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Residential, Commercial & Industrial 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 #	**RESIDENTIAL, COMMERCIAL & INDUSTRIAL**						
RCI-1	Expanded Demand Side Management						TBD
RCI-2	Energy Efficiency in Buildings Owned by State and Local Governments						TBD
RCI-3	Enforcement of Building Codes						TBD
RCI-4	Planning and Design						TBD
RCI-5	Inverted Block Rates to Fund Energy Efficiency						TBD
RCI-6	Retrofitting Existing Buildings for Energy Efficiency						TBD
RCI-7	Pricing and Purchasing						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			
RCI-8	Renewable Energy Systems on New and Existing Buildings						TBD
RCI-9	Energy Delivery						TBD
RCI-10	Targeting Small and Medium Enterprises						TBD
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS						
	REDUCTIONS FROM RECENT ACTIONS (table to be added below)						
	SECTOR TOTAL PLUS RECENT ACTIONS						

RCI-1. Expanded Demand Side Management

Policy Description

This option focuses on improving energy efficiency through increased investment in demand-side management programs. Energy efficiency is the lowest cost resource for reductions in electricity and natural gas use by the residential, commercial and industrial sectors. There is a long track record of cost effective energy efficiency initiatives, typically called demand side management (DSM), at the local, state and regional levels in areas around the country. There is vast potential for improving the energy efficiency of homes, appliances, businesses and industry in Colorado.

Policy Design

Goals: 1%/year reduction in energy use in all sectors relative to BAU forecast

Timing: Starting in 2008, through 2020

Parties involved: Entire state's gas and electric producers, suppliers and customers

Related Policies/Programs in Place

Several investor owned utilities (IOUs), municipal utilities (muni's) and rural electric cooperatives have established DSM policies and programs in place. House Bill 07-1037 will facilitate and expand energy efficiency programs implemented by both natural gas and electric utilities (IOUs only) in Colorado (high likelihood of passage in current legislative session). The bill would roughly double the energy and demand savings targets of IOUs from existing levels.

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

Electricity

- *Estimated DSM potential:* The Southwest Energy Efficiency Project (SWEEP) 2002. THE NEW MOTHER LODE: The Potential for More Efficient Electricity Use in the Southwest, November, 2002, available at http://www.swenergy.org/nml/New_Mother_Lode.pdf
- *Cost of saved energy and other energy efficiency policy and program assumptions:* Western Governor's Association (WGA) 2006. The Energy

Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governors Association, January, 2006, available at http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf

- *Electricity prices by sector:* EIA http://www.eia.doe.gov/cneaf/electricity/esr/esr_sum.html (2005 prices) and Annual Energy Outlook 2006 national forecast

Gas

- *Cost of saved natural gas and benefit cost ratio for gas DSM programs:* SWEEP 2006. Natural Gas Demand-Side Management Programs: A National Survey, Southwest Energy Efficiency Project, available at www.swenergy.org;
- *Gas prices (2005):* EIA http://tonto.eia.doe.gov/dnav/ng/xls/ng_sum_lsum_dcu_SCO_a.xls (2005 prices) and Annual Energy Outlook (future prices)

Quantification Methods:

Regional studies of gas and electricity efficiency potential and analyses/experience in other western US states (best practices) will be used to estimate efficiency savings per $ spent on programs, which in turn will be used to calculate the spending required to reach the energy use reduction target.

Key Assumptions:

- Electricity savings per $ of program investment: 2.5 cents/kWh (2005$) (WGA 2006)
- All programs aim for cost-effectiveness as a portfolio of measures.

RCI-2. Energy Efficiency in Buildings Owned by State and Local Governments

Policy Description

Energy Efficiency can be an expensive undertaking up front due to the cost of new technologies, as well as improving the efficiency of existing systems. The steps required to determine the cost to improve efficiency include an audit, design, implementation and measurement and verification. All these steps have costs, which prohibit or slow the conversion to GHG reducing efforts, even though the measures would ultimately result in savings. Having low- or zero-interest funding readily available would make it much easier for public agencies to invest in improving the performance of buildings owned by state and local governments.

Policy Design

Goals: 20% reduction in energy use by buildings owned by state and local governments, including schools, through use of a revolving fund providing zero-interest loans

Timing: Reductions in individual facilities to be implemented in stages over a five-year period. Program would start in 2008 with a goal of reaching 50% of state buildings by 2015.

Coverage: All buildings owned by state and local governments are eligible to participate.

Related Policies/Programs in Place

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

- *Cost of saved energy and other energy efficiency policy and program assumptions:* Western Governor's Association (WGA) 2006. The Energy Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governors Association, January, 2006, available at http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf; also Kinney, Geller, and Ruzzin 2003. Increasing Energy Efficiency in New Buildings in

the Southwest: Energy Codes and Best Practices: SWEEP, available at www.swenergy.org/ieenb/index.html

- *Cost of "beyond code" efficiency improvements:* Southwest Energy Efficiency Project Report, Increasing Energy Efficiency in New Buildings in the Southwest: Energy Codes and Best Practices
- *Commercial and educational facility floor space:* 2003 Commercial Buildings Energy Consumption Survey (CBECS), Detailed Tables, dated October 2006 and published by EIA, http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/alltables.pdf

Quantification Methods:

Regional studies of gas and electricity efficiency potential and analyses/experience in other western US states for commercial space will be used to estimate efficiency savings per $ spent on programs, which in turn, will be used to translate energy savings and program savings targets into required spending levels.

Key Assumptions:

- Program investment ($) for the public sector per unit of electricity savings: 4.74 cents/kWh (2005$) (WGA 2006)
- Senator Reid from Nevada has proposed a bill to provide 0% financing to school districts in 4 "Sun" states to include NV, CO, NM and AZ. This analysis does not include Sen. Reid's bill in the baseline, however it is worth noting that the cost of RCI-2 would be lower if such a bill is enacted.

RCI–3. Enforcement of Building Codes

Policy Description

Building energy codes can be an effective way to eliminate the least efficient energy approaches in new or renovated buildings. The International Energy Conservation Codes (IECC) have become a widely accepted standard. These codes are updated every three years through an exhaustive consensus process involving a large number of code officials and building experts. Many Colorado jurisdictions adopt the IECC. More will do so, if legislation recently passed by both houses of the Colorado Assembly (HB1146) is signed by the Governor as expected. Adoption of the IECC will do no good, however, if it is not enforced, and enforcement is questionable in many building jurisdictions. Building code jurisdictions need to be encouraged to enforce the IECC with training, technical support and education.

Colorado is a home rule state – incentives to local governments are more acceptable than mandates. Incentives will take the form of training and technical support for the inspectors, plan reviewer and code officials as well as education for builders and contractors. This approach can have the added benefit of educating local governments and the contractors and builders about the programs that encourage "beyond code" construction.

Policy Design

Goals: Spend $1M/yr in training and resources to improve energy code enforcement

Timing: Begin funding in 2008

Coverage: Covers the 20,000 new homes per year in CO, plus retrofits.

Related Policies/Programs in Place

Some areas, notably Boulder, are already "beyond code".

HB 1146 requires county and municipal boards that have building codes to adopt standards at least as stringent as the 2003 International Energy Conservation Code (IECC). This bill has been passed by the legislature and signed by the governor.

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources: PWG members to provide references on effectiveness of building code enforcement, OR to suggest/agree on % increase in compliance to be achieved by proposed level of investment.

Quantification Methods: A literature review will be conducted to estimate returns (emissions reductions) on enforcement.

Key Assumptions: % increase in compliance to be achieved by proposed level of investment.

RCI-4. Planning and Design

Policy Description

Mandating building design to a very high efficiency standard will ensure that the next generation of buildings in Colorado produces much lower GHG emissions per unit of utility.

Policy Design

Goals:

- ~~For~~ All new construction and major renovations of government-owned buildings, including schools and publicly-owned hospitals, must attain LEED™ certification; 30% must be certified ~~, certification~~ to LEED™ Gold, and the other 70% to LEED™ Silver ~~for 100% of these buildings~~.
- For residential: 70% of new homes to EnergyStar standard "high performing" (see HPH100.org for definition)
- Commercial: new buildings held to Architecture 2030 standards

Timing:

- For Government buildings, applies to structures and major renovations for which design begins after December 31, 2007.
- For residential, 70% by 2015
- For commercial, 70% meet standards by 2015

Coverage: See above

Related Policies/Programs in Place

US Green Buildings Council's LEED™ New Construction (NC), LEED™ Existing Buildings (EB), LEED™ Core and Shell (C&S), and LEED™ Homes (H) (expected launch of LEED for Homes in Fall 2007)

Colorado Homebuilders Association Built Green

EPA Energy Star and HPH100

Architecture 2030

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

- *Levelized cost of electricity savings:* WGA CDEAC EE, 2005, The Energy Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governors Association and The Potential for More Efficient Electricity Use in the Western United States, January, 2006, http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf.
- *Total Commercial floor space, electricity and gas consumption:* 2003 USDOE EIA CBECS data (Table B.5) for the Mountain region, extrapolated using projected Colorado population as a driver. http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/alltables.pdf
- *Energy consumption by housing unit:* US EIA 2004. "Consumption and Expenditure Data Tables" in Residential Energy Consumption Survey 2001, available at http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html
- *Cost and benefit of LEED:*
  - Enermodal Engineering, Inc. 2007. The Costs and Benefits of LEED-NC in Colorado, prepared for Colorado Governor's Energy Office, March 2007, available at http://www.colorado.gov/rebuildco/services/highperformance/leed_cost/index.htm
  - Gregory H. Kats 2003. Green Building Costs and Financial Benefits: A Report to California's Sustainable Building Task Force, available at http://www.cap-e.com/ewebeditpro/items/O59F3481.pdf
- *Cost of "beyond code" efficiency improvements:* Southwest Energy Efficiency Project Report, Increasing Energy Efficiency in New Buildings in the Southwest: Energy Codes and Best Practices

Quantification Methods:

Per-unit energy savings associated with achieving target levels of efficiency (over code or existing practices) to be determined from data sources and/or sources to be provided by PWG members. Projected number of new units per year to be derived from state or federal census projections or other publicly available data.

Key Assumptions:

Per-unit efficiency improvement over BAU associated with these standards

RCI-5. Inverted Block Rates to Fund Energy Efficiency

Policy Description

This option uses tiered, increasing surcharges to simultaneously provide a source of funding for energy efficiency and a financial incentive to adhere to high energy efficiency (low energy intensity) standards. Unlike a traditional public benefits charge, the surcharge grows with increasing use above target levels. High efficiency consumers will pay no surcharge.

Note: implementing this state wide would probably require legislation.

Policy Design

Goals: Standard rates up to Architecture 2030 targets, 2 cents per kWh surcharge for kwh above 2030 target up to two times the 2030 target, and 5 cents/kWh surcharge for all kwh in excess of two times the Architecture 2030 target. Proceeds to be used to fund energy efficiency programs in the Residential & Commercial sectors.

Timing: Starting in 2010

Coverage: Rates are applicable statewide, Residential & Commercial sectors.

Related Policies/Programs in Place

Architecture 2030 (http://www.architecture2030.org/news/targets.html)

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

- *Price elasticity of electricity:* SWEEP 2002. THE NEW MOTHER LODE: The Potential for More Efficient Electricity Use in the Southwest, November, 2002, http://www.swenergy.org/nml/New_Mother_Lode.pdf
- *Electricity prices:* same sources as used for RCI-1.
- *Return on investment in efficiency measures:* same sources as used for RCI-1.

*PWG members: please assist in defining these targets based on this table from the Architecture 2030 website. Also, targets **must** be related to readily available economic and BAU data for analysis.*

2030 CHALLENGE Targets

U.S. Average Site Energy Use and 2030 Challenge Energy Reduction Targets by Space/Building Type (CBECS 2003)[1]

From the Environmental Protection Agency (EPA): Use this chart to find the site fossil-fuel energy targets.

Primary Space/Building Type [2]	Available in Target Finder [3]	Average Source EUI [4] (kBtu/Sq.Ft./Yr)	Average Percent Electric	Average Site EUI [4] (kBtu/Sq.Ft./Yr)	2030 Challenge Site EUI Targets (kBtu/Sq.Ft./Yr)				
					50% Target	60% Target	70% Target	80% Target	90% Target
Administrative/Professional & Government Office	✓								
Bank	✓								
Clinic/other outpatient health		199.0	76%	84.2	42.1	33.7	25.3	16.8	8.4
Convenience store (with or without gas station)		681.1	90%	241.4	120.7	96.5	72.4	48.3	24.1
Distribution/shipping center		82.9	61%	44.2	22.1	17.7	13.3	8.8	4.4
Fast food		1195.0	64%	534.3	267.2	213.7	160.3	106.9	53.4
Fire station/police station		145.7	56%	77.9	39.0	31.2	23.4	15.6	7.8
Hospital/inpatient health	✓								
Hotel, Motel or inn	✓								
K-12 School	✓								
Medical Office	✓								
Non-refrigerated warehouse	✓								
Nursing home/assisted living		234.8	54%	124.3	62.2	49.7	37.3	24.9	12.4
Post office/postal center		131.9	58%	63.5	31.8	25.4	19.1	12.7	6.4
Preschool/daycare		155.3	60%	75.0	37.5	30.0	22.5	15.0	7.5
Refrigerated warehouse	✓								
Religious worship		77.5	52%	45.9	22.9	18.3	13.8	9.2	4.6
Residence hall/Dormitory	✓								
Restaurant/cafeteria		565.7	53%	301.6	150.8	120.7	90.5	60.3	30.2
Retail store		158.3	67%	72.2	36.1	28.9	21.7	14.4	7.2
Self-storage		10.9	44%	4.0	2.0	1.6	1.2	0.8	0.4
Supermarket/Grocery	✓								
Vehicle repair/service/storage		96.6	64%	50.7	25.3	20.3	15.2	10.1	5.1
Secondary Space/Building Type [2]									
Ambulatory Surgical Center	✓								
Computer Data Center	✓								
Garage	✓								
Open Parking Lot	✓								
Swimming Pool	✓								
Residential Space/Building Type [5]									
Single-Family Detached		-	-	44.7	22.4	17.9	13.4	8.9	4.5
Single-Family Attached		-	-	45.6	22.8	18.2	13.7	9.1	4.6
Multi-Family, 2 to 4 units		-	-	56.1	28.1	22.4	16.8	11.2	5.6
Multi-Family, 5 or more units		-	-	48.5	24.3	19.4	14.6	9.7	4.9
Mobile Homes		-	-	72.0	36.0	28.8	21.6	14.4	7.2

Quantification Methods:

TBD. Review recent studies on California block rate structure.

Key Assumptions:

- Price elasticity of electricity: –0.2 to –0.3

- Conversion of Architecture 2030 goals (kBtu/sq.ft/yr) to kwh standards: ?
- Distribution of customer types to be associated with pricing thresholds, OR estimation of number (& MWh) of customers affected by rates.
- Architecture 2030 Challenge Site EUI Targets: 50, 60, 70, 80, or 90%?
- Substitution effect for heating fuel (cross price elasticity): ?

RCI-6. Retrofitting Existing Buildings for Energy Efficiency

Policy Description

This option is designed to improve the energy efficiency of existing privately owned (e.g., non-municipal) residential, commercial and industrial buildings through a variety of energy-efficiency upgrades and improvements in day-to-day operations. This proposal would provide short-term, low- or no-interest loans from the state (paid back by energy savings) to businesses; and tax credits to homeowners and residential rental property owners to offset the initial costs and thus encourage energy-efficiency upgrades. It could also create low- or no-interest loans to energy service companies who contract with commercial and industrial clients to implement energy-savings measures.

Policy Design

Goals: By 2017, reach 5% of commercial/industrial/institutional buildings per year with low interest loans from revolving fund – recipients to achieve 25% reduction in energy use on a per square foot basis over five years.

Timing: Begin in 2008, continuing for 5 years. Renewed every 5 years, based on satisfactory outcome.

Coverage: Commercial, industrial and institutional properties

Related Policies/Programs in Place

State Partners for Energy and the Environment program for inspectors to identify energy efficient potential during their regular inspections; Colorado Business Energy Partnership helps Colorado companies identify cost-effective strategies to boost energy efficiency; EPA's Energy Star program offers free tools to property owners to assess energy efficiency potential; Industrial Assessment Center/DOE offer free energy audits for small- and medium-sized businesses.

Proposed Colorado Bill 07-1037 directs the Public Utilities Commission to adopt rules establishing funding and cost recovery mechanisms for distributors of natural gas and electric to engage in conservation and energy efficiency programs, and directs distributors of natural gas and electric to develop and implement cost-effective energy efficiency programs once such rules are adopted. The purpose of the bill is to conserve energy and slow the need for new energy resources to be built or purchased.

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD. Existing buildings account for up to 40% of GHG emissions. Because many buildings are extremely inefficient, small efficiency upgrades can result in dramatic reductions in GHG emissions and economic savings.

Data Sources:

- *Cost of saved energy and other energy efficiency policy and program assumptions:* Western Governor's Association (WGA) 2006. The Energy Efficiency Task Force Report to the Clean and Diversified Energy Advisory Committee of the Western Governors Association, January, 2006, available at http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency-full.pdf.
- *Estimated DSM potential:* The Southwest Energy Efficiency Project (SWEEP) 2002. THE NEW MOTHER LODE: The Potential for More Efficient Electricity Use in the Southwest, November, 2002, available at http://www.swenergy.org/nml/New_Mother_Lode.pdf.
- *Program-specific data:* NWPCC 2005. The Fifth Northwest Electric Power and Conservation Plan, available at http://www.nwcouncil.org/energy/powerplan/plan/Default.htm; California DEER (Database for Energy Efficiency Resources), available at http://eega.cpuc.ca.gov/deer/; ACEEE 2003. America's Best: Profiles of America's Leading Energy Efficiency Programs, available at http://www.aceee.org/pubs/u032.htm

Quantification Methods:

Reductions to equal 25% of 5% of total Commercial, industrial and institutional energy use over five years. Cost to be estimated based on public data on cost-effectiveness of retrofits, less economic benefits associated with greater energy efficiency.

Key Assumptions:

Cost-effectiveness of retrofits for existing Colorado building stock

RCI-7. Pricing and Purchasing

Policy Description

Adopt smart metering, combined with time-of-use rate schedules and in-home displays, to enable electricity consumers to better manage energy use.

Initial expectation is to reduce electricity consumption 4 to 15%.

Policy Design

Goals: Implement time of use rates with smart meters and in-home displays of energy use, cost, and associated GHG emissions for 100% of electricity customers in Colorado (including customers of investor-owned utilities, cooperatives, and municipal utilities).

Timing: Start up in 2009, targeting 10% of industrial, commercial, and residential consumers, ramping up to 100% by 2013.

Parties involved: All industrial, commercial, and residential electricity customers in Colorado.

Related Policies/Programs in Place

Types(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production

Estimated GHG Savings and Costs per $MtCO_2e$

TBD.

Customers that have real time energy consumption information have been shown to use 4-15% less energy with lasting results. (Primen, 2004)

Data Sources:

Impacts of different types of smart metering:

- "Smart Metering Study Summary" (smart-metering-append.pdf) compiled by CU Denver for the City & County of Denver
- Primen, Inc. 2004. California Information Display Pilot Technology Assessment, http://www.ucop.edu/ciee/dretd/documents/idp_tech_assess_final1221.pdf
- CRA International. 2006. California's Statewide Pricing Pilot: Commercial & Industrial Analysis Update, available at http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=1036

- Resource Insight, Inc. 2003. Peak-Shaving/Demand Response Analysis: Load-Shifting by Residential Customers, June 2003, available at www.capelightcompact.org/pdfs/Peak%20Shaving%20Demand%20Response%20Analysis.pdf
- Summit Blue Consulting, Inc. 2006. Evaluation of the 2005 Energy-Smart Pricing PlanSM, prepared for Community Energy Cooperative, August 2006, available at www.energycooperative.org/pdf/ESPP-Evaluation-Executive-Summary-2005.pdf and http://www.energycooperative.org/energy-smart-pricing-plan.php

Quantification Methods: Cost will be based on costs of real-time metering experienced by other states/localities. Economic savings in reduced energy use will also be estimated. Emissions reduction will draw on California experience.

Key Assumptions: Energy use reduction associated with real-time metering and in-home displays, translated from CA to CO

RCI-8. Renewable Energy Systems on New and Existing Buildings

Policy Description

This policy option will promote wider use of active and passive renewable energy systems on all buildings through education and financial incentives in the form of tax credits to businesses, homeowners and residential rental property owners who install proven and reliable renewable energy systems on property owned or operated by them.

Systems to be included in the mix of renewable energy technologies include passive solar heating, solar hot water, concentrated solar thermal, PV in areas not already covered by the RPS, and geothermal (ground-source heat pumps). (Other renewable energy systems that will qualify for the tax credit are under discussion.)

Proposed tax incentives will be awarded only to individuals and businesses that have significantly reduced energy consumption prior to or concurrent with system installation.

An educational campaign will be created to assist individuals and businesses in understanding the renewable energy options and requirements of the program. In addition, short-term, low-interest loans from the state and/or tax credits will be available to businesses, and tax credits will be available to homeowners and residential rental property owners, for energy-efficiency upgrades (to enlarge the pool of homeowners, residential property owners, and businesses eligible to take advantage of the renewable energy system tax credit).

Policy Design

Goals:

(1) Expand the use of renewable energy by creating tax incentives to individuals and businesses who install proven and reliable renewable energy systems on property owned or operated by them. The incentive will be a 30% tax credit for passive solar heating, solar hot water, concentrated solar thermal, PV in areas not already covered by the RPS, and geothermal (ground source heat pumps), all of which have to meet the performance standard under (2), below, to qualify. (Other types of renewable energy systems that will qualify for the tax credit are under discussion.)

(2) Create a complementary energy efficiency requirement that buildings related to the renewable energy system to be installed must reduce energy consumption by 20% prior to applying for renewable energy tax credits.

Timing: Start up in 2008, continuing for 5 years, with additional 5-year renewals based on success of program. Program should include periodic assessment of program performance with legislative policy adjustments, if required.

Parties involved: (1) Homeowners, (2) Commercial Sector, (3) Industrial Facilities, and (4) Rental property owners in all sectors.

Other: Systems that qualify for tax incentives should significantly reduce energy use when combined with energy efficiency measures. Businesses will have short-term, low-interest loans from the state and/or tax credits available to them for energy efficiency upgrades; tax credits will be available to homeowners and residential rental property owners for energy efficiency upgrades.

Related Policies/Programs in Place

Amendment 37 requires major public utilities to provide rebates to residential and business customers of utility companies that install solar electric systems. HB 07-1281 has since doubled the Renewable Energy Standard, effectively doubling the set-aside for generation by customer-sited solar electric systems.

Federal incentives are available for individuals and businesses that apply energy conservation measures and install solar electric, and domestic solar hot water.

Type(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

- *Housing units and commercial building area:* The Southwest Energy Efficiency Project's Report Increasing Energy Efficiency in New Buildings in the Southwest: Energy Codes and Best Practices, http://www.swenergy.org/ieenb/fact_sheet_arizona.pdf
- *Building floor area:* 2003 Commercial Buildings Energy Consumption Survey Detailed Tables, http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/allbc.pdf, Tables A5 and A6
- *Costs of renewable energy systems:* Iton, Inc. 2005. CPUC Self-Generation Incentive Program Preliminary Cost-Effectiveness Evaluation Report, prepared for California Public Utilities Commission, available at http://www.cpuc.ca.gov/static/energy/electric/050914_self-generationincentiveprogram_cost-effectiveness+evalreport.pdf or http://www.cpuc.ca.gov/static/energy/electric/051005_sgip.htm; San Diego Regional Energy Office 2007. "Statewide Self-Generation Incentive Program Data" (updated April 2007, 2.3 MB XLS), available at http://www.energycenter.org/ContentPage.asp?ContentID=279&SectionID=276&SectionTarget=35
- *Federal solar tax credits by sector:* Energy Policy Act of 2005, http://www.seia.org/getpdf.php?iid=21

- *PV penetration and performance:* LBL and CESA. "Designing PV Incentive Programs to Promote Performance - A Review of Current Practice," by Galen Barbose, Ryan Wiser, and Mark Bolinger, LBNL. October 2006. Available at http://www.cleanenergystates.org/case.html

Quantification Methods:

As written, this policy option cannot be analyzed quantitatively. Benefits of providing financing for renewables may be amenable to quantification, although this would not be consistent with the option as defined by the PWG and approved by the CAP.

Key Assumptions:

RCI-9. Energy Delivery

Policy Description

Combined heat and power (CHP) refers to any system that simultaneously or sequentially generates electric energy and utilizes the thermal energy that is normally wasted. Western Governors Association analysis shows that CHP is an affordable, efficient, clean, and reliable piece of the puzzle for meeting the Western region's energy needs while substantially reducing carbon emissions. CHP is sometimes called "recycled energy" because the same energy is used twice. The recovered thermal energy can be used for space heating, hot water, steam, air conditioning, water cooling, product drying, or for nearly any other thermal energy need. The end result is significantly more efficient than generating electric and thermal energy separately. In fact, many CHP systems are capable an overall efficiency of over 80 percent – double that of conventional systems.

In addition to tremendous efficiency gain, increased adoption of CHP in the West would save literally billions in new capital investment, reduce power costs, reduce security vulnerabilities, improve reliability and power quality, avoid transmission losses, reduce water used by power plants, cut fossil fuel use, cut greenhouse gas emissions, and cut other pollutants. Combined heat and power, using proven and affordable technologies, significantly improves every key outcome from power generation.

Policy Design

Goals & Timing: 1500 MW of CHP statewide by 2015 (based on WGA white paper potential)

Coverage: Statewide

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production or on-site fuel combustion, reduction in transmission losses, improvements in overall energy use efficiency

Estimated GHG Savings and Costs per $MtCO_2e$

TBD. One generalized estimate (WGA) is that CO_2 emissions from CHP are 49 percent lower than centralized power generation (coal).

Data Sources:

CHP Technical Potential:

- WGA 2006. Combined Heat and Power White Paper to the Clean and Diversified Energy Initiative of the Western Governors Association, January 2006, available at http://www.westgov.org/wga/initiatives/cdeac/CHP-full.pdf.
- Energy and Environmental Analysis, Inc. 2003. Market Potential for Advanced Thermally Activated BCHP in Five National Account Sectors.
- Resource Dynamics Corporation 2004. Combined Heat and Power Market Penetration for Opportunity Fuels, August 2004, prepared for U.S. DOE

CHP Economic Potential:

- Energy and Environmental Analysis, Inc., EPRI Solutions, Inc., and Energy and Environmental Economics, Inc. 2005. Assessment of California CHP Market and Policy Options for Increased Penetration. July 2005, prepared for Electric Power Research Institute and California Energy Commission's Public Interest Energy Research Program
- EEA 2004. Assessment of Large Combined Heat and Power Market. April 2004, submitted to Oak Ridge National Laboratory.

Cost and Performance of CHP and DG:

- WGA 2006. Combined Heat and Power White Paper to the Clean and Diversified Energy Initiative of the Western Governors Association, January 2006, available at http://www.westgov.org/wga/initiatives/cdeac/CHP-full.pdf.
- Navigant Consulting 2006. "Energy Cost Savings Module for customer-sited DG" prepared for the Massachusetts DG Collaborative, available at http://masstech.org/renewableenergy/public_policy/DG/EnergyCostSavingsModule-Jan202006.zip
- GRI and NREL 2003, Gas-Fired Distributed Energy Resource Technology Characterizations – Bringing you a prosperous *future where energy is clean, abundant, reliable, and affordable*, available at http://www.eea-inc.com/dgchp_reports/TechCharNREL.pdf**.**

Quantification Methods:

Emissions benefit of increased overall energy use efficiency of CHP will be multiplied by target penetration rate. Cost of CHP investments and economic potential for CHP to be determined from public sources. Energy cost savings associated with greater efficiency to be estimated based on forecast energy prices in Colorado.

Key Assumptions:

- 1,578 MW of technical CHP potential in Colorado (per WGA 2006)
- Existing CHP capacity (CO): 791MW (per PWG)
- Economic CHP potential

RCI-10. Targeting Small and Medium Enterprises (SMEs)

Policy Description

Introduction

This option builds on the success of Fort Collins' "Climate Wise" program, a voluntary program for reducing energy use in small businesses, by expanding this concept to the entire state of Colorado.

Policy Design

Goal: 1 million tons CO2/yr reduction in emissions by replicating the Fort Collins program statewide, with free on-site technical assistance.

Timing: Ramp up to 1 million tons annual avoided emissions by 2015.

Parties involved: Small and Medium-sized enterprises throughout the state

Types(s) of GHG Reductions

Reduction in GHG emissions (largely CO_2) from avoided electricity production and on-site fuel combustion, as well as avoided transportation (VMT), pollution, waste-related emissions (CO_2 and methane), GHG-reduction benefits from water conservation will not be analyzed.

Estimated GHG Savings and Costs per $MtCO_2e$

TBD

Data Sources:

- *Technical assistance:* TBD
- *Public recognition:* TBD
- *Publicity of their participation:* TBD

Quantification Methods: Potential statewide benefits to be estimated based on information to be provided by Fort Collins program staff.

Key Assumptions:

TBD.