Colorado Climate Project

www.coloradoclimate.org

Energy Supply Policy Work Group

Summary List of Draft Priorities for Analysis

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of CAP Support
		2012	2020	Total 2007-2020			
Option #	**ENERGY SUPPLY**						
ES-1	Renewable Energy Incentives including Waste to Energy						TBD
ES-2	Mandated Portfolio Standards						TBD
ES-3	Transmission Infrastructure for Renewables						TBD
ES-4	Cost for CO_2 Emissions (C&T or tax)						TBD
ES-5	Public Benefit Charge Funds						TBD
ES-6	Incentives for CHP, DG, Smart Grid						TBD
ES-7	Carbon Capture & Storage Infrastructure						TBD
ES-8	Pricing and Rates						TBD
ES-9	R&D for DG & Renewables, Advanced Fossil Fuel						TBD
ES-10	Promote Advanced Fossil Fuel Generation with Carbon Capture, Including IGCC						TBD

	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2007–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of CAP Support
		2012	2020	Total 2007-2020			
ES-11*	Small New Hydro and efficiency Improvements at Existing Hydro						TBD
ES-12*	Nuclear Energy						TBD
ES-13*	Efficiency Improvements for Existing Generators (Includes Heat Recovery)						TBD
ES-14*	Oil and Gas Operations						TBD
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS						
	REDUCTIONS FROM RECENT ACTIONS (table to be added below)						
	SECTOR TOTAL PLUS RECENT ACTIONS						

* Indicates additional policy options from Call # 4 vote – chosen outside formal balloting process.

ES-1. Renewable Energy Incentives Including Waste to Energy

Policy Description

Resource maps of renewable energy in Colorado developed by NREL show that Colorado is endowed with multiple renewable resources. Wind is prevalent in the northeast and southeast corners of the state. Biomass is available in the northeast. Photovoltaics can be deployed throughout the state. Concentrating solar power can be tapped in the San Luis Valley. Deep geothermal resources exist in the southern portion of the state. Solar and wind alone have the potential to produce 100 times the electricity currently used in Colorado, even after reasonable filters area applied. However, renewables are generally more costly than today's conventional energy supplies. Financial incentives are needed to greatly accelerate the deployment of renewables and allow time for learning curves, economies of scale, and R&D to lower their costs.

Mechanisms include an investment tax credit, an energy production tax credit, a feed-in tariff, and incentives to help support financing of projects. Generous feed-in tariffs have been successful at promoting renewables in Europe. However they come at considerable expense to the taxpayer and are considered unlikely in the U.S. political climate. Production tax credits are generally preferred by renewable energy providers that can produce electricity at under about 10 cents per kWh (wind and geothermal), whereas investment tax credits are generally preferred for more expensive technologies (concentrating solar power). Key to the success of these incentives is that they be guaranteed for a period of at least 5 years to allow time to raise financing and build projects.

Financial incentives that encourage utilities to deploy or purchase renewable energy should also be considered. Finally, R&D aimed at solving Colorado-specific problems can be funded at state universities and NREL. These include resource assessment and performance-cost analysis.

Policy Design

Goals: Support rapid deployment of wind, solar, geothermal, and biomass in Colorado.

Timing: To do Colorado's share of the effort needed to avoid dangerous climate change, 30-35% of Colorado's electricity (after efficiency improvements are made) must come from renewable sources by 2020

Parties Involved: This will impact all Colorado utilities and renewable energy producers. NREL and universities will be involved in Colorado-specific R&D.

Other: Not applicable**.**

ES-2. Mandated Portfolio Standards

Policy Description

A renewable portfolio standard (RPS) is a requirement that utilities must supply a certain percentage of electricity from an eligible renewable energy source(s). For example, an RPS of 5% would mean that for every 100 kWh that a utility supplies, 5 kWh must be generated from renewable resources. An environmental portfolio standard (EPS) or clean energy standard (CES) would expand that notion to include energy efficiency as an eligible resource. About 20 states currently have an RPS, including Colorado. In Montana and some other states, utilities can also meet their RPS (or EPS) by purchasing certificates from eligible energy projects, typically referred to as Renewable Energy Certificates (RECs) in the case of RPS policies.

Policy Design

Goals: The goal of a RPS, EPS or CPS is to expand the amount of renewable energy (or energy efficiency) generated (or saved).

Policy Design: Just this year, the Colorado legislature strengthened an existing RPS, the first in the nation to be passed by a vote of the citizens, and extended it to cover more of the state's utilities, including some rural electric cooperatives. Opt-out provisions in the older standard were dropped. The standards and other provisions also vary by size of the utility and its ownership structure. The current standards will be met almost entirely with wind, although there is a significant solar "set-aside" for some utilities. Colorado's RPS not include an energy efficiency component, but it does contain a cost cap.

Timing: Because the current standards are so new, it may be that the Colorado Legislature or Governor has little appetite for revisiting this issue in the short term.

Parties Involved: TriState Generation and Transmission Association, which supplies wholesale power to the state's rural electric utilities, may not be directly covered by the state's RPS. There is no "portfolio standard" for natural gas utilities.

Other: To encourage the deployment of lower emitting fossil plants, Oregon developed a carbon intensity performance standard for new generation. In that state, new power plants have to achieve certain emission intensity targets, expressed in tons of carbon dioxide per Megawatt-hour.

ES-3. Transmission Infrastructure for Renewables

Policy Description

Colorado has enacted SB 100 which provides that utilities regulated by the Public Utilities Commission are required to file maps of generation resource areas that need transmission, and transmission plans to serve those areas, for approval by the PUC by October 31 of each odd-numbered year. This new law changes the goal of transmission planning and investments by requiring planning and investment for transmission to serve resource areas, not single generators as has been the case in the past. This will break the "chicken and egg" dilemma for new renewable energy projects in the state, where cost effective wind projects could not be built because transmission was not available and transmission could not be built because no wind project developer could develop a project in an area without transmission.

The mitigation option proposed here is to expand the coverage of SB 100 to all Colorado utilities to achieve a seamless, coordinated transmission network solution to support renewable resources statewide, instead of limiting transmission planning to areas served by investor owned and PUC regulated utilities.

The proposed solution is to plan for phased expansion based on the magnitude of the wind resource, along with attention to engineering, cost, statewide and regional transmission needs, and benefits associated with transmission investments including consumer savings from adding diverse resources to utility generation portfolios.

As a guide, this proposal includes full implementation of theNWCC / WGA Leadership Forum Draft Action Plans: Implementing Transmission Recommendations in the West. Information on these plans can be found on the following websites:

Press release: http://www.westgov.org/wga/press/plenary1-pr.htm

Policy resolution: http://www.westgov.org/wga/policy/06/clean-energy.pdf

Report: http://www.westgov.org/wga/meetings/am2006/CDEAC06.pdf

General website:
http://nationalwind.org/events/transmission/western/2006/default.htm

Policy Design

Goals: Expand transmission to serve renewable energy resources.

Timing: Pass legislation expanding SB 100 in the 2008 legislative session. Resource and transmission plans filed each October 31 in odd numbered years. Transmission upgrades and new lines to be build as soon as possible thereafter.

Parties Involved: utilities, generators, state and local governments, public interest groups, rural economic development interests.

Other: Economics of transmission investments must include consideration of the cost savings to ratepayers by providing stable-priced renewable energy in place of unpredictably varying fossil fueled electric generation.

ES-4. Cost for CO_2 Emissions (C&T or tax)

Policy Description

Establishing a cost for CO_2 emissions is an alternative, and complementary, GHG-control method relative to direct regulations such as energy efficiency standards. The concept is to internalize the externality, allowing the marketplace find the most efficient reductions. Pricing CO_2 emissions has two primary effects. First, it increases the cost of carbon-based energy to encourage conservation and energy efficiency. Second, it provides an economic advantage to non-carbon-based energy sources.

There are two basic approaches to market control: cap and trade (C&T) and carbon taxes. The cap and trade approach has largely been based on the success of the C&T system for acid rain in the US. A cap is placed on GHG emission permits, which can be traded to find the lowest cost compliance. Typically the caps begin somewhat high and ratchet down on a pre-determined schedule.

Under the carbon tax approach, the government collects a tax per unit of GHG emissions. The tax collection can be done either upstream (e.g., wellhead, power plant) or downstream (e.g., gas pump, electricity bill). A carbon tax can be designed to be net revenue neutral. That is, the carbon tax revenue collected would be offset dollar-for-dollar by a reduction of some other tax.

Hybrid schemes are possible, such as a tax and trade system where an entity facing a large tax liability could offset their taxes through investments in reducing the GHG footprint of another with no or low liability (e.g., a school or hospital).

Policy Design

Goals: TBD

Timing: TBD

Parties Involved: TBD

Other: TBD

ES-5. Public Benefit Charge Funds

Policy Description

A "public benefits charge" is a small monthly fee assessed on utility bills. The money that is collected is used to fund "public benefits," which can include low-income weatherization programs, appliance efficiency rebates, renewable energy rebates, energy efficiency programs, and demand-side management programs. More than twenty states currently assess such charges under a variety of names, including wires charge, access charge, universal service charge or distribution charge.

Public benefits charges can be assessed as a percentage of the monthly bill, or as a fixed monthly fee that varies by customer class. The funds can be managed by the utilities that collect them, by a nonprofit set up to do so, or by a state agency.

The goal of public benefits charges, in the context of climate policy, would be to accelerate the capture of cost effective efficiency measures and the deployment of renewable resources. Public benefits charges may range from one to five percent of the monthly bill. In Europe, more than 50 municipal utilities collect fees to promote solar energy installations. In Germany, which has adopted a goal of achieving 20% of its electricity from renewable energy, a typical household may pay up to $15 more each month. In the United States these charges have typically been much smaller.

In Wisconsin, for example, Madison residential customers pay about 10 cents a day, or $3 per month. Wisconsin's public benefits charge collects about $70 million statewide each year. For small business customers, the charge is a maximum of $6 per month per meter. For more information on the Wisconsin program see www.focusonenergy.com

In Colorado, some utilities already assess "energy efficiency" charges, and the proposal is to expand this. Natural gas utilities can also collect such funds, and a bill to require this has been introduced in the Colorado legislature in past sessions.

Policy Design

Goals: TBD

Timing: TBD

Parties Involved: TBD

Other: TBD

ES-6. Incentives for CHP, DG, Smart Grid

Policy Description

Financial incentives for combined heat & power (CHP) and Distributed Generation (DG) could include: (1) direct subsidies for purchasing/selling systems given to the buyer/seller; (2) tax credits or exemptions for purchasing/selling systems given to the buyer/seller; (3) tax credits or exemptions for operating systems; (4) feed-in tariff, which is a direct payment to CHP/DG owners for each kWh of electricity or BTU of heat generated from a qualifying system; and (5) tax credits for each kWh or BTU generated from a qualifying system.

In addition, the availability of net metering would substantially increase the value of certain kinds of DG resources, as any excess energy produced could be sold to the grid to offset the cost of purchasing power when additional energy is needed.

Barriers to these resources include inadequate information, institutional barriers, high transaction costs for small projects, high financing costs because of lender unfamiliarity and perceived risk, "split incentives" between building owners and tenants, and utility-related policies like interconnection requirements, high standby rates, exit fees, etc. The lack of Standard Offer or long-term contracts, payments at avoided cost levels, and lack of recognition of the value of reduced carbon emissions also creates obstacles.

Policies to remove these barriers include:

- Improved interconnection policies
- Improved rates and fees policies, including net metering
- Streamlined permitting
- Procurement policies
- Education/outreach

Policy Design

Goals: Ramp up CHP/DG to 3% of total fossil fuel generation

Timing: 3% by 2020

Parties Involved: Mostly on customer side of the meter, so large industrials, commercial, universities, anyone with a heating or steam load.

Other: Not applicable

ES-7. Carbon Capture & Storage Infrastructure

Policy Description

Carbon dioxide capture and sequestration (CCS) in conjunction with advanced fossil fuel generation offers one potential option to significantly reduce the carbon dioxide emissions associated with electricity generation. One barrier to implementation of CCS on a wide scale is the lack of a pipeline infrastructure to carry carbon dioxide to suitable and economic sequestration sites. Another barrier to CCS implementation is regulatory uncertainty in key areas such as regulation of sequestration sites, ownership of underground sequestration resources, and long-term liability against carbon dioxide leakage. This policy recommendation seeks to address these barriers through policies to encourage development of a regional pipeline infrastructure for CCS, and also through policies to reduce regulatory uncertainties that today hinder the planning and development of CCS projects.

Policy Design

Goals: Creation of a regional pipeline infrastructure authority. Creation of a workshop process and written report by Colorado state agencies to address various regulatory uncertainties associated with CCS.

Timing: TBD

Parties Involved: TBD

Other: TBD

ES-8: Pricing and Rates

Policy Description

The design of electricity rates, such as increasing block structures, can be used to encourage electricity conservation. However, studies have indicated significant inelasticity between price and demand for electricity. Residential customers tend to reduce consumption by about 1% for every 3-5% increase in price. In some business sectors, price must increase 10-30% for every 1% reduction in usage. Impacts on Colorado business must be closely considered. Time-of-use rates can be used to shift consumption to lower priced hours when more efficient resources may be on the margin. With the same resource mix on line, time-of-use rates may not provide any direct energy savings, as usage is simply moved from one time to another. For some utilities, off-peak marginal resources may have higher emission rates than on-peak marginal resources (e.g. coal off-peak vs, gas on-peak). However, there still may be a carbon benefit if reducing peak usage avoids or delays the construction of new power plants.

Real-time pricing is a strategy by which utility customer rates are not fixed, but reflect the varying costs that utilities themselves pay for power (which can vary substantially during the day and over seasons). But again, there may be little or no energy savings if loads are merely shifted and not actually reduced.

Successful conservation pricing programs have included additional features beyond simply raising prices. Employing the use of advanced metering to inform customers and allow them to manage electric consumption and to conserve energy (used in conjunction with conservation pricing) should be considered. Also, educational materials and customer support are useful to enhance participation in such programs.

Policy Design

Goals: TBD

Timing: TBD

Parties Involved: TBD

Other: TBD

ES-9: R&D for DG & Renewables, Advanced Fossil Fuel

Policy Description

R&D funding can be targeted toward a particular technology or group of technologies as part of a state program with a mission to build an industry around that technology in the state and/or to set the stage for adoption of the technology for use in the state. For example, an agency could be established to help develop and deploy energy storage technologies. R&D funding can be made available to any renewable or other advanced technology through an open bidding procedure (driven by bids received rather than by a focused strategy to develop a particular technology). Funding can also be given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use.

Under this policy Colorado would establish a fund, funded by a per-kWh charge on electricity use, to be made available for in-state R&D on low- or non-carbon emitting sources of electricity, such as advanced solar, fuel cells, wind power, etc. The fund would *not* be available support to generating technologies which depend on carbon sequestration to become low-emitting.

Policy Design

Goals:

- Increase penetration of low- or non-carbon emitting generation in Colorado.
- Support development of renewable energy industry in Colorado.
- Create jobs and economic development while reducing overall carbon emissions.

Timing: Begin RFP process in 2008, with first funding available in 2009.

Parties Involved: Low interest loans would be made available to Colorado research institutions and companies through an RFP process.

Other: Not applicable

ES-10. Promote Advanced Fossil Fuel Generation with Carbon Capture, Including IGCC

Policy Description

Advanced fossil fuel generation technologies, in combination with carbon dioxide capture and sequestration (CCS), offer one potential option to significantly reduce the carbon dioxide emissions associated with electricity generation. Coal generation in conjunction with CCS may combine the cost-effectiveness of coal with low carbon emissions. Coal generation with CCS could be based on integrated gasification combined cycle (IGCC) technology, pulverized coal technology, or some other approach.

Under this proposal, the Climate Action Panel recommends that:

1. Based on the importance of commercialization of the option of low-carbon emitting coal-based generation, the Colorado Climate Project and Governor Ritter carefully consider and, if appropriate, support the Colorado IGCC with CCS project as reflected in Xcel Energy's application the Colorado Public Utilities Commission.
2. Governor Ritter and Colorado's federal legislators work to obtain meaningful federal funding for the Colorado IGCC with CCS project. Federal funding would leverage the benefits of advanced coal with CCS for the entire nation, mitigate the technology risk of the project borne by Colorado utilities and ratepayers, and directly benefit Colorado's electric customers by reducing the cost of an IGCC with CCS project.

Policy Design

Goals: Colorado CCP and Governor support for Colorado IGCC with CCS project in late 2007. Procure federal funding for Colorado IGCC with CCS project.

Timing: IGCC with CCS project expected to be operational in 2015.

Parties Involved: TBD

Other: TBD

ES-11. Small New Hydro and Efficiency Improvements at Existing Hydro

Policy Description

Currently, existing hydroelectric plants in Colorado produce abut 1,200 GWh of electric energy per year. This energy is produced from plants built in the early 1920's and before as well as relatively newer units. Older plants present opportunities for improvements in efficiency and production including more efficient turbines, upgraded generator windings and replacement of mechanical controls with solid state equipment. The improvement in efficiency and plant production can range from 1-2% to as high as 25-30%.

In addition, several studies have suggested there may be 1000 MW or more of hydroelectric potential in Colorado that could be developed at existing sites – e.g. current impoundments, diversions and water conveyance structures. Depending on the location, small hydroelectric projects can be cost competitive with both fossil-fueled and other renewable power sources. Some sites would be suitable for pump/storage operation – thus increasing the value during peak operating periods. Pump/storage is also a valuable way of storing energy from wind and solar generating facilities. Opportunities for small hydroelectric development that are often overlooked include sites on domestic water systems.

Many of these sites are located close to loads, thus they would incur minimal transmission and distribution losses. With the recent enthusiastic acceptance of wind energy programs, it is reasonable to expect that small hydroelectric energy programs based on local resources would also be favorably received by customers. Development of this resource could also postpone the need for additional large base loaded plants.

The primary barrier to development of hydroelectric facilities is that the water facilities are owned and operated by water utilities with little or no expertise in power production. The generation potential of each site is often small and thus overlooked by power providers.

Policy Design

Goals: Funds available for community and technical evaluation of sites – by 2008, completed 2009.

Timing: Ramp-up increasing efficiency and production from existing plants and development of new small hydro – by 50 MW per year for 10 years.

Parties Involved: TBD

Other: TBD

ES-12. Nuclear Energy

Policy Description

Electricity generation accounts for 37% of Colorado's greenhouse gas emissions or about 43 million tons of CO_2 annually. Of that, coal-fired base load plants emit 35 MMT/yr. This amount is slated to increase to 48 MMT/yr by 2020 in the Reference Case projection. Since nuclear plants produce base load power they are potentially a direct replacement for coal.

During operation, nuclear plants generate no GHG, although there are GHG emissions associated with the mining, refining, and transport of uranium fuel. There are also life-cycle GHG emissions (due to construction, decommissioning etc.) which may be small relative to the power they produce.

The value of nuclear power as a GHG mitigation option is clouded by several serious (and highly interrelated) issues:

- Cost per MWh.
- Proliferation of nuclear materials.
- Disposal of nuclear waste.
- Safety issues – real or perceived.
- Resource limitations of uranium or other nuclear fuels.
- Siting problems (NIMBY) and licensing delays.
- Willingness of utilities to invest in nuclear.

This GHG mitigation proposal is to take actions at the state level to facilitate the licensing, siting, financing, and construction of new nuclear power plants in Colorado.

Policy Design

Goals: TBD

Timing: TBD

Parties Involved: TBD

Other: TBD

ES-13. Efficiency Improvements for Existing Generators (Includes Heat Recovery)

Policy Description

Making efficiency improvements at existing generation stations has a number of benefits such as: offsetting the rising cost of fuel, reducing overall emissions and improving plant reliability. This can be done through improvements in both the combustion and steam cycles, as well as with waste heat recovery.

Efficiency improvements at existing generating stations may be hampered by federal regulation, lawsuits and uncertainty. New Source Review (NSR) and New Source Performance Standard (NSPS) regulations need to be clarified and should encourage, not discourage, efficiency improvements such as turbine upgrades, motor, pump, fan and drive improvements, control system upgrades and recovery of waste heat. Though these are federal programs, the State of Colorado may be able to help mitigate potential problems associated with improvements. Public policy could specifically encourage the State to utilize its regulatory discretion to streamline the process of evaluating a plant's NSR and NSPS requirements. Significant reform of NSR should be addressed in any carbon control regulations to encourage plant efficiency. One option is to reinstate the pollution control project (PCP) exemption and broaden it to include significant plant upgrades such as turbine replacements. Another option is to require issuance of construction permits for efficiency projects on a more timely basis (e.g. permits processed within 12 months).

Efficiency improvements at existing generating stations may also be hampered by lack of regulatory cost recovery certainty for regulated investor-owned utilities under the jurisdiction of the Colorado Public Utilities Commission (PUC). Public policy could specifically encourage the PUC to allow for the recovery of costs for efficiency improvements at existing generators. These efficiency improvements could reduce customer energy costs as well as carbon dioxide emissions.

Policy Design

Goals: Increasing plant output without increasing emissions, ensuring plant upgrades are economically beneficial to the provider and consumer and give the provider a clear understanding of the laws that regulate efficiency improvements.

Timing: TBD

Parties Involved: Energy producers, suppliers of new technologies, governmental regulators and installation contractors.

Other: As needed, identify incentives that encourage plant efficiency improvements and utilization of new technology to reduce emissions.

ES-14. Oil and Gas Operations

Policy Description

There are a number of ways in which Greenhouse Gas (GHG) emissions in the oil and gas industry can be reduced. Natural gas consists primarily of methane, a potent GHG, so any leaks during production, processing, and transportation/distribution should be addressed. Eliminating these leaks is economically beneficial because it prevents the waste of valuable product. The EPA Natural Gas STAR program offers numerous methods of preventing leaks.

The Colorado Climate Action Panel (CCAP) recommends that – subject to verification of technical and economic feasibility and reduction potential:

> (a) Colorado implement, on a voluntary basis, all BMPs, PROs, and available technologies starting in 2008 to reduce overall CO2e emissions due to methane emissions from the oil and gas sector by 20% by 2020;
>
> (b) Colorado actively promote participation by oil and gas operators in EPA's Natural Gas Star program; and
>
> (c) as voluntary measures are implemented, if the State determines that oil and gas operators are not on track to achieve the above goal, the State should implement mandatory approaches where appropriate. Mandatory measures would be implemented only after following formal rule making or statutory change procedures with the appropriate "due process" requirements.

There are also a number of ways in which CO_2 emissions in the oil and gas industry can be reduced. The CCAP recommends that Colorado focus attention on reducing GHG emissions from fuel combustion in the oil and gas industry through education, financial incentives, mandates and/or standards – coupled with cost and investment recovery mechanisms, if appropriate.

The CO_2 reduction goals for this policy option reflect – subject to verification of technical and economic feasibility and reduction potential – a reduction in CO_2 emissions from fuel production and handling by 75% by 2020. It is the intent of the CCAP to require further study and analysis of the approaches recommended above by the Colorado Department of Public Health and Environment and other appropriate agencies, and that from this study and analysis, changes in goals and determinations regarding the economic and technical feasibility of these approaches may result.

Policy Design

Goals: 20% reduction in GHG emissions from methane/75% reduction in GHG emissions from fuel production by 2020

Timing: 2008

Parties Involved: Colorado oil and gas permittees.

Other: Not applicable