town of Rico's Master Development Plan Committee.

Economic models and forecasted revenue streams were created for a hot springs spa, a geothermal greenhouse focused on food production, and a district-level heating system. All of the options will need committed community stakeholders, development partners, and access to financing. CEO is working with community leaders on the next steps with the goal of assisting Rico to become a geothermal development leader in Colorado.

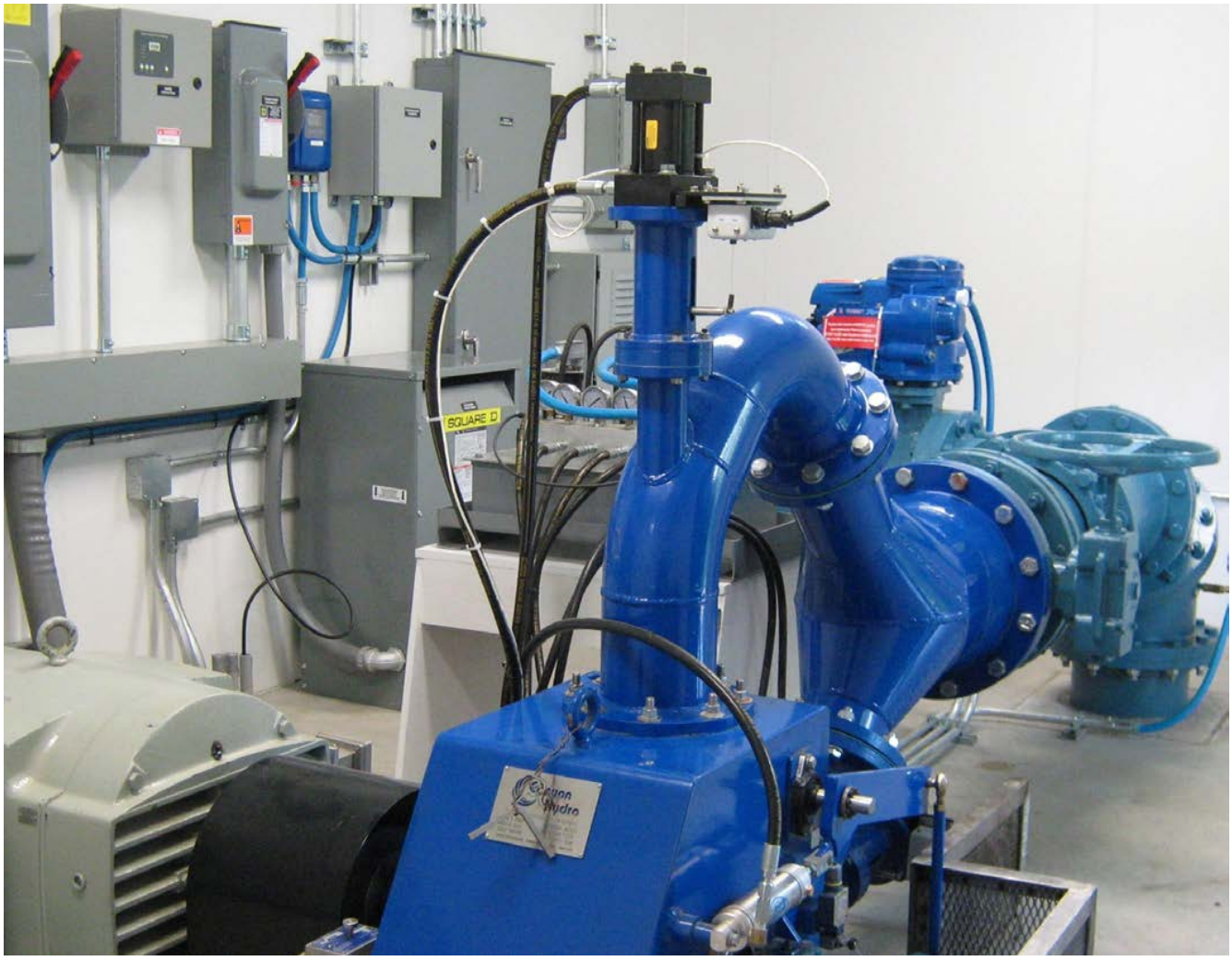
POLICY AND RESEARCH | Hydropower

The Colorado Energy Office (CEO) works to uncover Colorado's potential for hydro-based electric generation through specific types of cost-effective small hydropower projects. As one significant step forward in this effort, CEO produced a PRV–Hydropower Market Assessment that identifies hydropower opportunities within water utility delivery systems where pressure reducing valves (PRVs) are used to reduce water pressure.

To facilitate data collection and provide visual access to relevant data for this assessment, CEO developed an online mapping application called a geoportal. This database gives CEO the ability to refine the estimated potential of PRV–hydropower projects that could be developed.

This project identified two water utilities, the City of Montrose and North Table Mountain Water and Sanitation District, for case studies to examine PRV–hydropower projects within their systems. The studies determined that the potential projects are technologically and economically feasible. CEO next will work with the utilities on project development.

A conservative estimate is that there is 20 to 25 MW of hydropower potential in modifying PRVs in Colorado statewide. The projected potential of PRV to hydropower within the state and the detailed case studies point to a positive future for the development of this renewable energy source within the state of Colorado.



POLICY AND RESEARCH | Recycled Energy

In industrial processes that transform raw materials into useful products—at steel mills, paper plants, refineries, chemical plants, oil and gas pipelines—the resulting heat is wasted as a byproduct. Recycled energy—also known as "waste heat to power"—is the process of recovering the heat that would otherwise dissipate into the atmosphere and converting it into electricity with no additional emissions or fuel consumption.

Recycled energy reduces the energy costs to industrial facilities, and also reduces the total emissions of existing plants by offsetting electricity that would have been purchased from the grid. While recycled energy is classified as an "eligible energy resource" under Colorado's Renewable Energy Standard (RES), projects using this technology are not yet broadly deployed in the state, with only one or two projects in place.

Xcel Energy will offer incentives for up to 20 MW of renewable energy (over the next two years), thereby improving the economic case for new projects.

The Colorado Energy Office (CEO) is involved in several activities to help move the market for this technology.

In 2015, CEO contracted with ICF International to conduct a Colorado-specific study of recycled energy market potential:

- The goal of the Colorado study was to better understand the potential market for recycled energy in Colorado, while identifying key barriers to developing these projects and potential solutions.
- The study showed that there are 52 sites in the state where it would be economically feasible to generate more than 106 megawatts from recycled energy. Of those, 10 sites have a projected payback of less than five years.
- This research shows that there is significant potential to develop this underutilized clean energy resource in the state.
- CEO plans to expand this study in the coming year to include the market potential for smaller-sized systems and lower heat sources. CEO is helping to fund feasibility studies that ideally will lead to projects. As a follow-up to this study, CEO is partnering with the U.S. Department of Energy's Southwest Combined Heat and Power Technical Assistance Partnership program to offer no-cost feasibility assessments for four sites in the state with high potential for recycled energy systems.

POLICY AND RESEARCH | Colorado Energy Office Publications

Coal Mine Methane Market Research Study–2016

The study identifies and highlights opportunities to capture and redirect into productive use the coal mine methane (CMM) emissions from active and inactive coal mines in Colorado. Re-directing CMM emissions released during or as a result of coal mine operations has the double benefit of repurposing an otherwise wasted resource while also reducing the adverse impact of methane upon the environment. CMM is an energy resource that is severely underutilized nationwide. This study is a catalyst for industry stakeholders to recognize and act upon CMM opportunities within Colorado.

Colorado Customer-Sited Energy Study–2016

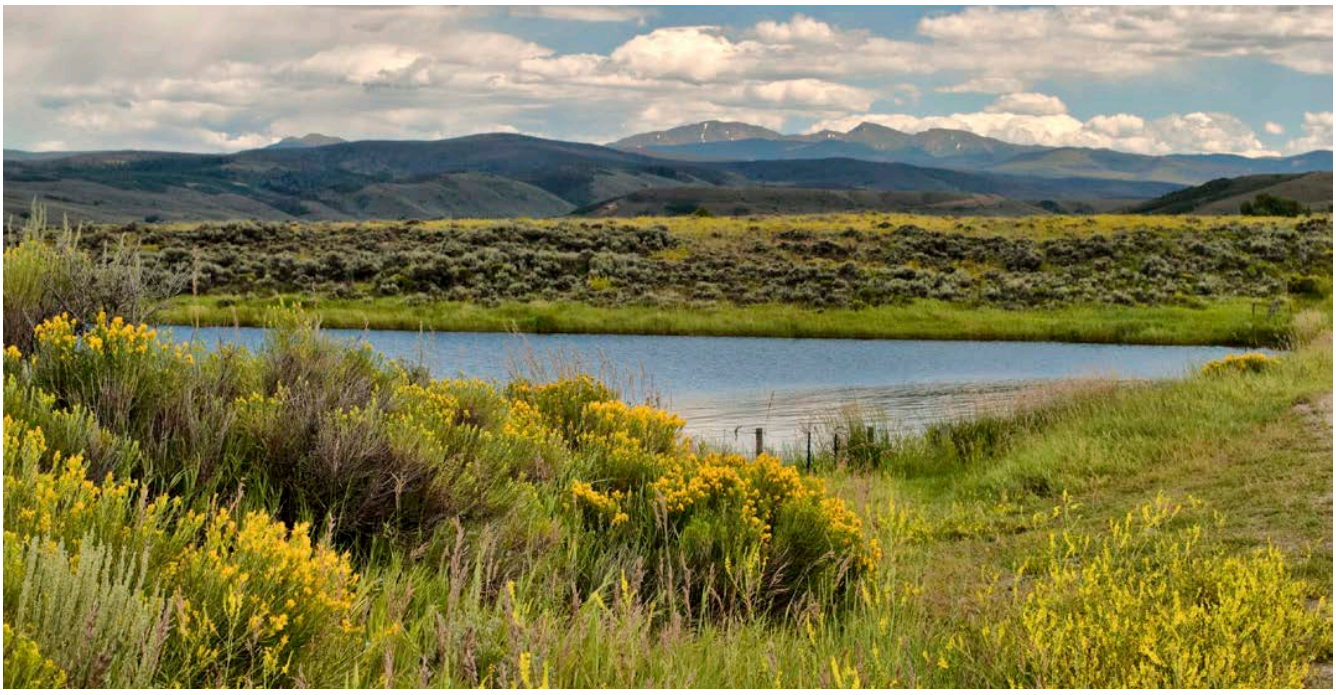
This study provides an overview of the deployment of customer-sited energy systems in Colorado, such as wind, solar and geothermal. The results identified gaps in energy system data and recommended best practices for permitting that can help streamline the process for reporting and tracking the information. Better data makes these markets more accessible to prospective investors and supports more informed policy decisions.

Greenhouse Gas Neutrality Assessment–2016

In 2013, Colorado's Renewable Energy Standard (RES) added energy produced from coal mine methane (CMM) and synthetic gas produced by pyrolysis of municipal solid waste (MSW) as qualified energy resources for meeting the standard. "Greenhouse Gas Neutrality" is a condition placed upon the eligibility of these resources to qualify for RES compliance. This assessment provides a framework and evaluation tools for project developers and the Colorado Public Utilities Commission (PUC) to determine the greenhouse gas neutrality of CMM and MSW projects.

STEM Natural Resources Survey–2016

Colorado's education system has a vested interest in teaching about Colorado's energy and natural resources, and cultivating talent among our next generation. Filling future industry gaps and positions is critical to sustaining this sector. This survey aimed to better understand the availability and utilization of science, technology, engineering and math (STEM) curriculum related to natural resources and energy issues among high school students.



Colorado Recycled Energy Market Overview–2016

Recycled energy in Colorado is more commonly known nationwide as waste heat to power (WHP), which is a process of capturing heat from industrial processes and utilizing that heat to generate electricity. This report assesses the recycled energy market in Colorado, incorporating market and policy trends for this industry to provide policy and program recommendations for encouraging recycled energy adoption in Colorado.

Updated Colorado Energy Assurance Emergency Plan–2016

The State Emergency Operations Plan (SEOP) provides a framework for state agencies to coordinate their efforts during emergency situations. The SEOP prepares for situations ranging from natural disasters to cyberattacks that shut down Colorado's energy network either locally or statewide. This plan aims to create awareness of energy security issues for the state of Colorado and describes how to most effectively and efficiently address and identify these issues as they arise.

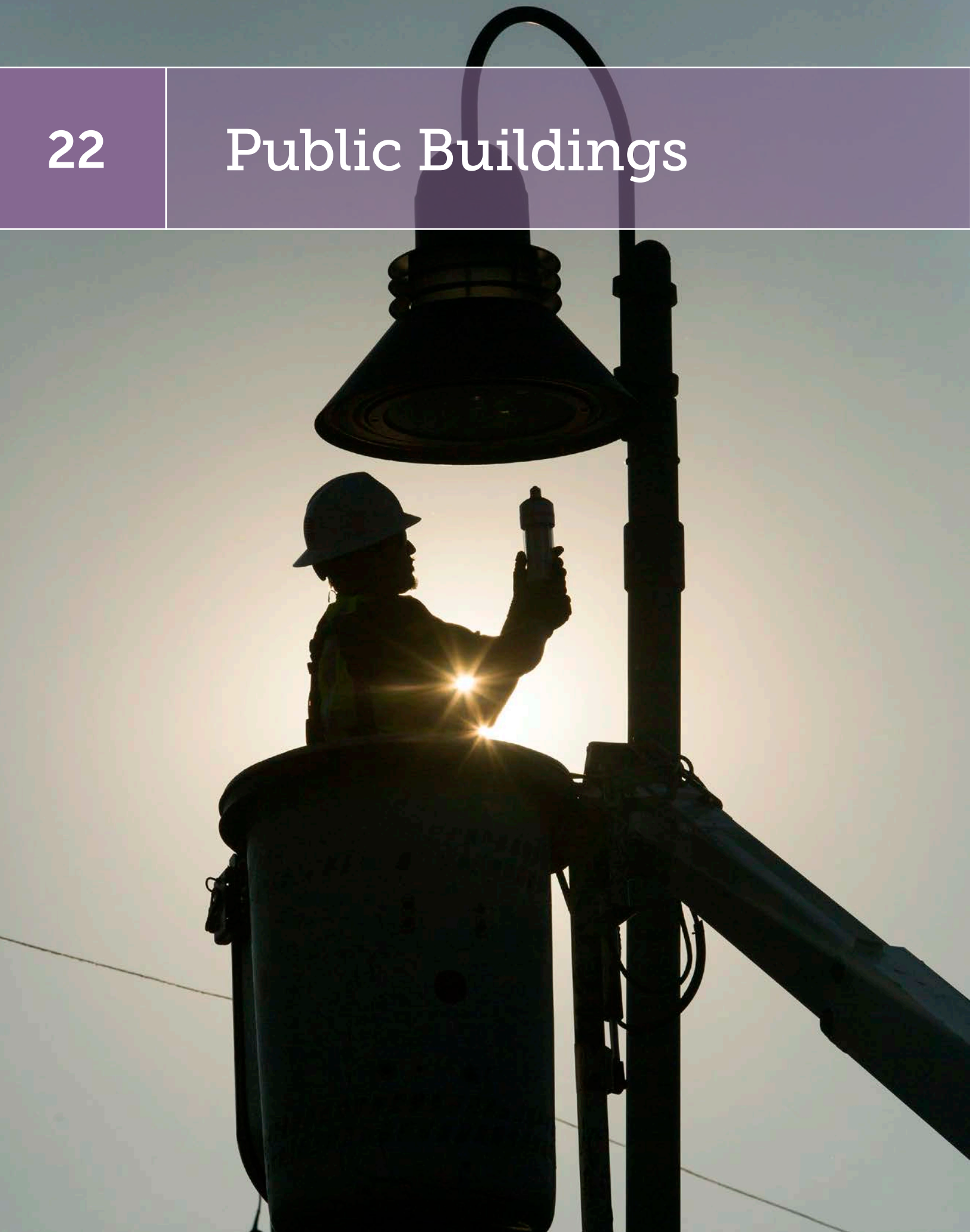
Low-Income Community Solar–2015

Since 2010, solar gardens have been required by law to maintain a 5 percent carve-out for low-income residents. This is the first comprehensive report on the effectiveness and current opportunities for low-income energy customers to participate in solar gardens. This report helps stakeholders gain a better understanding of best practices for the industry. It aims to increase the usage and access to community solar for Colorado's potentially low-income subscribers.

Updated Small Hydropower Handbook–2015

This handbook is a step-by-step guide to permitting, designing and building small hydropower systems in Colorado. The handbook provides information to evaluate Colorado's existing hydropower sites and hydropower's untapped potential. Outlining steps in small hydropower project development, the handbook is a valuable tool for project developers considering the construction and operation of a hydropower system.

22 Public Buildings



PUBLIC BUILDINGS | Energy Performance Contracting

The Colorado Energy Office's (CEO) Energy Performance Contracting (EPC) Program helps public building owners reduce energy consumption with no upfront cost to the owner. Through the EPC Program, a building owner can finance energy efficiency improvements and pay back the financing through annual utility cost savings resulting from the usage reductions.

Public jurisdictions can select an energy service company (ESCO) from CEO's list of pre-qualified ESCOs to conduct high-quality energy efficiency audits, the results of which provide a guarantee of utility cost savings. ESCOs identify areas for improvements such as lighting and other electrical, mechanical and plumbing upgrades that can reduce utility expenses and address long-standing, controlled maintenance needs in public facilities. CEO delivers free assistance in stewarding technical, legal and financial aspects of energy performance contracting throughout the life of the project.

Participation in the program starts with a Memorandum of Understanding between CEO and the public building owner and an agreement to select one of CEO's pre-qualified ESCOs. High standards for success are maintained by CEO to achieve the building owner's goals. State- and industry-approved contracts, rigorous audit protocols, guidance documents, communication protocols and toolkits aid in the selection of an ESCO and assist in securing private sector financing.

Since Colorado established its Energy Performance Contracting Program in the mid-1990s, 146 public jurisdictions have worked with an ESCO to identify nearly $31 million in annual utility savings through a technical energy audit. Because each technical energy audit is "investment-grade," the ESCO's guarantee of utility savings has been leveraged to attract financing for more than half-a-billion dollars in capital improvement funds. As of June 2015, 194 EPC projects have improved the performance of public school and university buildings, veterans facilities, libraries, parks, community centers, wastewater treatment plants, prisons and other government buildings in communities across 75 percent of Colorado's counties.

HIGHLIGHT: City and County of Denver

The City and County of Denver was able to achieve energy efficiency and lower utility costs in its facilities through the Colorado Energy Office's (CEO) Energy Performance Contract (EPC) Program. Implementing energy efficiency improvements through the EPC Program requires no upfront cost, offers an ability to combine improvements on one or more facilities under one project, and the investment is paid off through annual utility savings.

"The intent was to evaluate energy conservation measures in several buildings and take a look at what we could implement in a short time frame," said David Basich, Energy Manager for the City and County of Denver.

Denver chose an EPC project that would provide an average of 17 percent energy efficiency savings for 14 participating buildings at a total cost of $2 million. The $2 million investment will be paid back in 15 years through energy efficiency savings. The buildings in the project include libraries, recreation centers, fire stations and police district buildings.

This is Denver's first EPC project, Basich explained. EPC was chosen because the savings are guaranteed and the diversity of the buildings shows that this process is effective with a wide variety of facility types.

The EPC professional-grade audit identified energy efficiency measures such as: interior and exterior lighting, lighting controls, energy management control upgrades, and pump improvement measures, particularly with pools.

While most energy efficiency upgrades won't be noticeable by the general public, lighting changes from a yellowish color to a brighter white light will be noticeable.

"Working in conjunction with the Colorado Energy Office made it a lot easier," Basich said. "One benefit was having staff that could help us through the RFP process and list of pre-approved vendors (ESCOs), along with authenticating the measurement and verification process as well."

PUBLIC BUILDINGS | Energy Savings for Schools

Colorado schools, especially in rural or lower income districts, are finding that high energy costs may be draining their education budget, but school districts are in a weak financial position to pay for building upgrades. The average Colorado school building is 41 years old. The U.S. Environmental Protection Agency estimates that inefficient K12 school facilities waste more than 30 percent of energy per year.

The Colorado Energy Office's (CEO) Energy Savings for Schools Program (ESS) provides technical resources to all schools, particularly rural and low-income schools across Colorado, for energy/water efficiency and renewable energy, and provides a consolidated platform for all of CEO's K12 supported programs. The ESS Program includes a free energy audit, preliminary renewable energy assessment, technical and implementation support, and energy coaching. Schools also are connected to other resources that can help them meet their energy goals. The ESS Program works with more than 20 schools per year to achieve measurable savings and create sustainable energy programs.

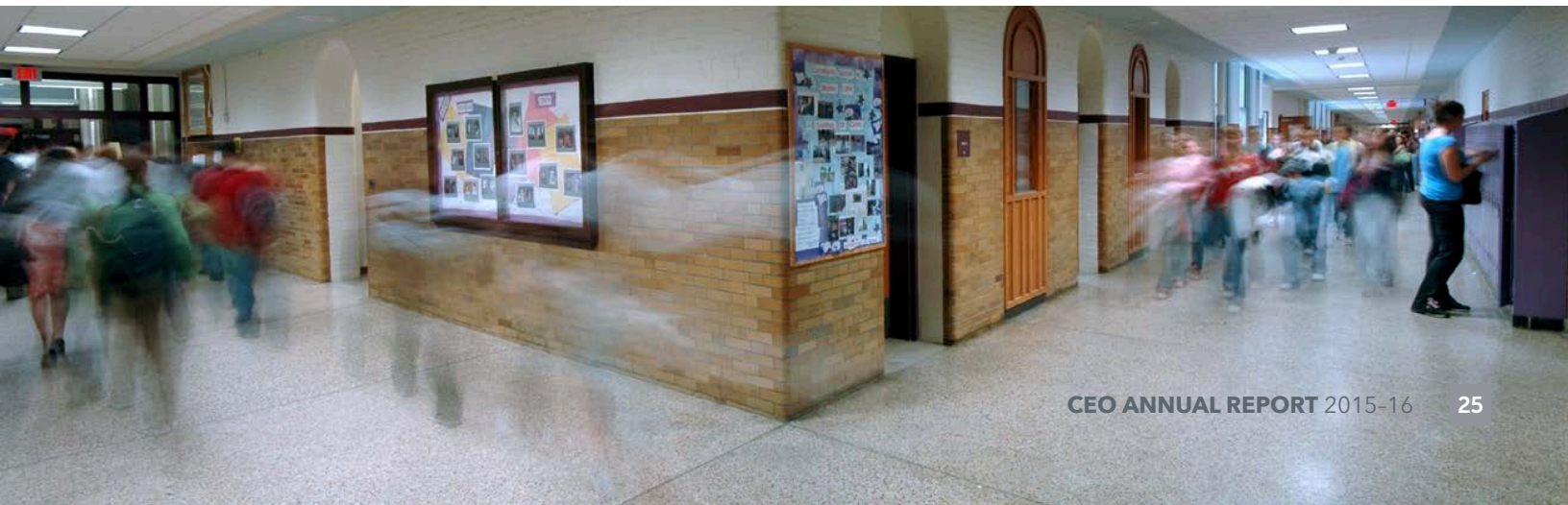
Program Success to Date:

- 21 schools are enrolled in the ESS Program
- 1,849,490 kWh of electrical savings, 108,140 therms of gas savings, and 2,097 kgallons of water savings have been identified
- Over $733,600 in grants has been secured to help schools finance project implementation.
- An exchange component of the program has been developed with the objective to provide a long-lasting, self-sustaining, and capacity-building platform for schools to develop relationships with other schools and to learn from their experiences.

The ESS Program helps schools to implement energy efficiency measures and leverage low- to no-cost options to pay for upgrades that yield long-term benefits for Colorado. Schools reap the benefits of lower monthly utility bills and higher classroom comfort and safety, and students increase their energy literacy and gain a valuable understanding of how their behaviors influence consumption of resources.

ESS also connects school districts to other CEO K12 programs, potential funding sources, and a peer network for sharing best management practices and successes. Programs supported by CEO include:

- Supplemental Environmental Projects Program (SEP) through the Colorado Department of Public Health and Environment
- High Performing Schools Program
- CEO's Energy Performance Contracting
- Renew Our Schools Program
- Renewable Energy and Energy Efficiency for Schools Loan Program (REEES)



PUBLIC BUILDINGS | Greening Government

On Oct. 28, 2015, Gov. John W. Hickenlooper signed Executive Order D 2015-013, *Greening of State Government*. This executive order established the Greening Government Leadership Council (GGLC), responsible for environmental leadership across the state agencies, and for establishing new one- and five-year goals for reductions in energy, water, and petroleum consumption, greenhouse gas emission reductions and improvements in environmental purchasing.

The Colorado Energy Office (CEO) has been integral in supporting the GGLC by developing and documenting performance baselines and evaluation protocols for each of the goals, creating templates for annual reporting, entering data in EnergyCAP (the state's utility database), and providing feasibility studies for Energy Performance Contracting (EPC) projects on state-owned facilities.

Baseline Documentation

After several months of stakeholder engagement, the GGLC endorsed baselines and evaluation protocols for each of the five goals. This is essential to show that state agencies are on track to meet the goals established by the Executive Order and provide an annual evaluation process that is easy to replicate each year. CEO coordinated stakeholder meetings on each of the goal areas, researched what other states and the federal government are doing in these areas, and drafted and finalized the documents that outline the baselines and protocols for annual evaluation.

Annual Reporting Templates

CEO created templates for the annual report card and agency energy and water management reports for the GGLC's reporting use. These reports will be completed by GGLC representatives and their respective agency "green teams" and presented to executive directors by Oct. 31 of each year. A summary report of all executive agencies in the state will be presented to the governor and cabinet by Dec. 15, 2016, and each year thereafter.

Technical Support

Staff at CEO have provided technical support for documenting baseline criteria and uploading data into EnergyCAP. CEO is coordinating ongoing, high-level, feasibility studies at roughly 750 buildings for EPC projects for each agency as outlined in the Executive Order. Following this, CEO will work with each agency to identify the best candidates for EPC.

Colorado State Capitol—Retro-commissioning and LEED Certification

In fiscal year 2016, the Colorado State Capitol became the first state capitol building in the United States to pursue the LEED Dynamic Plaque. The LEED Dynamic Plaque is a tool to help manage building performance data such as energy and water usage. It also will help maintain the Capitol's LEED certification. The building was the first LEED-certified state capitol in the country when it was initially certified in 2008. As a part of the project, the building went through a retro-commissioning study to evaluate all of its energy and resource consuming building system components. Through the evaluation, low-cost and no-cost savings measures were developed and then implemented by Colorado Department of Personnel and Administration to realize the savings potential.

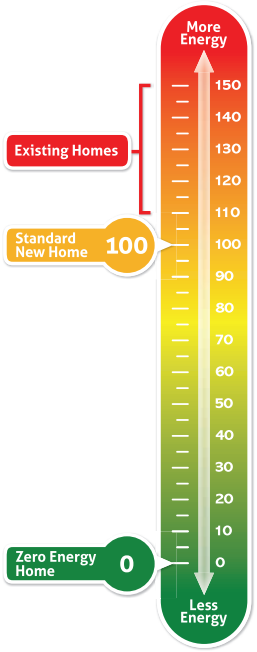
27 Residential

RESIDENTIAL

New Homes and Energy Codes

The Colorado Energy Office (CEO) continues to address energy efficiency of the new home construction market through various residential training offerings including energy code trainings.

Over the last nine years, CEO's Residential program has worked with industry stakeholders to increase use of the Home Energy Rating System (HERS) Index. In fiscal year 2016, there were 8,832 HERS ratings conducted for single family homes in Colorado, resulting in a statewide average HERS rating of 55. The HERS Index is a miles-per-gallon rating for a home. Generally, a rating of 100 means that the home is 2006 code-compliant regarding energy features. Colorado improved the average HERS rating from 57 in 2015 to 55 in 2016, which means homes built in 2016 are 45 percent more efficient than a home built to the 2006 code.

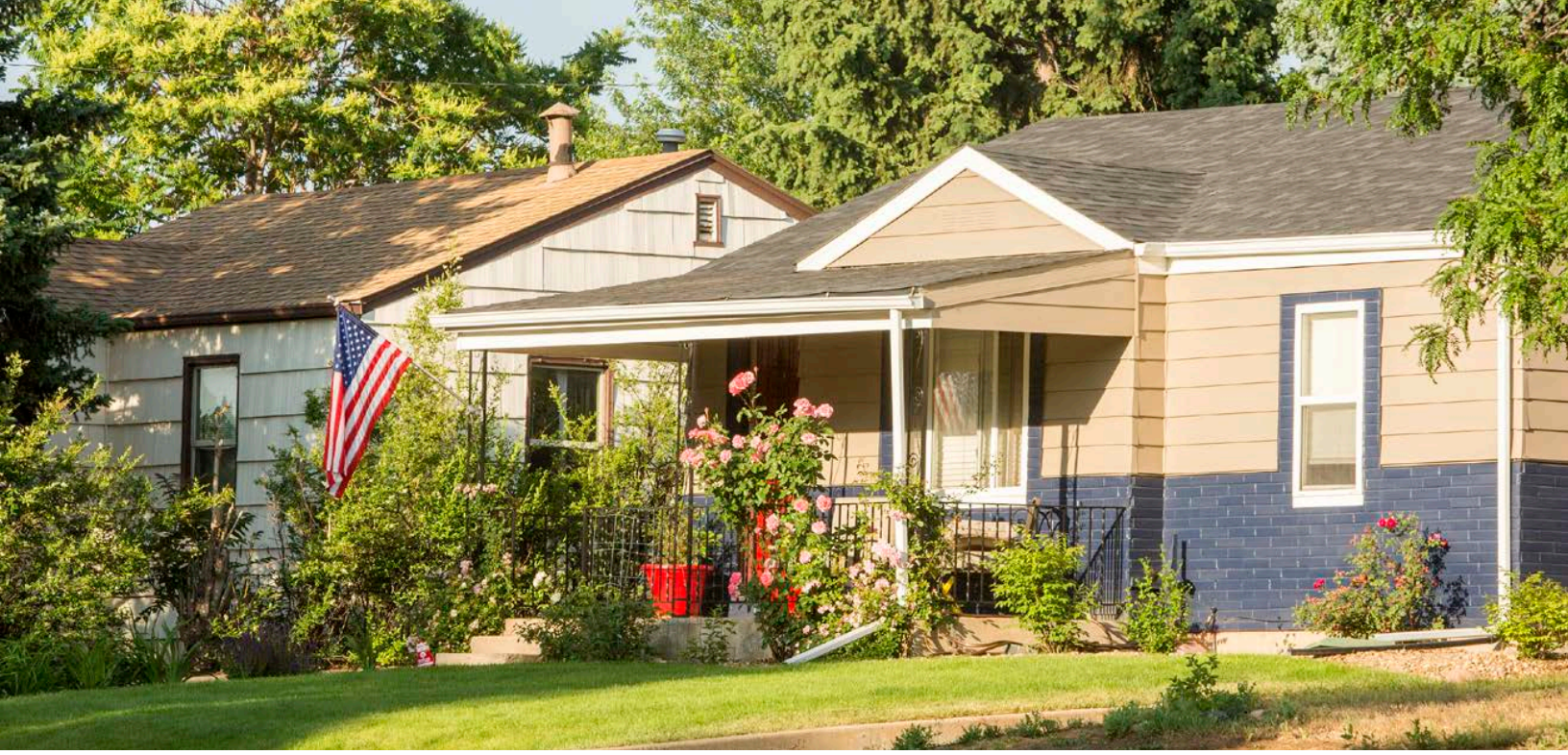


CEO focused much of its work in fiscal year 2016 on Colorado Springs, working with six builders to make HERS Index and code compliance recommendations. CEO targeted Colorado Springs after reviewing HERS Index data, which showed a market penetration rate of less than 15 percent of all new homes receiving a rating compared to 67 percent in the Denver metro area or 50 percent statewide. Energy improvements included increasing the use of LED lights, installing 0.70 energy factor hot water heaters instead of 0.58 energy factor ones, and training to improve installation of insulation. Based on these findings, in fiscal year 2017, CEO will provide additional trainings for builders in the Colorado Springs market.

Commercial Code Compliance Study

CEO continued to provide commercial building energy code trainings across the state and began a commercial code compliance study.

An energy code compliance checklist was developed for the study and site visits were scheduled in the 10 jurisdictions with the highest amount of commercial construction and renovation projects. With completion targeted for fiscal year 2017, the study will identify cost and energy savings and highlight opportunities for additional code training.

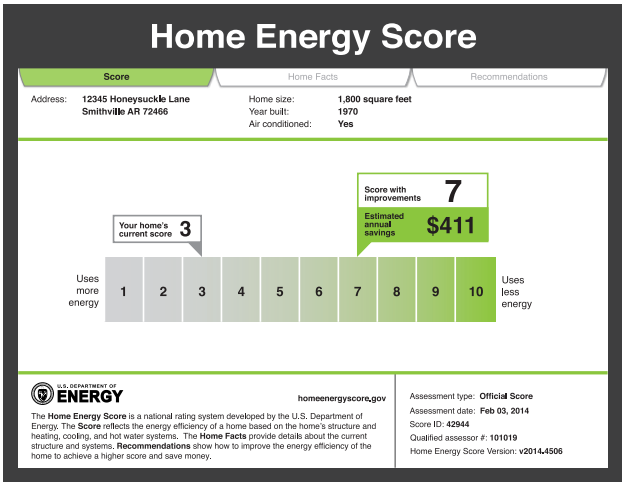


Existing Homes

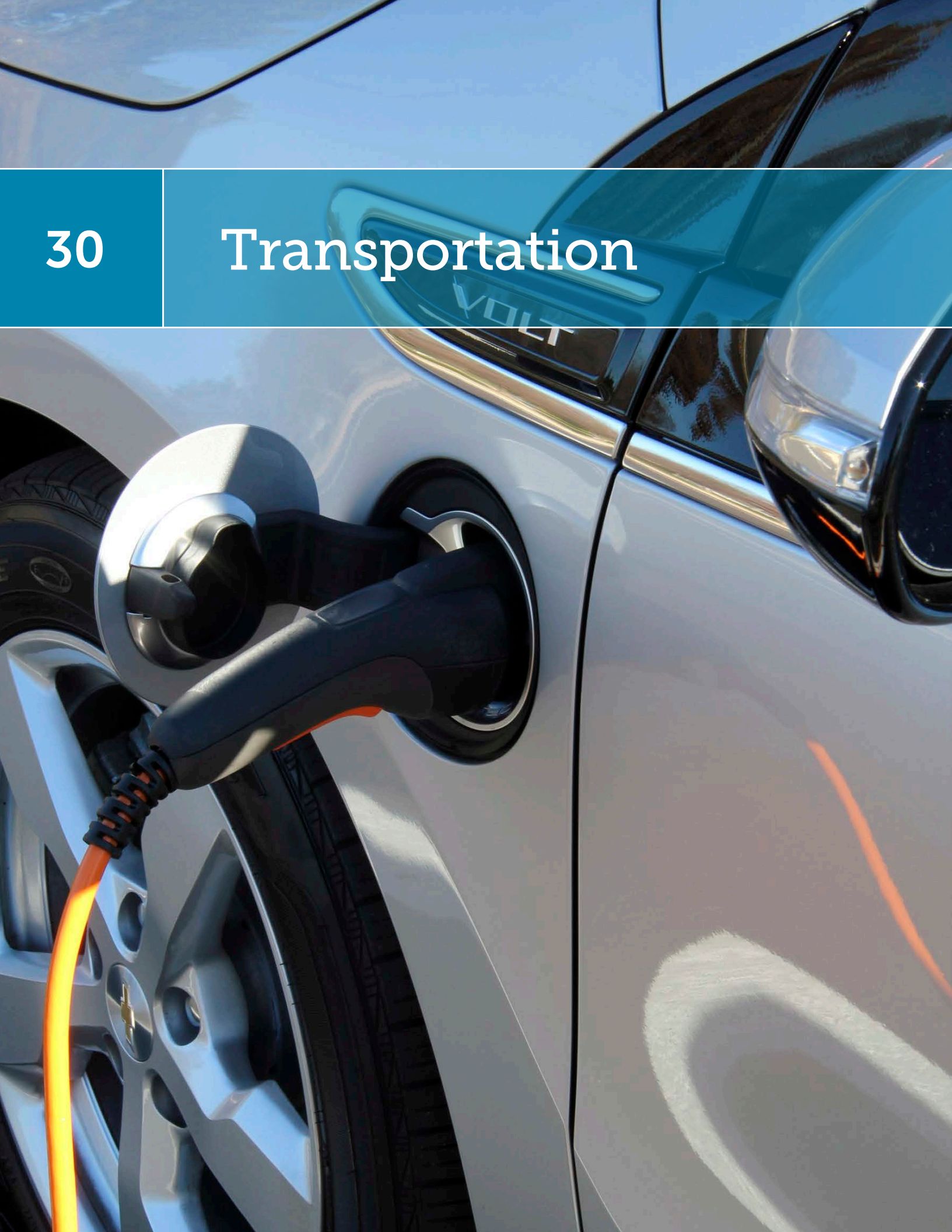
CEO launched the U.S. Department of Energy's (DOE) Home Energy Score (HES) platform on Sept. 17, 2015, at the Colorado Association of REALTORS® annual convention. The HES offers owners of existing homes an easy-to-understand assessment of their home's energy use to make educated choices about how to improve efficiency of their homes. It provides the market data to be used in energy efficient mortgage transactions. The HES also provides marketable features for real estate sales, and gives information for appraisers to use in their opinion of value. The data allow a homebuyer the ability to plan for future capital improvements and possible equipment failures.

Over the course of five years, CEO worked with real estate stakeholders to develop the necessary infrastructure for the HES to enter the Colorado market. CEO is now educating consumers and stakeholders on the value of this new tool.

CEO and DOE worked together to incorporate the HES into federal mortgage programs, including the U.S. Federal Housing Administration Energy Efficient Mortgage Program. This back-of-the-house work, in addition to bridging utility-sponsored audit platforms, will make it easier for consumers statewide to obtain a Home Energy Score and have a resource to help make energy efficient improvements at the point of purchase.



30 Transportation



TRANSPORTATION

Coloradans are choosing alternative fuel vehicles in increasing numbers. Colorado has a consistent, low price of electricity and compressed natural gas (CNG) per unit that makes the benefits of alternative fuels, such as better air quality and emissions savings, more attainable. Additionally, state tax credits, improved under HB16-1332, offer Coloradans the best value in the United States for purchasing alternative fuel vehicles.

The number of public fueling and charging stations also is increasing statewide with grants through the Colorado Energy Office (CEO). In fiscal year 2016, CEO's ALT Fuels Colorado program awarded grants for four new CNG stations and five previously funded stations came into service. CEO's Charge Ahead Colorado program awarded grants for the installation of 53 electric vehicle (EV) charging stations. This significant increase in charging and fueling infrastructure statewide is lowering "range anxiety" for drivers and empowering potential purchasers to make more confident investments in new transportation technologies.

CEO is committed to advancing Colorado's emerging alternative fuels markets and is setting plans for full natural gas vehicle (NGV) mobility along all interstate highways and several other critical statewide routes.

CEO's Refuel Colorado offers free technical assistance to fleets statewide by helping to identify monetary savings and other advantages for the conversion to alternative fuel vehicles. Refuel Colorado actively works with community leaders, fuel providers and auto dealerships to build self-sustaining local alternative fuel markets.

More information is at **RefuelColorado.com/Refuel-Colorado-fleets**.

HIGHLIGHT: TRANSPORTATION | Expanding Compressed Natural Gas (CNG) Infrastructure in Colorado

Colorado Springs Utilities (CSU) has had a commitment to the research and use of alternative fuel vehicles (AFVs) for some time. Toward this end, CSU opened its second public compressed natural gas (CNG) station in March 2016.

CSU worked with the Colorado Energy Office (CEO) to determine the level of Colorado Springs interest in CNG use and to find state and national programs that might support its project. The utility created the Natural Gas Vehicles and Infrastructure Project, an internal task force, to investigate the introduction of CNG vehicles into its fleet, as well as the development of publicly accessible CNG fueling stations in the Colorado Springs area.

"The goal of creating a CNG station and continuing research addresses more than regulatory standards or our commitment to environmental stewardship. Our goal is to be a leader in the promotion of alternative fuel vehicles and fueling stations," said Chris Lundquist, Colorado Springs Utilities Fleet Manager.

The CEO ALT Fuels Colorado grant program helped CSU to further its interest in using CNG for its fleet. The ALT Fuels Colorado grant program is designed to remove barriers to the adoption of AFVs by addressing the lack of fueling infrastructure. The program also addresses the initial costs of AFVs by providing incentives to offset incremental costs between AFVs and conventional vehicles.

CSU found that there was a CNG fueling deficiency in Colorado Springs. ALT Fuels Colorado awarded CSU grant funding for the construction of its second publicly accessible CNG station, and the Regional Air Quality Council provided a grant for the purchase of six CNG vehicles.

CSU isn't resting on these leadership efforts concerning CNG infrastructure. CSU is also investigating the possibility of using renewable natural gas (RNG) to power its fleet. RNG is natural gas manufactured from renewable sources, such as agricultural waste products. CSU continues to work with CEO and the Southern Colorado Clean Cities Coalition to research renewable natural gas development for use in its fleet.

HIGHLIGHT: TRANSPORTATION | Electric Vehicles (EVs) and Compressed Natural Gas (CNG)

EV Charging Stations

Charge Ahead Colorado is a program administered by the Colorado Energy Office (CEO) and the Regional Air Quality Council with a goal of improving air quality through encouraging the use of electric vehicles (EVs). Recently the program provided southeastern Colorado with the ability to move into alternative fuels through incentives for EV purchases and grants for EV charging station equipment.

In fiscal year 2016, a grant was awarded for the purchase and installation of four EV charging stations to be located in Springfield, Las Animas, Eads, and Lamar. The charging stations are located close to shopping in downtown areas, conveniently supporting the use of EVs as around-town vehicles.

The decision to apply for the Charge Ahead Colorado grant was made to increase charging ability in Baca, Bent, Crowley, Kiowa and Prowers counties, according to Stephanie Gonzalez, Southeast Colorado Enterprise Development executive director.

"We don't have any charge units for electric powered vehicles coming through our area, so we applied for dual charge units that let two cars power up at the same time," Gonzalez said.

CNG Stations

CEO's ALT Fuels Colorado grant program funded a CNG fueling station in Trinidad, leading the City of Trinidad to add CNG vehicles to its fleet.

The City of Trinidad uses CNG vehicles as work pick-up trucks, utilities department service vehicles and code enforcement vehicles for the city's police department.

CNG vehicles have been smoothly integrated into the City of Trinidad's fleet, according to Mike Valentine, Trinidad Utility Director.

COLORADO
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