Energy Supply (ES) Policy Work Group

Brief Descriptions of Potential State Actions

ES-1 RENEWABLE ENERGY

1.1 Environmental portfolio standard (renewables and energy efficiency) with renewable energy credit trading

A renewable portfolio standard (RPS) is a requirement that utilities must supply a certain, generally fixed percentage of electricity from an eligible renewable energy source(s). An environmental portfolio standard (EPS) expands that notion to include energy efficiency as an eligible resource. About 20 states currently have an RPS in place (including Colorado), while a handful have implemented an EPS (Washington and Nevada among them). In some cases, utilities can also meet their portfolio requirements by purchasing Renewable Energy Certificates (RECs) from eligible renewable energy projects.

1.2 Greenpower renewable resources programs

Greenpower refers to electricity from environmentally preferred sources such as renewables. These programs allow consumers to purchase “green tags” along with their electricity ensuring that a quantity of electricity equal to their purchase was produced from renewable resources.

1.3 State purchase of electricity through Greenpower renewable resources programs

See option 1.2, with the State government using programs to meet some fraction of its electricity consumption.

1.4 Public benefit charge funds

A public benefits charge (sometimes call systems benefits charge) is a fee on utility customers based on their usage of energy which is to be spent on public goods such as energy efficiency. In many deregulated states the utility commissions have lost the ability to require efficiency programs of the electric utilities, so the public benefits charge has been introduced as a non-bypassable charge on electric bills. The funds collected are then provided to a third party to provide energy efficiency programming.

1.5 Renewable energy incentives (biomass, wind, solar, geothermal)

This policy option reflects financial incentives to encourage investment in renewable energy resources. Examples include: (1) direct subsidies for purchasing/selling distributed renewable technologies; (2) tax credits or exemptions for purchasing distributed renewable technologies; (3) feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (4) tax credits for each kWh generated from a qualifying renewable facility; (5) regulatory policies that provide incentives and/or assurance of cost recovery for utilities that invest in customer-owned renewable energy systems. The policy could also include R&D funding to support development of distributed renewable technologies.

1.6 Green power purchases and marketing

Same as option 1.2.

1.7 Renewable energy development issues (zoning, siting, etc.)

The goal of this option is to reduce zoning, siting, and other regulatory barriers to development of renewable energy resources.

1.8 Research and development (R&D)

The state can initiate or promote R&D funding toward renewable technologies. The goal is to build an industry around that technology in the state and to set the stage for adoption of the technology for use in the state. R&D funding can be made available through an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology). Funding can also be made available for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. Funding could be targeted to increase collaboration between existing institutions for R&D on technologies.

1.9 Landfill Gas Recovery (see also Waste)

Capture of methane gas from landfills to reduce direct emissions and to produce electricity. This option could be structured as either a mandate or an incentive program.

1.10 Waste to energy (see also Waste)

Certain components of municipal waste can be used as a non-fossil combustion resource for generating electricity.

1.11 REC tracking System

The state could join a broader renewable energy credit trading market, such as WREGIS, in order to increase liquidity of environmental generation attributes.

1.12 Small and medium hydro

Smaller hydropower resources throughout the state could be inventoried and exploited. This could also apply to capturing the energy from pressure-release valves in water delivery systems.

1.13 Regulatory hurdles to Small Hydro

To the extent that regulatory hurdles prevent the use of small, dispersed hydropower resources, these could be addressed.

1.14 National portfolio standards

Colorado could work to introduce a portfolio standard (see 1.1) on a federal level.

1.15 Wastewater gas recovery

Capture of methane gas from wastewater management facilities to reduce direct emissions and to produce electricity. This option could be structured as either a mandate or an incentive program.

1.16 Aggregation

Small, distributed renewable energy resources could be aggregated to assist in marketing environmental attributes.

ES-2 DISTRIBUTED GENERATION (DG)

2.1 Incentives for combined heat and power (CHP) and clean DG

Financial incentives for combined heat and power (CHP) and clean distributed generation systems could include: (1) direct subsidies for purchasing/selling systems; (2) tax credits or exemptions for purchasing/selling systems; (3) tax credits or exemptions for operating such systems; (4) feed-in tariff, which is a direct payment to 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.

2.2 Removing barriers to CHP and clean DG (including utility rate and interconnection barriers, financing, information, etc.)

Barriers to CHP and clean DG include inadequate information, institutional barriers, high transaction costs because of 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 requirement, high standby rates, and exit fees. The lack of standard offer or long-term contracts, payment at avoided cost levels,

and lack of recognition for emissions reduction value provided also creates obstacles. Policies to remove these barriers include: improved interconnection policies; improved rates and fees policies; streamlined permitting; recognition of the emission reduction value provided by CHP and clean DG; financing packages and bonding programs; power procurement policies; education and outreach; etc.

2.3 Interconnection rules for clean, distributed generation

Utility interconnection rules can be changed to be more DG-friendly.

2.4 Net metering

Net metering provides financial incentives to DG by allowing DG owners to sell excess electricity to the grid when they are generating more than they consume, to offset the cost of purchases when the opposite situation pertains.

2.5 Pricing strategies and rate structures

The design of electricity rates, such as inclining block structure, can be used to encourage electricity conservation. Time-of-use rates can be used to shift consumption to lower-priced hours, when more efficient resources may be on the margin.

2.6 Highlight local benefits of DG

Local benefits include security, economic development and jobs creation, educational opportunities, and environmental preservation.

2.7 R&D for DG

The state can initiate or promote R&D funding toward distributed generation technologies. The goal is to build an industry around that technology in the state and to set the stage for adoption of the technology for use in the state. R&D funding can be targeted or can be made available through an open bidding procedure. Funding can also be made available for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use.

2.8 Smart Grid

Smart Grid systems promote efficiency through improvements in system stability and better control technology and systems integration.

ES-3 ADVANCED FOSSIL FUEL

3.1 Incentives for advanced coal, including IGCC and carbon capture and storage (CCS)

Advanced fossil technologies produce fewer CO_2 emissions per kWh as the result of more efficient generating technologies (supercritical coal, integrated gasification combined cycle, etc.) and/or carbon capture and sequestration of CO_2, either before or after fuel combustion. Incentives may be in the form of direct subsidies, assistance in securing financing and/or off-take agreements, or preferential treatment such as guaranteed cost recovery for prudently incurred utility investments.

3.2 Incentives for CO_2 pipelines for CCS

Pipelines are required to transport CO_2 to sites, if any, that can provide storage. Incentives may be in the form of direct subsidies, assistance in securing financing and/or off-take agreements, or guarantee cost recovery for prudently incurred utility investments.

3.3 Fuel Cell Development Incentives

Incentives for fuel cell development would likely be similar to those discussed in 1.8, Research and Development (R&D), and 2.1, Incentives for combined heat and power (CHP) and clean DG.

3.4 Combined H_2/electricity production from fossil fuels with sequestration

This option focuses on the development of specific technologies. These technologies can be advanced through R&D promotion, incentives, or regulations.

3.5 Research and Development (R&D)

Similar to 1.8 Research and Development (R&D) with a focus on advanced fossil fuel technologies.

ES-4 NUCLEAR

4.1 New Nuclear Capacity and Licensing

Colorado currently has no nuclear plants but this could be an option for the future.

ES-5 OTHER ELECTRICITY MEASURES

5.1 Efficiency Improvements and Repowering Existing Plants

Efficiency improvements refer to increasing generation efficiency at power stations through incremental improvements at existing plants (e.g., more efficient boilers and

turbines, improved control systems, or combined cycle technology). Repowering existing power plants refers to switching to lower or zero emitting fuels at existing plants or for new capacity additions. This can include co-firing biomass at coal plants, or the use of natural gas in place of coal or oil. Policies to encourage efficiency improvements and repowering of existing plants could include incentives or regulations.

5.2 Transmission System Upgrading

Emissions from transmission systems includes SF_6 emissions from insulators, and the emissions impacts of electricity losses from the lines. This option can include industry goals, incentives or regulations to reduce GHG emissions associated with transmission.

5.3 Reduce Transmission and Distribution Line Loss

See 5.2, but focus specifically on energy losses rather than SF_6 emissions.

5.4 Improved electricity storage systems

Electricity storage can be used to shift system load to times when more efficient resources are on the margin, or to compensate for intermittency of renewable resources such as wind power.

5.5 Virtual storage

This concept can include real-time coupling of various generation options and better use of information technology to improve system operations and increase overall efficiency.

5.6 Transmission for renewables

The state could mandate or provide incentives for transmission infrastructure development to facilitate exploitation of renewable resources. For example, transmission lines are needed to deliver power from optimal sites for wind resources to load centers.

5.7 Recovery of waste heat

Existing, non-CHP generators release waste heat to the atmosphere that could often be recovered to extract additional energy or power industrial processes or steam loads. This includes bottoming cycles..

5.8 Pricing strategies and rates

Discussed as option 2.5.

ES-6 EMISSIONS POLICIES

6.1 CO_2 Tax

A CO_2 tax would be a tax on each ton of CO_2 emitted from certain sources. A CO_2 tax could be imposed upstream, based on carbon content of fuels (e.g. fossil fuel suppliers) or at the point of combustion and emission. Although taxed entities would pass some or all of the cost on to consumers, there would be competitive pressure to find cost-effective ways to lower (or offset) emissions. Consumers who see the implicit cost of CO_2 emissions in products and services could adjust their behavior to to lower CO_2 emissions and reduce cost. The program can be designed to be "revenue neutral" (not a net tax increase) for example by offsetting with an income tax reduction, can fund policies and programs to assist with CO_2 reductions, or can be directed to helping the competitiveness of industries or assisting communities affected by the tax.

6.2 GHG Cap and Trade

A cap and trade system is a market mechanism in which GHG emissions are limited or capped at a specified level, and those participating in the system are required to hold permits for each unit of emissions. Through trading, participants with lower costs of compliance can choose to over-comply and sell their additional reductions to participants for whom compliance costs are higher. In this fashion, overall costs of compliance are lower than they would otherwise be.

The initial allocation of the allowances is a crucial policy decision. They can be auctioned (with the proceeds used to benefit consumers who will pay higher costs) or allocated to existing sources, or some combination of the two. Participants can range from a small group within a single sector to the entire economy. As with carbon taxes, the compliance obligation can be imposed "upstream" (at the fuel extraction or import level) or "downstream" at points of fuel consumption.

Among the important considerations with respect to a cap and trade program are: the sources and sectors to which it would apply; the level and timing of the cap; how allowances would be distributed (e.g., whether load-based or generation-based, how new market entrants are accommodated, how leakage is addressed, etc.); and what if any offsets would be allowed. Other issues to consider include which GHGs are covered; whether there is linkage to other trading programs; banking and borrowing; early reduction credit; what if any incentive opportunities may be included; use of any revenue accrued from permit auctions; and provisions for encouraging energy efficiency.

The principal example of a GHG cap-and-trade system in the US today is the Northeast States' Regional Greenhouse Gas Initiative: http://www.rggi.org/

6.3 Generation Performance Standards

A generation performance standard (GPS) is a mandate that requires LSEs to acquire electricity, or power plant developers to build and operate new generation, with a per-unit emission rate below a specified mandatory standard. In some cases, GHG offsets or credits can be used for compliance. A market-based variation of a GPS would allow

generators with emission rates lower than the GPS to sell their extra "credits" to with generators with emission rates higher than the GPS.

6.4 GHG Offset/mitigation requirements for new power plants

See 6.3, but limited to requirements for new plants and including GHG offsets.

6.5 GHG Offset/mitigation requirements for existing power plants

See 6.3, but limited to requirements for existing plants and including GHG offsets.

6.6 Voluntary Utility CO2 Targets

Utilities provide their own non-mandatory targets for future GHG emissions. These targets can be total GHG emissions per year or intensity based (tons of GHG/MWh).

6.7 Support renewable energy at the federal level

Colorado can work to make renewable energy a priority at appropriate federal agencies.

6.8 Advocate for a national clean energy standard

Utilities provide their own non-mandatory targets for future GHG emissions. These targets can be total GHG emissions per year or intensity based (tons of GHG/MWh).

ES-7 EDUCATION/AWARENESS

~~7.1 Brownfield Re-development~~

7.2 Environmental (emissions) Disclosure

Energy providers (electricity or fossil fuel) can be required to provide information on sources of the energy, including emissions profiles, to increase consumer awareness. For example, electric utilities would report the mix of energy used to produce electricity (% coal, % natural gas, % renewables). This could also be used to provide information on the life-cycle emissions associated with various generation sources.

7.3 Public Education *(S,L)

Public education and outreach is used to foster a broad awareness of climate change issues and effects (including co-benefits, such as clean air and public health) among the state's citizens to impact consumer choices and to build support for other policy options. Public education and outreach efforts could integrate with and build upon existing outreach efforts involving climate change and related issues in the state.

7.4 Climate Neutral Communities

Incentives can be provided for planned communities which would have low or zero carbon impact through integrated renewable energy production, high efficiency practices, etc.

7.4 Attract climate friendly businesses

Colorado's economy can continue to grow without commensurate growth in emissions by attracting climate-friendly businesses.

ES-8 OIL AND GAS OPERATIONS

8-1 Methane and CO_2 reduction in oil & gas operations, including fuel use and emissions reduction in venting and flaring

There are a number of ways in which methane (CH_4) and CO_2 emissions in the oil and gas industry can be reduced. Any leaks encountered during production, processing, and transportation/distribution of natural gas can be addressed. In addition to reducing GHG emissions, stopping these leaks may be economically beneficial.

The EPA Natural Gas STAR program offers numerous methods of preventing leaks. These methods, called Best Management Practices (BMPs) and Partnership Reduction Opportunities (PROs), are divided by industry sub sector: production, processing, and transportation/ distribution. Among the practices recommended are *preventive maintenance*: (improving the overall efficiency of the gas production and distribution system), *reducing flashing losses (releases when pressure drops at* storage tanks, wells, compressor stations, or gas plants), and changing and replacing parts and devices to reduce leaks and improve efficiency, among others.

There are a number of ways in which CO_2 emissions in the oil and gas industry can be reduced by improving energy efficiency, including: (1) new efficient compressors, (2) optimize gas flow to improve compressor efficiency, (3) improve performance of compressor cylinder ends, (4) capture compressor waste heat, (5) replace compressor driver engines, and (6) waste heat recovery boilers.

Regulations, incentives, and/or support programs can be applied to achieve these reductions.

8.2 GHG reduction in refinery operations, including in future coal-to-liquids refineries

Methane and CO_2 emissions can be reduced in the production of liquid fuels, at oil refineries or a coal-to-liquids plant through various efficiency measures including enhanced combined heat and power along with carbon capture and storage. Coal-to-liquids plants are energy-intensive, and produce about 10 times more CO_2 emissions as conventional oil refineries in order to produce liquid fuels; however, with carbon capture and storage (and co-production of electricity and liquid fuels) such emissions may be

substantially reduced.[1] Regulations, incentives, and/or support programs can be applied to achieve these reductions.

8.3 CO2 capture and storage or reuse (CCSR) in O&G operations, including refineries and coal-to-liquids operations

Carbon capture and storage or reuse (CCSR) involves capturing carbon dioxide and either (1) sequestering it permanently in a geologically sound reservoir or (2) reusing it to aid in oil and 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. The process of carbon capture is well established in the chemical industry and forms the basis for Integrated Gasification Combined Cycle electricity generating plants; however, carbon sequestration remains speculative as a large-scale solution to GHG emissions.

Policies to encourage CCSR could include a state agency or department within an existing agency tasked with promoting CCSR, evaluation studies to identify geologically sound reservoirs, R&D funding to improve CCSR technologies, financial incentives to capture and store carbon or to capture and reuse it, and/or mandates – coupled with technical feasibility and cost and investment recovery mechanisms, if appropriate – to capture and store carbon or capture and reuse it.

8.4 Methane recovery from coal mining operations

Methane released from mining operations is generally unproductively flared (burned), but could be captured and used as a generation feedstock displacing other fuels. Obstacles include leasing issues, federal vs. state jurisdiction over mining and recovery operations, and availability of infrastructure for capturing and transporting the recovered gas.

[1] International Energy Agency, 2006. *Energy Technology Perspectives*. Well-to-wheel GHG emissions from coal liquids are approximately twice those of conventional oil products. Cogeneration and carbon capture and storage can reduce those emissions to levels similar to, or slightly below, those of conventional oil products.