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Catalog of State-Level GHG Reduction Policy Options
Energy Supply

Prepared by The Center for Climate Strategies (CCS) for the Montana Climate Change Advisory Committee (CCAC) and its Scientific Advisory Panel (SAP) and Technical Work Groups (TWGs) based on actions undertaken or considered by all US states.

Key to Future Rankings of Options in the Table that Follows:

Potential Emission Reductions 1/	Potential Cost or Cost Savings 1/ 2/
High (H): At least 0.5 Million Metric Tons (MMT) carbon dioxide equivalent (CO_2e) per year by 2020 (~1% of current MT emissions)	**High (H)**: $50 per Metric Ton CO_2e ($MTCO_2e$) or above
Medium (M): From 0.1 to 0.5 MMT CO_2e per year by 2020	**Medium (M):** \$5-50/$MTCO_2e$
Low (L): Less than 0.1 MMT CO_2e per year by 2020, or 0.5 MMT CO2e by 2050	**Low (L):** Less than \$5/$MTCO_2e$
Uncertain (U): Not able to estimate at this time	**Uncertain (U):** Not able to estimate at this time

1/ Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.
2/ Costs are denoted by a positive number. Cost savings (i.e., "negative costs") are denoted by a negative number.

NOTE: October 25, 2006 - CCS has provided preliminary estimates of potential emission reductions and potential costs or cost savings for some of the options in the catalog. These estimates are based on research for Montana and for other US states and provide rough order of magnitude. These estimates are subject to review and revision by TWG members to improve the estimates based on additional information or greater specificity of the option. TWG members are encouraged to provide feedback on the estimates during the October 25, 2006 TWG call or by email to CCS facilitators.

Definition of "Priorities for Analysis":

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.

- **Low**: Low priority options will be analyzed last, time and resources permitting.

Notation of Options: Options will be marked with an asterisk (*) at a later date to indicate options that are at least partially "base case" policies, i.e., that have been considered or undertaken at some level in Montana. This version of the catalog includes, in highlighted text, new options and revisions that were suggested during the first TWG meeting (September 6, 2006) and the second CCAC meeting (September 15, 2006).

Energy Supply (ES)

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Ancillary Impacts, Feasibility Considerations	Notes
ES-1	**RENEWABLE ENERGY**					
1.1	Environmental Portfolio Standard (renewables and energy efficiency) with renewable energy credit trading		Medium/ High	Low /High		
1.2	Greenpower renewable resources programs		See 1.6	See 1.6		This option essentially duplicates 1.6
1.3	State purchase of electricity through Greenpower renewable resources programs		Low/ Medium	Low/ Medium		
1.4	Public Benefit Charge Funds		Medium /High	Low /Medium		
1.5	Renewable Energy Incentives (biomass, wind, solar, geothermal)		Medium /High	Low /Medium		
1.6	Green Power Purchases and Marketing		Low/ Medium	Low/ Medium		
1.7	Renewable energy development issues (zoning, siting, etc.)					

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1.8	Research and Development (R&D)		Uncertain	Uncertain		
1.9	Landfill Gas Recovery (see also Waste)		Low /Medium			
1.10	Waste to Energy (see also Waste)		Low			
1.11 (new option)	Storage technologies. (in particular compressed natural gas or air).		Uncertain	Uncertain		Further information can be found at http://www.wapa.gov/es/pubs/esb/2003/03Aug/esb084.htm.
ES-2	**DISTRIBUTED GENERATION (DG) – note co-benefits of community/appropriate scale development of renewables.**					
2.1	Incentives for combined heat and power (CHP) and clean DG		High	Cost Savings - Medium Cost	Cost dependent on price of natural gas; interconnection an issue; utility system co-benefits.	
2.2	Removing barriers to CHP and clean DG (including utility rate and interconnection barriers, financing, information, etc.)		High (if combined with above)	Cost Savings - Medium Cost	(as above)	
2.3	Interconnection Rules for clean, distributed generation		High (if combined with above)	Cost Savings - Medium Cost	(as above)	

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2.4	Net Metering		Low / Medium	Cost Savings/ Low Cost		
2.5	Pricing strategies		Low / Medium	Cost Savings/ Low Cost		
ES-3	**ADVANCED FOSSIL FUEL**					
3.1	Incentives for advanced coal, including IGCC and carbon capture and storage (CCS)		High	Medium		
3.2	Incentives for CO2 pipelines for Carbon Capture and Storage (CCS)		High (if combined with above)	Medium		
3.3	Fuel Cell Development Incentives		Uncertain	Uncertain		
3.4	Combined H2/electricity production from fossil fuels with sequestration		Uncertain	Uncertain		
3.5	Research and Development (R&D)		Uncertain	Uncertain		
ES-4	**NUCLEAR**					
4.1	New Nuclear Capacity and Licensing					TWG members suggested these options should be removed (or made low priority).
4.2	Nuclear Plant Relicensing					
4.3	Nuclear Plant Uprating					

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ES-5	**OTHER ELECTRICITY MEASURES**					
5.1	Efficiency Improvements and Repowering Existing Plants		Medium/ High	Low		
5.2	Transmission System Upgrading		Low/ Medium	Uncertain		
5.3	Reduce Transmission and Distribution Line Loss		Low/ Medium	Uncertain		
5.4 (new option)	Demand-side Management		High	Cost savings/ low costs		CCAC members discussed importance of considering demand reduction on the energy supply side (noting that specific options are being explored in RCI)
ES-6	**EMISSIONS POLICIES**					
6.1	CO2 Tax		Low to High (Depending on Design)	Low / Medium		
6.2	GHG Cap and Trade					
6.3	Generation Performance Standards					
6.4	GHG Offset/mitigation requirements for new power plants					
6.5	GHG Offset/mitigation requirements for existing power plants					
6.6	Voluntary Utility CO2 Targets					

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ES-7	**EDUCATION/AWARENESS**					
7.1	Brownfield Re-development					
7.2	Environmental (emissions) Disclosure					
7.3	Public Education					
ES-8	**FOSSIL FUEL PRODUCTION**					
8.1	Methane Reduction in Oil & Gas Operations (BMPs & PROs)		Medium/ High	Cost Savings to Low/ Medium Cost	In addition to reducing potent GHG emissions, reducing these leaks and losses can provide an economic benefit in increased natural gas sales.	Emissions occur when natural gas (which consists primarily of methane) leaks or is vented during production, processing, and transportation/distribution activities. The EPA Natural Gas STAR program provides assistance with leak and loss prevention efforts through Best Management Practices (BMPs) and Partnership Reduction Opportunities (PROs).

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8.2	CO2 Reduction from Fuel Combustion in Oil & Gas Operations		Low/ Medium	Cost Savings to Low/ Medium Cost		There are a number of ways in which CO2 emissions in the oil and gas industry can be reduced, including (1) installing new efficient compressors, (2) optimizing gas flow to improve compressor efficiency, (3) improving performance of compressor cylinder ends, (4) capturing compressor waste heat, (5) replacing compressor driver engines, (6) installing waste heat recovery boilers and/or (7) ensuring proper maintenance of equipment. Policies to encourage these practices might include education and information exchange, financial incentives, and/or mandates/standards that require certain practices.

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8.3	CO2 Capture and Storage or Reuse (CCSR) in O&G operations.		Low/ Medium /	Cost Savings to Low/ Medium Cost		Carbon capture and storage or reuse (CCSR) involves capturing carbon and either (1) sequestering it in a geologically sound reservoir or (2) reusing the CO2 to aid in natural gas extraction or as a feedstock for industrial processes, and perhaps eventually as a feedstock that when combined with water can be reformed into liquid fuels. Excess CO2 is removed is typically removed and emitted to the atmosphere, in natural gas extraction and processing, and amounts can be significant where CO2 concentrations in the field are quite high. Carbon can also be captured in the process of gasifying coal to liquid fuels.
8.4	Venting and flaring reduction in Oil & Gas operations		Low	Cost Savings to Low/ Medium Cost		

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8.5	Methane and fuel use reduction in coal operations		Low/Medium	Cost Savings to Low/ Medium Cost		