Smart Savings

Practical Energy-Efficiency Policies That Will Save Coloradoans Money

CoPIRG Foundation

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CoPIRG Foundation

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Table of Contents

Executive Summary

Coloradans use more energy in their homes, businesses, and government buildings than they need to. This results in higher energy bills, adverse public health impacts, and environmental degradation. The more energy people use, the more power supply companies must build expensive base-load electrical generation. For example, Xcel Energy, Colorado's largest public gas and electricity utility, recently reported the second highest electricity rate increase in the country. This rate increase was largely because of the construction of a large new coal plant and a natural gas plant.

Fortunately, there are many practical ways to use energy more efficiently to save Coloradans money on their energy bills and protect public health. There are some programs already in place, such as energy sales savings goals for investor owned utilities. However, Colorado should do better. The American Council for an Energy Efficient Economy (ACEEE) ranked Colorado 19th nationally for its implementation of energy efficiency policies and current laws on the books.

Colorado needs to place more emphasis on implementing smart, practical energy efficiency policies that save consumers money by negating the need to build costly new power generation and transmission capacity and reducing the adverse public health consequences of current energy production. This report surveys ten policies Colorado could enact to promote energy efficiency statewide. Since these policies address different sectors of the Colorado economy, implementing several of them simultaneously would be a way to comprehensively promote energy efficiency in the Colorado economy and provide greater benefits to Colorado residents and businesses.

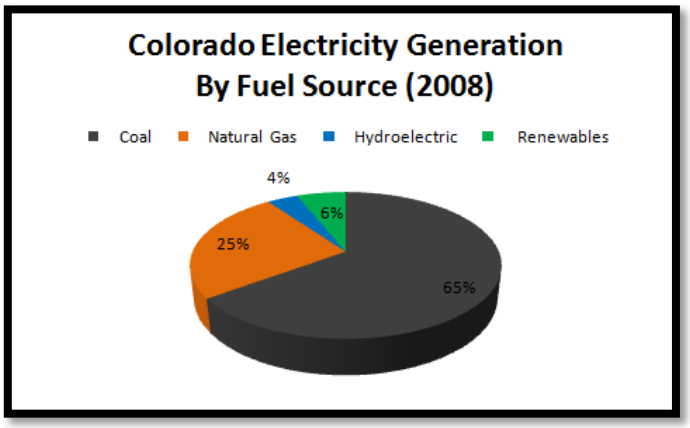
This report surveys the following policies:

1. Creating and Adopting an Energy Efficiency Rating System
2. Setting a Statewide Electricity Sales Savings Goals for All Colorado Utilities
3. Updating Building Energy Codes
4. Setting a Television Efficiency Standard
5. Requiring Homebuilders to Offer Energy Efficient Building Options for News Homes
6. Setting Goals for the Construction of Near Net-Zero Homes
7. Local Governments Opting-In to Property Assessed Clean Energy Financing (PACE)
8. Increasing Resources for Energy Efficiency Education
9. Increasing Energy Efficiency Standards or Resources for Schools and State Government Buildings
10. Requiring Existing Private Commercial Buildings to Reduce Energy Use

Introduction

Coloradans use more energy in their homes, businesses, and government buildings than they need to. This results in higher energy bills, adverse public health impacts, and environmental degradation.

The more energy people use, the more power supply companies will need to build base-load electrical generation, and this new generation is often very expensive. For example, Xcel Energy, Colorado's largest gas and electricity utility, recently reported the 2nd highest electricity rate increase in the country.[1] This rate increase was largely due to the building of a large new coal plant and a natural gas plant. [2]



In addition, as the graph on the right indicates, a lot of Colorado's electrical power generation comes from dirty fuel sources. [3] These dirty fuels have adverse public health effects. For example, in 2005, the National Academy of Sciences estimated that the sulfur dioxide emissions from burning coal cost the public $62 billion nationally in damages largely resulting from sickness and premature death from heart and lung disease.[4] In addition, generation of electricity from dirty fuel sources leads to water pollution and contributes to the problem of climate change.

Fortunately, there are many practical ways to use energy more efficiently to save Coloradans money on their energy bills and protect public health. For example, the Colorado Public Utilities Commission (PUC) sets goals to require that investor-owned utilities Xcel Energy and Black Hills Energy reduce their energy electricity sales by at least 10% by the year 2020 through the implementation of cost-effective energy savings programs. This has resulted in important savings for Xcel ratepayers. For example, Xcel estimates that annually its energy conservation programs save the energy required to power 50,000 homes.[5]

However, Colorado should do better. The American Council for an Energy Efficient Economy (ACEEE) ranked Colorado 19th nationally for its implementation of energy efficiency policies and current laws on the books.[6] In addition, many Colorado electric utilities do not offer programs to help their ratepayers reduce their energy use.[7] Colorado needs to place more emphasis on implementing smart, practical energy efficiency policies that save consumers money by negating the need to build costly new power generation and transmission capacity and reducing the adverse public health consequences of current energy production.

This report highlights policies Colorado could enact to prioritize energy efficiency. Since these policies address different sectors of the Colorado economy implementing several of them simultaneously would be a way of comprehensively promoting energy efficiency in the Colorado economy and providing greater benefits to Colorado residents and businesses.

Energy Efficiency Rating System

Policy: Require all properties to display at the time of rental or sale an energy rating that differentiates energy efficient properties with energy inefficient properties.

The energy cost of operating a home, rental unit, or commercial property is an important consideration for individuals or businesses when they are looking to rent, lease, or purchase property. For many Coloradans, energy expenditures are a sizable fraction of their budget. For example, low-income Coloradans may spend 15% of their income on home energy costs.[8] In addition, small businesses often spend a larger share of their budgets on energy costs than large businesses. The Small Business Administration found that small businesses spend 4.6% of their revenue on their energy bills, which is a much larger share than most large companies.[9]

Unfortunately, too often the energy efficiency of a property is very difficult for prospective buyers or renters to determine. This increases the risk that the buyer or renter would get stuck with a property with unexpectedly high energy bills due to the energy inefficiency of the property. Requiring sellers or landlords to provide a simple energy efficiency rating for the property would allow consumers to take these costs into consideration and shop around. In turn, this increased transparency would provide an incentive for sellers and landlords to invest in energy saving upgrades.

This rating system is particularly critical in the residential rental market because it helps solve a flaw in the marketplace that does not occur in the residential purchasing market. Property owners benefit from spending $10, $50, $200, or $1000 on energy efficiency measures because they will save more than that on their energy bills over time. The U.S. Department of Energy estimates that spending around $500 on energy efficient upgrades will save consumers an average of $400 on their annual utility bills.[10]

However, this is not true in the rental market because most landlords do not pay the energy bills for their property. Therefore, they do not see how they can directly benefit from energy efficiency investments and have little to no incentive to spend money on these cost-saving measures. Unfortunately, tenants also lack an incentive to invest in energy savings measures because despite paying the energy bills and seeing the savings on their energy bills, they do not usually rent a property long enough to break even from any substantial investment. This results in a broken market where renters are stuck with extremely energy inefficient rental properties and unnecessarily high energy bills.

Requiring all units to display an energy rating would go a long way to fixing this broken market by providing a financial incentive for landlords to improve the energy efficiency qualities of their units. This transparency allows potential renters to shop around and take potential energy costs into consideration and financially rewards landlords who invest in energy savings.

The Rating System

There are a number of rating systems that the state can turn to for examples. However whatever system that Colorado implements should have the following characteristics:

1. Simple to understand for buyers and renters such as a color system (eg. Red, Green, Blue), or 0-100 score index, such as the home energy rating system (HERS) index.
2. Include the amount of money that is being lost or saved in utility bills as a result of the property's energy efficiency as compared to similar properties.

3. Displayed prominently so it is easy to compare with other properties.
4. Detailed enough to establish significant score differences between the most efficient and least efficient properties.
5. Takes into consideration the cost and technical difficulty for the seller or landlord. Expensive upgrades that require a substantial investment maybe too difficult for landlords to afford.

The state could use an existing efficiency rating system such as the Home Energy Rating (HERS). This system has a 0-100 scale with the most efficient home receiving a score or 0.[11] To receive the score, a home often undergoes an air blower door test and a duct test to identify the leakiness of the home and its ducts among other things.[12]

Another option would be for a state agency, such as the Governor's Energy Office (GEO), to develop a residential rating system. Beyond developing and requiring a rating be prominently displayed, Colorado could also require upgrades for a building with poor energy performance results.

Alternatively, Colorado could require sellers or landlords to perform a simple energy audit and display the audit. For example, the City of Austin, Texas started a program in June 2009 that requires all residential or commercial properties for sale to undergo an audit and present the results to prospective buyers.[13] Austin also requires that multi-family homes undergo an audit and present the findings to tenants.[14]

Homes Renovated by City in 2020 Under A Program Similar to Austin, TX

City	Number of Homes
Boulder	1,420
Colorado Springs	1,720
Denver (6 County Metro)	11,200
Durango	60
Fort Collins	670
Grand Junction	200
Greeley	470
Longmont	410
Montrose	90
Pueblo	500

Savings for Colorado

To determine how a rating or audit policy would affect Colorado we examined its affects elsewhere and applied them to this state. In Austin, a year after its time-of-sale audit disclosure program was implemented, 4,075 properties were audited pre-sale.[15] 10.2% of these homes received efficiency upgrades, amounting to 416 upgraded homes.[16] The city of Austin expects the number of homes undergoing the audit will remain relatively constant. At the current rate of audits and upgrades, about 4,570 homes will be upgraded by the year 2020. However, the City of Austin has goals to increase the rate of upgrades through expanded promotion of its rebate program.

If Colorado implemented a program that was similar to Austin in terms of the rules concerning the energy audit, audit disclosure, and rebates for energy efficiency upgrades, the results would be larger because the population of Colorado is about 6.3 times greater than the city of Austin, TX.[17,18] Assuming home sale and upgrade rates are similar, about 23,560 homes would be upgraded by the year 2020 based on Colorado's larger population and implementation of the legislation in 2011. The graph on the left breaks down this number further by indicating the number of upgrades in certain Colorado cities based on population.

Undoubtedly, the renovations post-audit will save ratepayers money. In 2020, the average home rental gas and electric bill will conservatively be $1,944 annually.[19] Assuming the renovated properties are only 10% more energy efficient, that would amount to an average savings of about $195 annually per consumer and a savings of $4.5 million annually for the

residents of the 23,560 renovated homes. A 20% reduction in energy usage would amount to an average savings of $390 annually per consumer and a savings of $9.0 million for the residents of the 23,560 renovated homes. These energy savings would also save money by avoiding the need to build costly new power generation. In addition, energy efficiency upgrades improves the resale or rental value of a property. Existing homes in Portland, Oregon that were energy efficiency certified received a 23% price premium over non-certified homes when they were sold.[20]

The following are specific examples of the different savings that would be realized by implementing different efficiency measures. For example, an audit could recommend a furnace replacement, which usually costs $4,000 for an energy efficient furnace, but it will save the consumer about $400 annually on their energy bill.[21] Therefore, it will take 10 years to pay off the furnace. However, furnaces are often in homes for 30-50 years so the more efficient furnace could save $8,000 to $16,000 for the consumer over the life of the system. Re-insulating an attic would cost an average of $900-$1,440, pay itself off in two to four years, and save consumers an average of $400 a year.[22] (See Appendix 2 for calculations regarding this section)

Statewide Utility Savings Goals

Policy: Require all Colorado Electric Utilities to reduce their Electricity Sales by 10% by the year 2020.

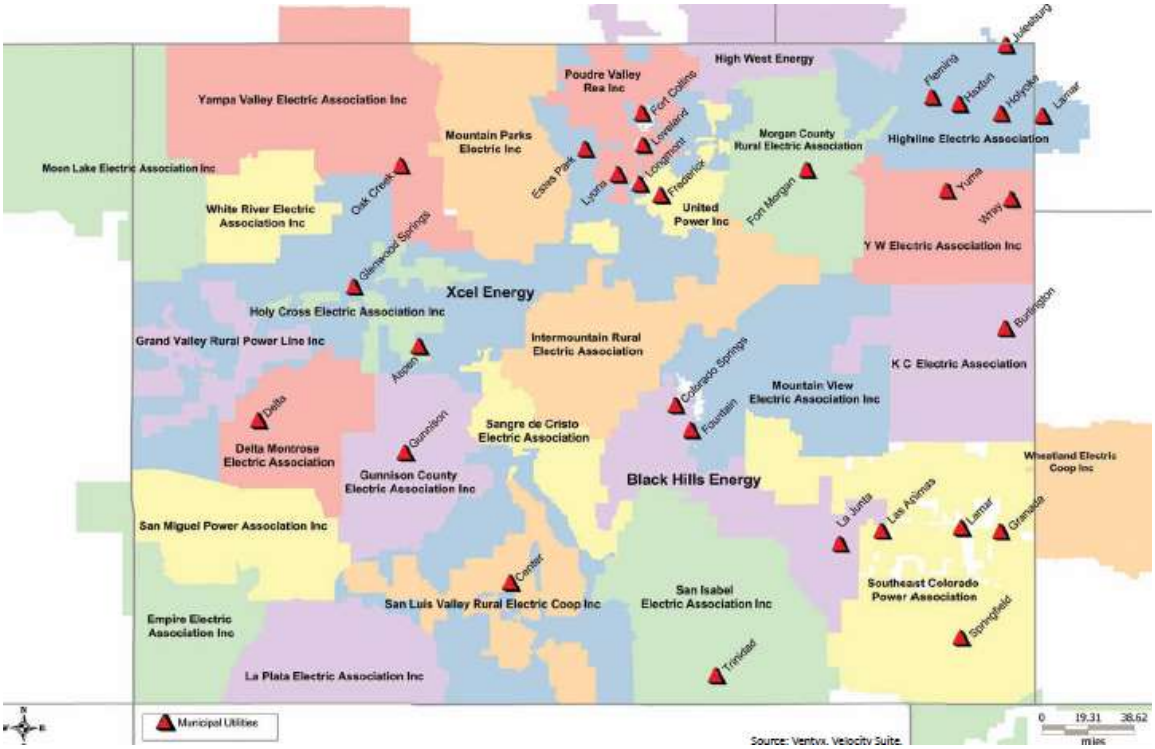
The Colorado Public Utilities Commission (CPUC) currently has goals that call on the two investor-owned utilities in Colorado, Xcel Energy and Black Hills Energy, to reduce their projected electricity sales by at least 10% through increased demand-side management (DSM) programs by the year 2020. DSM programs reduce ratepayer energy consumption by employing programs such as rebates on items ranging from highly efficient air conditioners and lighting to improved insulation, as well as encouraging behavior change through information and education. Xcel estimates that annually its energy conservation programs save the energy required to power 50,000 homes.[23]

However, this 10% reduction goal does not apply to municipal and cooperative electric utilities. The state could set a similar goal for cooperative and municipal utilities to also save at least 10% of their sales in 2020 through energy efficiency programs. In addition, the state could increase the savings goals for Xcel and Black Hills to 20% by 2020 since they are on track to accomplish the more modest 10% goal.

Thirty-seven percent of Coloradans receive their electricity from a cooperative or municipal utility.[24] These utilities tend to be smaller and all but four of them buy all of their power from larger electricity suppliers such as Xcel Energy and the Tri-State Generation and Transmission Association. That puts these utilities at the mercy of power generators and the decisions that those power generators make. For example, if Xcel or Tri-State decides to invest in a new $1 billion coal plant to meet increased demand from communities around the region, customers will have to pay higher energy rates to cover that capital costs. Or if federal law requires increased investments in cleaner power generation technology, the cost of the upgrades will be borne by customers with higher energy bills.

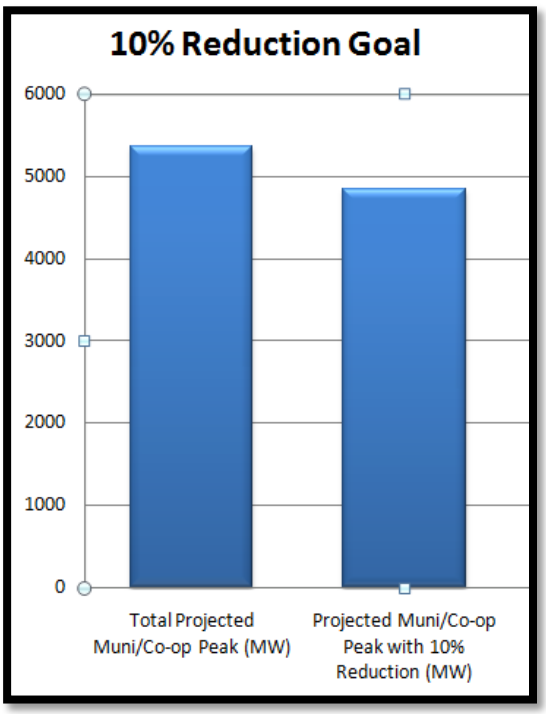
Cooperative and municipal utilities' main focus is providing low cost and reliable energy to their customers. When their perspective is short term, they avoid creating DSM programs because that would raise energy rates slightly for their customers. Unfortunately, customers pay a much higher price in the long run when power generation demand increases with population growth. Without energy efficiency investments, such demands must be met with more energy production from costly new power plants. In the long run, energy bills will be higher for customers as a whole if utilities fail to implement cost-effective energy efficiency programs for their customers. Some municipals and cooperative utilities, such as Fort Collins Municipal Utility, are leading the way and have implemented effective DSM programs.

The following map depicts the service territories of Colorado electric utilities. Municipal and cooperative utilities account for a significant portion of the state in terms of population and geography.[25]



Savings for Colorado

If a 10% reduction goal were placed on municipal and cooperative utilities, their ratepayers would realize important savings. Assuming municipal and cooperative utilities continue to account for 37% of the state's net electricity peak by the year 2020, they will account for about 5370 MW of the net electricity peak.[26] This means that a 10% reduction mandate for municipals and cooperatives would reduce their projected peak by 537 MW, which is the equivalent to shutting down almost three power plants the size of Boulder's Valmont coal-fired power plant.[27] This reduction in the projected peak in 2020 could save cooperative and municipal ratepayers $135 million.[28] In addition, if Xcel was held to a new goal of a 20% savings by 2020, this could lead to a 1,565 MW reduction from its projected 2020 peak.[29] (See Appendix 3 for calculations regarding this section)



Updating Building Codes

Policy: The Governor's Energy Office (GEO) should set the most recent IECC building code as the baseline standard for jurisdictions with a building code.

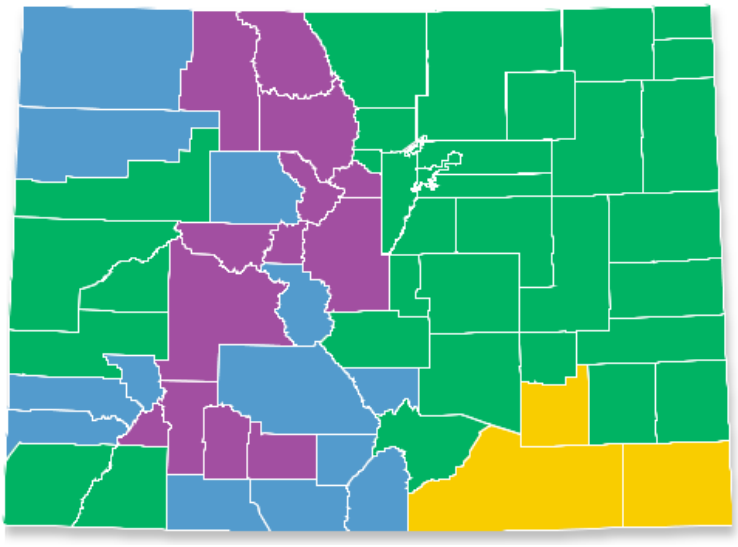
Colorado is a Home Rule state, thus building codes are adopted and enforced at the local level. However, state law as implemented by the Governor's Energy Office (GEO) sets a floor for cities and counties that have established building codes. 158 of 359 code jurisdictions participate in the building code program.[30] Currently, the minimum energy code established by the state is the International Energy Conservation Code 2003 (IECC), but there are two more recent versions of the IECC that the state does not enforce. The IECC is a set of building requirements ensuring that buildings meet basic energy conservations standards. It is developed by the International Code Council (ICC), which is a national non-profit organization dedicated to developing a uniform and comprehensive set of national constructions codes.

The Governor's Energy Office is not obligated to update the state building code as the International Energy Conservation Code (IECC) is updated. While local jurisdictions can exceed the current minimum energy code, 45% of jurisdictions surveyed by the GEO responded that they had no plan to update their buildings codes.[31]

The most recent model building energy code is IECC 2009. The law permits GEO to adopt this as the new minimum for cities and counties with building codes, and the GEO should therefore establish and enforce this more efficient code and set each, new subsequent code as the baseline when it become available. In addition, the state could implement a "stretch code" program that designates jurisdictions a "Green Community" if they implement a 20% more efficient energy code. In order to help cities or counties that implement a stretch code, GEO could provide grants using stimulus or other funds for training and enforcement activities. The next update is due out in 2012.

In addition, the state can work to adopt and enforce the International Green Construction Code (IGCC) once the development and publication of these state-of-the-art model codes are complete. The IGCC integrates current building codes to develop guidelines for very sustainable and efficient buildings.[32] It therefore can be implemented in conjunction with the most recent IECC codes.

Savings for Colorado



Ensuring that homes are built to the most recent version of IECC would amount to important savings for Coloradans. The specific amount of money that IECC 2009 can save consumers depends upon the climate zone that they live in. The map and chart on the right display the climate zones throughout Colorado. There are 4 primary climate zones in Colorado, 4 (non-marine), 5, 6, and 7.

Energy savings would be realized for both new commercial buildings and homes. The following savings calculations specifically apply to the residential sector. The first chart below indicates the average annual savings in energy costs for homes built to IECC 2009 standards compared to homes built to IECC 2006 standards in every U.S. climate zone. The second chart indicates the savings of IECC 2009 built homes in Colorado's specific climate zones. Climate zones are based on the cooling and heating energy requirements for specific geographic locations.[33] [34]

Nationally Weighted	2009 IECC Savings Across All Climate Zones								
	1	2	3	4	4 (Marine)	5	6	7	8
12.2%	14.1%	13.2%	13.4%	11.6%	9.5%	10%	11.6%	13.1%	13.3%
$235	$437	$223	$242	$238	$163	$221	$276	$337	$419

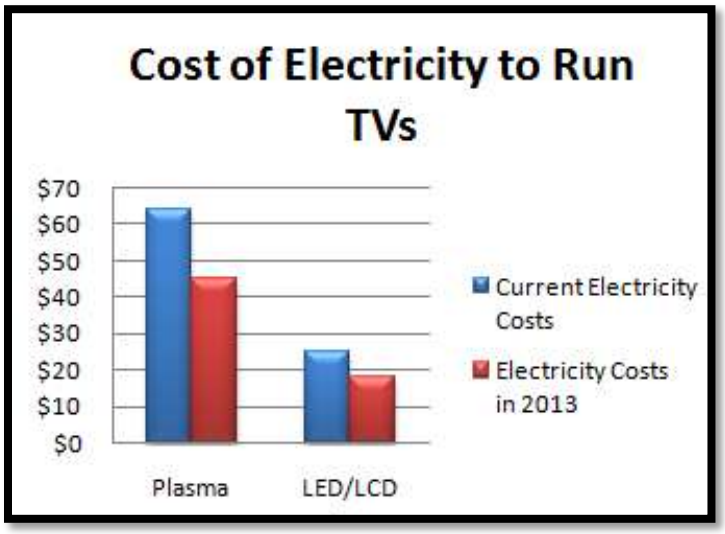
[35]

State Average	2009 IECC Savings in Colorado by Climate Zone			
	Trinidad (Zone 4 Non-Marine)	Denver, Grand Junction, Fort Collins, Colorado Springs, Pueblo, Durango (Zone 5)	Eagle, Salida, Alamosa (Zone 6)	Leadville, Steamboat Springs, Gunnison, Summit County, Aspen (Zone 7)
11.6%	11.6%	10%	11.6%	13.1%
$268	$238	$221	$276	$337

In addition, between 2012 and 2020, Colorado is projected to have 180,000 new homes, about 10% of the total number of homes in the state.[36,37] These new homes, if built to IECC 2009 would save a total of $40-$60 million annually in energy costs for their residents.[38] If these codes are effectively enforced, all new homes will be more efficient than present conventional homes by 2020. Finally, there are expected to be new versions of the IECC in 2012, 2015, and 2018; thus, new homes built after the new codes are released will be even more efficient than homes built in previous years if these newer codes are adopted and effectively enforced.

Television Efficiency Standard

Policy: Require that new televisions sold in the state by the year 2013 are 30% more energy efficient than current models.

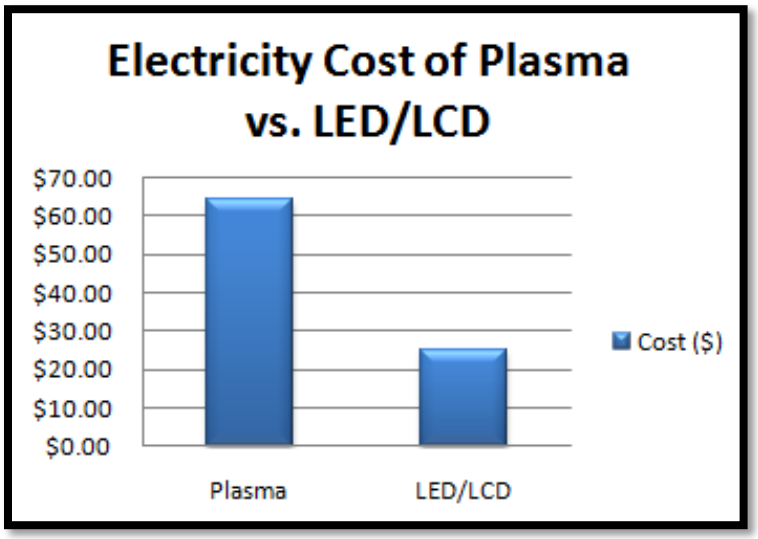


California recently adopted energy efficiency standards for TVs sold in that state, in advance of any federal standards on this product. Colorado could adopt similar standards and require that televisions sold in Colorado must be 30% more energy efficient than present models by the year 2013. The standards would be performance based and establish a ceiling on electricity use by screen size.

TV manufactures make inefficient televisions because it is cheaper for them even though technology exists to improve the energy efficiency. This leaves Colorado consumers with unnecessarily high energy bills for years to come.

Savings for Colorado

A statewide mandate for energy efficient televisions could save Coloradans $1.2 million in energy costs over the next 10 years assuming Colorado's rule was implemented in 2013. To understand cost savings for consumers compare energy efficient TVs by type. For LCD and LED TV's, the energy efficient versions cost consumers $18 annually in electricity versus $25, a $7 annual savings.[39] For plasma TVs, energy efficient versions cost consumers $45 annually in electricity costs versus an average of $64 now, a $19 annual savings.[40] The cost of purchasing energy efficient LCD, LED or plasma TVs versus inefficient ones is negligible so these are immediate savings consumers earn from the first day they watch a Broncos game or nightly news.[41]
(See Appendix 7 for calculations regarding this section)



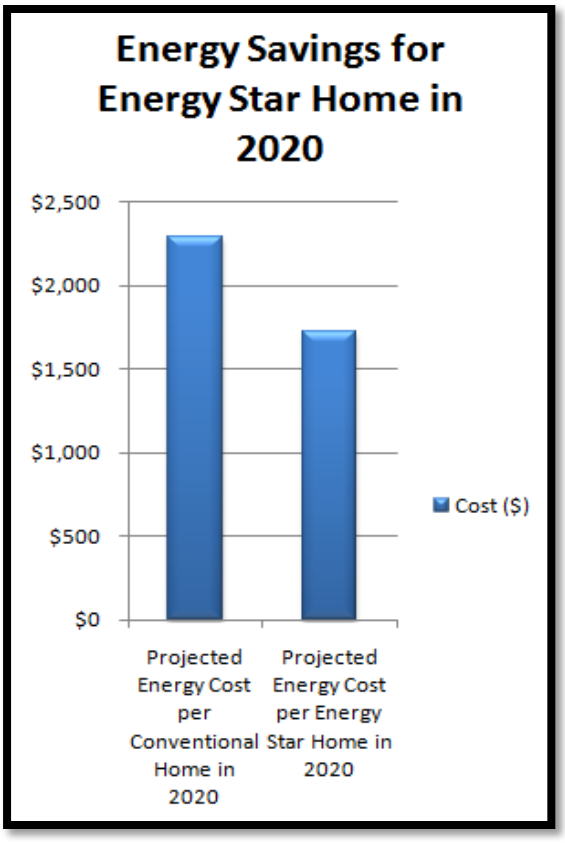
Energy Efficient Building Option

Policy: Require builders to offer Energy Star Certified homes or other energy efficiency features as an option when building new homes.

Colorado could require that builders offer certain energy upgrades as an option when designing a new home with a new home buyer. This efficiency upgrade option should be at least as efficient as an ENERGY STAR-Certified home, or even better including a 50% above code option, or the option could even be a net-zero home. The uses as much energy as it produces over a year due to very high energy efficiency standards coupled with solar energy features so it requires little to no energy from a grid.

More efficient homes often have larger upfront costs and builders might not offer these options because they assume customers will not want them. However, prospective homebuyers often do not know that more efficient buildings are an option and therefore do not demand them. Likewise, prospective buyers may not realize that an energy efficient home often saves money from day one due to the upgrade costs getting rolled into the mortgage. By simply requiring builders to offer an energy efficient package as an option, consumers are more likely to consider this option by realizing that it will save them money.

The state could require a range of efficiency measures as a design option. An ENERGY STAR-Certified home presents a good metric for calculating savings for Coloradans because the savings from these homes have been well documented. In addition, the GEO could encourage builders to offer "good, better, best" options that range from ENERGY STAR-Certified to near net-zero homes.



Savings for Colorado

If the state required offering an ENERGY STAR-Certified home, this option could amount to important savings for Coloradans. On average, ENERGY STAR-Certified homes use 20% to 30% less energy than conventional homes, and homeowners currently pay $200-$400 less on their annual utility bills compared to conventional homes make sure this comports with other savings data.[42,43]

Between 2012, when the policy would take effect, and 2020 there will be 180,000 new homes built in Colorado.[44] Therefore, even if this option is not very popular and 10% of prospective homebuyers choose it, there will still be around 18,000 ENERGY STAR-Certified homes built by the year 2020 because of this policy. Therefore, if average energy costs are $1,944 in 2020, people who have opted for ENERGY STAR-Certified homes will on average pay 25% less, amounting to $490 in annual savings. For the total 10% of homebuyers who opted for an ENERGY STAR-Certified home, the total energy savings would amount to $8.8 million in 2020. In addition, the energy saved by these homes by 2020 would be enough to power about 4,700 new current conventional homes in Colorado without additional new power generation. (See Appendix 8 for calculations regarding this section)

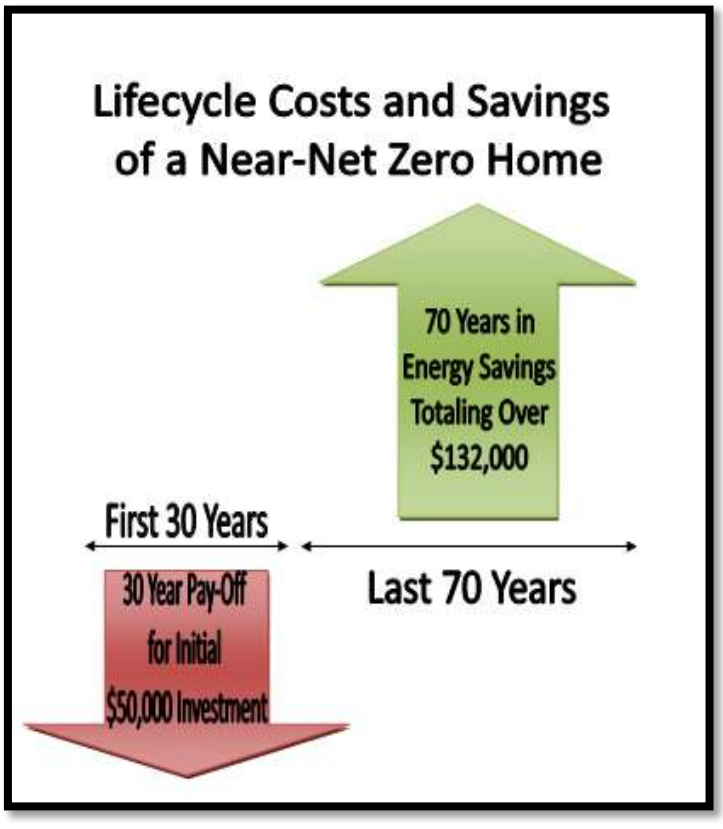
Near Net-Zero Homes

Policy: Require that half of the new homes built in Colorado be net-zero by 2020 and that all homes built in Colorado be near net-zero by 2030.

The state could require that by 2030 all new homes built are near net-zero energy users. To meet this goal, the state could require that half of new homes built in the state are near-net zero by 2020.

Currently, most builders do not offer near net-zero homes to their buyers because of the substantial upfront costs. In addition, most buyers do not know these types of homes are an option so they do not demand them. The market for these types of homes is currently very small, and a requirement to increase the number of these homes would expand this market.

If the state required that builders build more near-net zero homes these buildings would save consumers a lot of money in energy costs over the life of the structure. However, the upfront costs of these homes would necessitate a substantial payback period. Furthermore, because the additional cost of these homes would likely be passed on to the consumer, the state government could work to provide financial incentives to make building and purchasing these homes more affordable.



Savings for Colorado

Currently, the cost of building a home net-zero is $50,000 in additional costs for the near net-zero features.[45] Coloradans spend $876 on electricity and $1010 on natural gas annually.[46,47]This means most Coloradans spend about $1,886 on their energy bills annually.[48] Thus, at current energy rates, it will take almost 30 years for these homes to pay off the initial net-zero investments.

If the house exists for 100 years, it will save its residents a total $132,000 in energy costs after the net-zero technologies are repaid. However, because both natural gas and electricity prices will increase over time, the payback will likely be shorter, and the lifecycle savings of the home will be greater. In addition, solar panels or other onsite renewable energy production, which would likely be needed for a near net-zero home, often reduce consumer energy bills by half, further reducing the payoff of the home.[49]

Property Assessed Clean Energy Financing (PACE)

Policy: Local Jurisdictions Opt into the Statewide PACE Program.

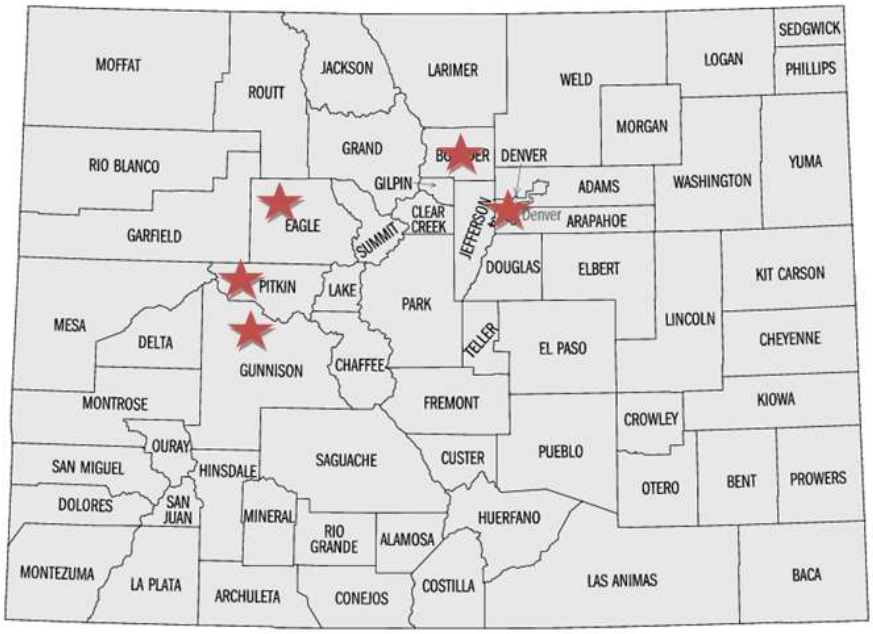
During the 2010 legislative session, Colorado created a Property Assessed Clean Energy Loan (PACE) program for the entire state.[50] This bill allows the state to establish up to $800 million in bonds that Colorado property owners can receive as loans for clean energy and energy efficiency upgrades.[51] The money is repaid through an assessment on the borrower's property taxes. Therefore, the loan stays with the property, and not with the person who initially received the loan.

In Colorado, local jurisdictions must opt into the PACE program because the program is administered by the jurisdiction. Therefore, the PACE program will cost local jurisdictions money to administer. It cost Boulder County approximately $120,000 in administrative costs to run the program.[52] Boulder recovered much of the administrative overhead through a $75 PACE application fee.[53]

It is important that local jurisdictions opt into PACE because many of their residents likely want to save money through increased efficiency, but they often do not have the money to make the initial investments in the needed upgrades. PACE provides the money for the initial investment, and a viable way to repay the loan through a property tax assessment. With banks hesitant to lend right now PACE provides an important funding option.

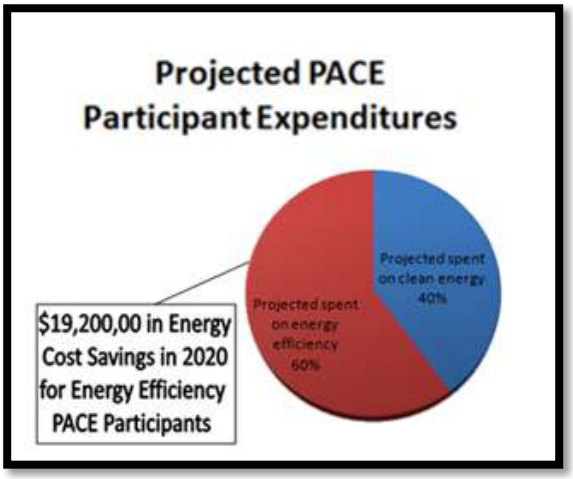
Unfortunately, PACE is currently not in effect because the Federal Housing Financing Agency has placed a hold on the program. Despite that, it is important for jurisdictions to opt-in to demonstrate support for PACE and encourage the federal government to resolve their issues with PACE in a timely manner. Once the federal conflicts are resolved, jurisdictions that have opted into PACE will be eligible to participate in the state program.

The following map indicates the counties that have opted into PACE. Most Colorado counties still have not opted in.

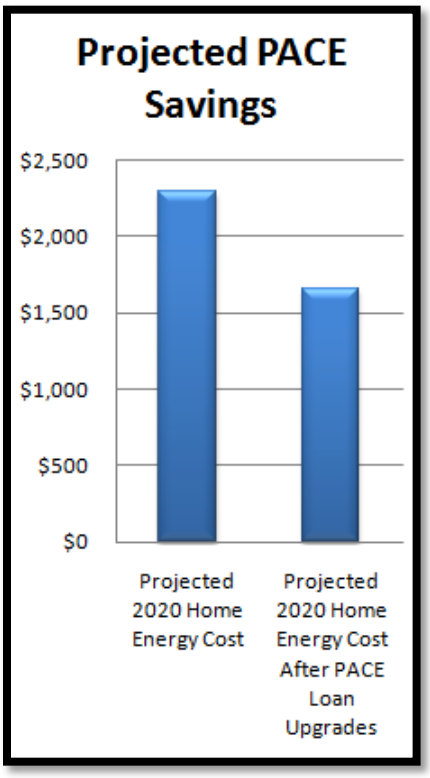


54

Savings for Colorado



Colorado's 2010 PACE legislation authorizes the state to issue up to $800 million in bonds for PACE loans.[55] In Boulder, 60% of the PACE loans funded energy efficiency upgrades and 40% funded photovoltaic installations. Assuming that similar percentages for energy efficiency upgrades hold at the state-level $480 million would be issued for energy efficiency loans. Additionally, for the Boulder County PACE program the average loan was $16,000.[56] Therefore, assuming similar loan amounts statewide, about 30,000 Coloradans will receive PACE loans for energy efficiency upgrades.



The following are specific savings consumers could realize from PACE:

- A PACE loan could replace a furnace, which cost $4,000 on average for a new energy efficient furnace, but it will save the consumer about $400 annually on their energy bill.[57] Therefore, it will take 10 years to pay off the furnace. However, furnaces are often in homes for 30-50 years so the more efficient furnace could save $8,000 to $16,000 for the consumer over the life of the system.
- Re-insulating an attic would cost an average of $900-$1,440, pay itself off in two to four years, and save consumers an average of $400 a year.[58]

In total, Boulder County projects its PACE programs will save PACE participants $445 million in total energy costs in 2020.[59] Another example of a program is the Babylon New York PACE program, which allocated an average of $7,100 PACE loans to consumers for efficiency upgrades; these loans are projected to save consumers 28% on their annual utility bills.[60] If similar results occur in Colorado, instead of paying $1,944 for energy in 2020, PACE consumers would save $544 individually, or $16 million for all 30,000 PACE energy efficiency participants in 2020.[61] (See Appendix 6 for calculations regarding this section)

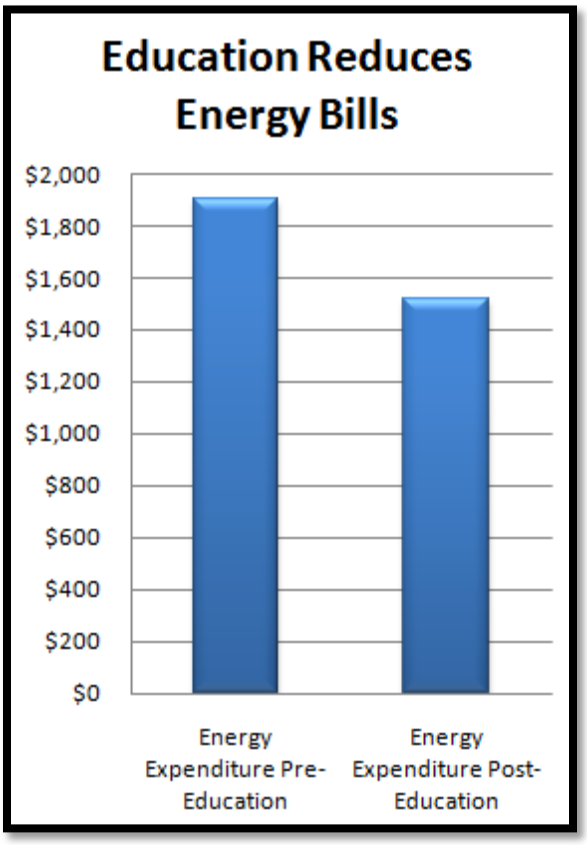
Energy Efficiency Education

Policy: Expand energy efficiency educational programs for Colorado residents.

The Governor's Energy Office or another Colorado state agency could dedicate more resources to educate Coloradans about the best ways to save money on their utility bills. For example, lighting typically constitutes 11% of a home energy bills and costs Colorado consumers about $96 annually.[62,63] Thus consumers can reduce their bills through a simple behavioral change such as turning off their lights when leaving their rooms or homes.

Savings for Colorado

Expanded education programs are important and effective because people often do not know the most effective energy efficient practices, but their behavior changes with energy efficiency education.[64] This fact is elucidated by a study conducted by Cornell University. In this study, people were educated in classroom settings about energy efficiency.[65] Of the 8,991 educated about energy efficiency, 6,027 (69%) responded to the education with a change in their behavior or by investing in energy efficient improvements.[66] The study also reported that state-run programs to increase awareness of energy efficiency best practices can result in a 20% reduction in residential energy use. [67] Therefore, if Coloradans currently pay almost $1,900 annually on energy bills, increased education programs could reduce this expenditure to $1,520 annually, saving consumers $380 annually.[68] Unfortunately, we do not know how much money the GEO would need to invest in education to realize this 20% reduction in consumer energy bills. (See Appendix 9 for calculations regarding this section)



Schools and State Government Buildings

Policy: Extend Governor Bill Ritter's government building efficiency executive order to require a further 20% reduction in energy use by state buildings by 2020. Schools could be required or incentivized to retro-commission their facilities.

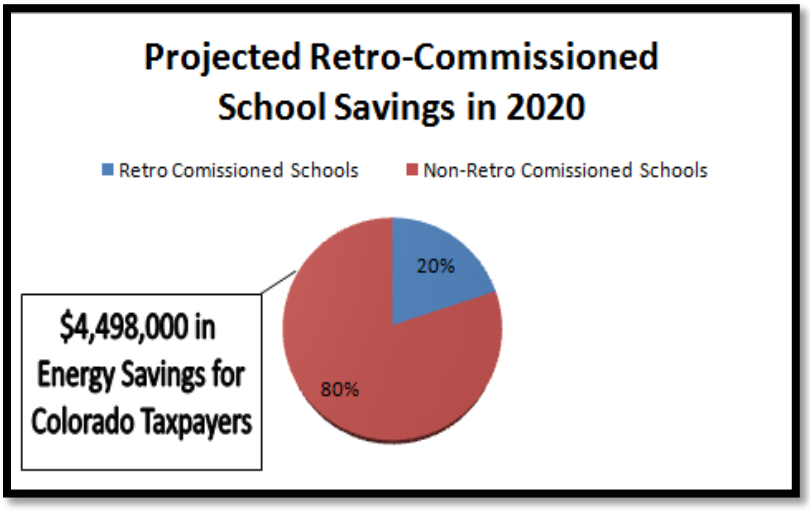
There are a number of energy efficient polices that the state could pursue around schools and state buildings. Governor Bill Ritter's executive order requiring existing state buildings to reduce their energy use 20% by the 2011-2012 fiscal year could be put into law and expanded to require a further reduction of 10-20% by 2020. Another policy could require that all new state government buildings be built net-zero or near net-zero. The same requirements could be placed on new and existing schools. However, requiring such reductions on schools is difficult because of a lack of resources in many school districts. Alternatively, the state could supply additional grants or loans to schools to create an incentive to retro-commissioning. Therefore, the state or individual districts could apply for additional federal or private grant money for these upgrades.

Support from the state would be an important way to encourage energy efficiency investments because local schools typically do not have substantial funding to pay for the upfront costs of more energy efficient buildings, even though these investments would save schools money and allow them to allocate more resources into classrooms.

Savings for Colorado

School energy costs are substantial so it is important that Colorado implement programs to reduce these costs. For example, Colorado taxpayers pay $159 million in energy bills for K-12 public schools.[69] Fortunately, new energy efficient and renovated efficient schools can achieve substantial energy savings. For example, retro-commissioning a building, to ensure its components are as efficient as possible and replacing inefficient components, will save an existing individual school an average of $13,000 annually.[70] Retro-commissioning is typically very cost effective with a typical payback of 1.5-7.5 years.[71]

Currently, there are 1,730 public K-12 schools in the state.[72] Therefore, if 20% of Colorado public schools are retro-commissioned it would save approximately $4.5 million in energy costs for taxpayers in 2020. These savings would likely be even greater in 2020 because the price of energy will increase. The same savings could be achieved through renovating existing state buildings; although because there are fewer state buildings, the overall savings to Colorado taxpayers will not be as significant. (See Appendix 10 for calculations regarding this section)

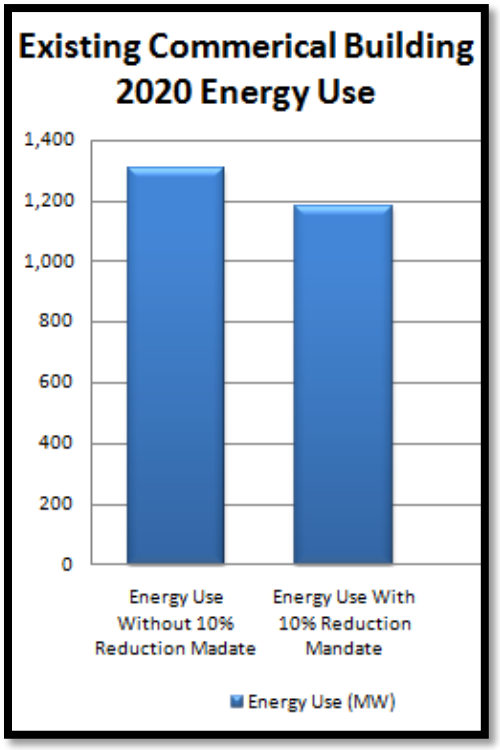


Existing Private Commercial Buildings

Policy: Require certain efficiency upgrades for private commercial buildings or require that they be more efficient by a certain date.

Most of the policies outlined in this report were selected because they are pragmatic and could be implemented immediately. This policy is perhaps more aggressive and would not likely be implemented soon. However, it is important to mention because the existing private commercial building sector uses a substantial percentage of energy statewide, and a strong policy may eventually be necessary to reduce this sector's energy usage.

Therefore, the state could require that commercial buildings receive an energy audit and undergo energy efficiency renovations if they fail the audit. Alternatively, the state could require that commercial buildings be a certain percentage more efficient by a particular date—for example, they could be required to become 10% more energy efficient than they currently are by the year 2020.



Requiring efficiency from the private commercial sector is important because the commercial sector constitutes a substantial portion of energy usage. By 2020, the commercial sector will account for 20% of energy usage.[73]

Unfortunately, improving their efficiency, while in the commercial sector's best long-term interests, is challenging for them in the short-term due to the high upfront costs of energy efficiency renovations especially in a competitive environment. Companies may fear that substantial investments in energy efficiency will make them lose their competitive edge. A mandate requiring that all businesses be held to the same standards for efficiency upgrades would remove the problem of no business wanting to "go first" with upgrades.

Savings for Colorado

Improved efficiency in the private commercial sector will play an important role in reducing the sector's energy intensity. If private commercial buildings are substantially renovated to be 10% more efficient by 2020, this could amount to savings of 130 MW by 2020,[74] which is almost the amount of energy produced by the Arapahoe coal plant in Denver.[75] In addition, the reduction will save $33 million annually in energy costs for existing commercial buildings after the renovations occur.[76] (See Appendix 11 for calculations regarding this section)

Conclusion

Every year, Colorado consumes more and more energy, and much of this energy use is unnecessary. This trend shackles Colorado consumers to continually increasing energy costs. They must foot the bill for the costly expansion of Colorado's base-load generation and transmissions costs and for the adverse public health costs of generating energy from dirty power sources such as coal.

Energy efficiency presents a viable ways to reduce all of these costs. It saves consumers money in the short-term by immediately reducing how much they pay each month on their utility bills. Energy efficiency also saves all consumers money in the long-term because it reduces the amount of base-load power supply needed to power the state and lowers the adverse public health costs that come from dirty fossil fuel electricity generation.

For these reasons, Colorado needs to make energy efficiency a priority, and the policies outlined in this report will help it to do so. These policies present practical ways for the state to realize improved efficiency, which will benefit Colorado consumers. Implemented simultaneously, these policies would help Colorado become comprehensively more energy efficient and save its residents money in both the long and short-term.

Savings from Individual Policies		
Policy	Who Saves Money	Potential Savings
Residential Energy Efficiency Rating or Audit Disclosure Program	Renters and homebuyers living in upgraded properties post-rating or audit	-$195-$390 annually for individual ratepayers in 2020 -$4.5-$9 million total for all people living in renovated properties in 2020
Statewide Utility Savings Goals	Cooperative and municipal utility rate payers	-$135,420,000 in energy savings in 2020 for all municipal and cooperative ratepayers -537 MW reduced from the projected municipal and cooperative peak in 2020 -1,565 MW reduced from the projected Xcel peak in 2020
Building Code Upgrades	People living in properties built to 2009 IECC standards compared to 2006 IECC standards	-$221-337 in savings for individual consumers in 2020 -$40-60 million for all residents of homes built to IECC 2009 in 2020
Television Appliance Standard	New TV Owners	-$7 annual savings for LCD/LED owners -$19 annual savings for plasma owners
Energy Efficiency Building Option	People who opted for an energy efficient home that is ENERGY STAR-Certified	-$490 annually in 2020 for people residing in ENERGY STAR-Certified homes -$8.8 million in annual savings in 2020 for all homeowners who opted for an ENERGY STAR-Certified home
Near Net-Zero Homes	Residents of near net-zero homes	$132,000 in savings over the life of the home
Property Assessed Clean Energy Loans (PACE)	Recipients of PACE loans used for energy efficiency upgrades	-$540 in savings in 2020 for individual PACE participants who invested in energy efficiency upgrades -$17 million total in 2020 in savings for all PACE participants who invested in energy efficiency upgrades
Energy Efficiency Education	People who have been educated in a classroom about energy efficiency	$380 annually in savings for changes in behavior and upgrades resulting from classroom education
Schools and State Government Buildings	Schools and state government buildings	-$4,500,000 saved in 2020 energy costs for Colorado taxpayers from all retro-commissioned schools -$13,00 saved annually for individual retro-commissioned schools
Existing Commercial Buildings	Commercial building owners who own energy efficient renovated buildings	-130 MW saved total by 2020 from all commercial buildings that have undergone an energy efficiency upgrade -$32,940,000 total savings in energy costs for existing commercial buildings in 2020

Appendices

Appendix 1

2020 Price Forecast Calculation

2008 total retail sales were 20,551,000,000 kwh.[77] Net peak will increase 16% over the next decade based on projection concerning Xcel's net peak projections, because net peak exists to supply sales, total retail sales will likely increase by the same percentage.[78] In 2008, the average monthly electricity residential in bill Colorado was $68.80 with rates averaging 10.10 cents/kilowatt-hour and average residential consumption averaging 679 kilowatt-hours, or $876 annually.[79] Average national natural gas bill in 2005 was $1010.[80] Therefore, currently, Coloradans pay $876+$1010=$1,886 for energy. By 2020, Xcel projects that the average residential electric bill will be $934.[81] Assuming natural gas prices will remain constant and statewide average electrical rates a similar to Xcel's projection, average residential customers will pay $1,944 for energy in 2020. (Note: a projection for 2020 natural gas costs could not be found for the purposes of this report.)

Appendix 2

City Home Renovations Calculation

The population of the City of Austin is 786,382[82,] which at the current rate of upgrades means that 4,570 homes upgraded by 2020. Thus, accounting for a two year lag for the implementation of Colorado legislation, in this time there would be 3,740 renovated homes in Austin, which provides the baseline for CO numbers. Therefore, statewide 23,560 homes would be renovated because Colorado's population is 6.3 times the size of Austin's. The following are the number of homes in different Colorado cities depending on city population:

Boulder metro area 300,452[83]-% of Austin-38% homes--1,420 renovated homes.
Colorado Springs-360,890[84]-% of Austin-46%-homes, 1,720 renovated homes.
Denver 6 County Metro Area[85]—2.4 million-% of Austin-3 times greater—11,200 renovated homes.
Durango--13,920[86]-% of Austin-1.7%--60 homes renovated.
Fort Collins—138,736[87]-% of Austin-18%--670 homes renovated
Grand Junction--41,986[88]-% of Austin-5.3%--200 homes renovated
Greeley--98,596 [89]-% of Austin-12.5%--470 homes renovated
Longmont, CO-88,420[90]-% of Austin-11%--410 homes renovated
Montrose-18,400[91]-% of Austin-5.2%--90 homes renovated
Pueblo—104,880[92]-% of Austin-13%--500 homes renovated

Appendix 3

Utility Reduction Goal Calculation

The number of reduced municipal and cooperative utility megawatts in 2020 was determined by first calculating Xcel's projected 2020 peak based upon its 2007 resource plan.[93] Then, the projection for the remainder of the state was calculated by assuming it would follow the Xcel trend. I then calculated Xcel's current share of net peak and added the percent that they do not account to Xcel's 2020 projection to determine the state total projection.

Municipal and cooperative utilities account for 37% of the state's energy supply.[94] In 2020, based on Xcel's projections and their current percentage share of total peak,[95] peak demand will be 14,910 MW. Therefore, by the year 2020 cooperative and municipal utilities would account for about 5520 MW of peak electricity demand. If they were set to the same DSM savings goals as Xcel that would mean reducing cooperative and municipal utilities would reduce their peak by 552 MW by 2020. (Note: These projections were made by Xcel before the wide-scale implementation of their DSM programs.)

Appendix 4

Price Projection Calculation

Right now the average residential electricity price is 11.52cents/kwh, it will increase 31% by 2020 based on Xcel's projections. [96] This means rates will be about 15.70 cents/kwh in 2020.[97] 2008 total retail sales 20,551,000,000 kwh.[98] Net peak will increase 16% over the next decade based on projection concerning Xcel's net peak projections,[99] because net peak exists to supply sales, total retail sales will likely increase by the same percentage. Therefore, the state's average retail sales in 2020 will be about 24,400,000,000 kW (same percentage increase as Xcel's)*15.70 cents/kwh=$3,660,000,000 for Colorado's total electricity expenditure in 2020. In a business as usual scenario, municipal and co-ops customers will pay 37% of this expenditure, or $1,354,200,000. Therefore, a 10% reduction mandate through DSM programs could save cooperative and municipal ratepayers $135,420,000 on their utility bills.

Appendix 5

New Homes Calculation

Between 2005 and 2009, there were about 90,000 news home built in Colorado.[100] Assuming this similar development trend over the next decade, there will be 180,000 built between 2012 (assuming this is when the policy takes effect) and 2020.

Appendix 6

PACE Loan Calculation

During the first round of its PACE program Boulder County issued 9.8million in bonds for PACE loans to 612 people. [101] Therefore, the average loan was $16,000. If Colorado issues the maximum bonds of $800 and the average loan, like Boulder, is $16,000, this means 50,000 people will receive PACE loans.

Appendix 7

Television Calculation

California's new law requiring that new televisions sold in 2011 use 30% less energy than the current manufacturing standards is projected to save consumers statewide $8.1 billion in energy costs over 10 years.[102] Through comparing population sizes of the two states, a similar policy would save Coloradans $1.2 million in energy costs over 10 years.[103]

Appendix 8

ENERGY STAR-Certified Homes Electricity Savings Calculation

Currently, average home in Colorado uses 679 kilowatt hours of electricity monthly or 8,150 kwh annually.[104] A 25% reduction from this average would mean that the average ENERGY STAR-Certified home would use 6,130 kwh of energy. If 10% of the 18,000 new homes are ENERGY STAR-Certified that would mean instead of these homes using 146,700,000 kwh in 2020 they would use 137,925,000 kwh of electricity. Therefore, these homes would save 36,360,000 kwh. This savings equals the amount of electricity used by about 4,700 current average Colorado homes based upon current usage.

Appendix 9

Education Savings Calculation

This was calculated by finding 11% of Coloradans' current energy bills, which are: In 2008, the average monthly electricity residential bill was $68.80 with rates averaging 10.10 cents/kilowatt-hour and average consumption 679 kilowatt-hours.[105] With consumption remaining constant, 2010 bill would be 11.52 cents/kwh*679kwh consumed which is an average of $78 on monthly bills. Therefore, average annual bills currently are $876.[106]

Appendix 10

Colorado School Energy Costs Calculation

Energy savings for schools calculation-Colorado currently has 774,649 k-12 public school pupils.[107] On average, schools spend $205 on energy costs per student every year.[108] Therefore, public schools in total spend $158,803,000 on energy every year.

Appendix 11

Existing Commercial Buildings Energy Reduction Calculation

Total energy commercial use for commercial buildings went up 40% between 1998 and 2008 in Colorado,[109] and during the same time period, total spending on energy from the commercial sector increased 49%.[110] By 2020, the commercial sector will account for 20% of Colorado's total energy use.[111] Existing private commercial sector buildings will account for 44% of this 20%--or 9% of total energy demand. In 2020, this 9% will account for 1,309 MW of energy demand. A mandate requiring that these buildings be 10% more efficient would reduce this projected use by 130 MW.

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