

Energy Supply TWG GHG Reduction Options

Short descriptions

Revision: June 26, 2006

Note: these are short, preliminary descriptions solely for group's initial reference. There is nothing “official” about them, as the TWG will develop substantially more detailed descriptions as it considers the GHG reduction options in more depth over the course of the following months. The TWG will revise the descriptions and tailor them to the situation in North Carolina, reflecting the results of research and analysis done by the TWG and decisions agreed by the TWG and CAPAG.

ES-1.1 Renewable Portfolio Standard

A renewable portfolio standard (RPS) is a requirement that utilities must supply a certain percentage of electricity from renewable energy sources. For example, an RPS of 5% would mean that for every 100 kWh that a utility or a “load serving entity” (LSE) supplies to end users, 5 kWh must be generated from renewable resources. An RPS differs from an Environmental Portfolio Standard (EPS) in that an RPS is a requirement specifically for renewables, while an EPS can be broader, e.g., include energy efficiency. Utilities can meet their requirements by purchasing or generating renewable-based electricity or by purchasing renewable energy credits (RECs). RECs are tradable credits that are typically part of an RPS policy. RECs are created for every kWh of eligible and verified renewable electricity produced.

Anyone can build an eligible renewable facility and earn RECs for the electricity that it generates. Anyone with RECs can sell them to a utility that needs to meet its RPS requirement. In this way, utilities themselves may not need to build and operate renewable generating facilities. By providing this flexibility, a market in these credits is created, which will provide an incentive to companies that are best able to generate renewable energy.

A “safety valve” can be put in place that limits the price of RECs at a specified level by allowing utilities to purchase RECs from the state at the “safety valve” price. The “safety valve” would provide a degree of cost certainty, but could make the penetration of renewables and corresponding GHG reductions uncertain if the actual price of RECs moves above the “safety valve” level.

ES-1.2 NC Greenpower renewable resources program

NC GreenPower is an independent, nonprofit program that uses voluntary contributions to encourage the development of electricity generated from renewable energy sources to add more green power to the state’s power supply. Individuals may contribute as little as \$4 per month to add one block of 100 kilowatt-hours of renewable energy to the electric supply. More contributions means more renewable energy can be available. In January 2003, the North Carolina Utilities Commissions approved the program plan for NC

GreenPower. NC GreenPower is administered by Advanced Energy, an independent, non-profit, Raleigh-based corporation with over 25 years of experience working with renewable energy, energy efficiency and the electric utilities. Advanced Energy formed the separate nonprofit entity, NC GreenPower, which is governed by a board of directors with representation from consumers, state government, technology, environmental advocacy groups and electric utilities. (source: <http://www.ncgreenpower.org/about/faqs.html>)

ES-1.4 Public Benefit Charge for funding efficiency

A public benefit fund (PBF) is a state fund dedicated to support energy efficiency (EE) and renewable energy (RE), funded through a per kilowatt-hour charge on electricity sales. To date, nineteen states have implemented PBF programs. A small charge rate, typically in the 2 to 5 mils per kWh range, is applied to electricity sales in the state and collected by a PBF manager. Funds are typically used to support EE and RE in a number of ways, such as through public education, R&D, demonstration projects, direct grants/buy-downs/tax credits to subsidize advanced technologies, and low interest revolving loans. Funding goes to the residential, commercial and industrial sectors. Fund managers decide which technologies to support based on criteria such as GHG reduction potential, cost-effectiveness, co-benefits, etc.

ES-1.5 Renewables Energy Incentives

This policy option reflects a suite of financial incentives to encourage investment in distributed renewables. Financial incentives for distributed renewables could include: (1) direct subsidies for purchasing/selling renewable technologies given to the buyer/seller; (2) tax credits or exemptions for purchasing/selling renewable technologies given to the buyer/seller; (3) tax credits or exemptions for operating renewable energy facilities; (4) feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (5) tax credits for each kWh generated from a qualifying renewable facility;

ES-1.6 Green Power Purchase and Marketing

This option would require state facilities to acquire minimum portions of their electricity from specified renewable resources. A State renewable purchase requirement is similar in concept to an RPS. It stipulates a date and level by which a portion of total electricity consumption by state agencies is met by renewable energy sources. New York, Maryland, and New Jersey have adopted this approach. In New York, Executive Order 111 called for state agencies to obtain 10% of their electricity needs from renewable sources, such as wind, solar, biomass, geothermal, and fuel cells by 2005, with the percentage increasing to 20% by 2010. The order applies to state buildings and those of quasi-independent organizations. The order also calls for state agencies to implement energy efficient practices, increase purchases of energy efficient products, and follow

green building standards for new construction and renovation projects. In New Jersey, the current renewable purchase level is 152,000 MWhs or 15% of the bid state contract for electricity which was estimated to be 85% of the state facilities electric use.

ES-1.7 Renewable Energy Development Issues

Policies can be developed to help overcome barriers such as commercialization barriers; price distortions; failure of the market to value the public benefits of renewables; failure of the market to value the social cost of fossil fuel technologies; and market barriers such as 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 transmission costs are often higher for renewables.

ES-1.8 Research and Development (R&D) for Renewables

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. R&D funding can also be made available to any renewable or other advanced technology 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 given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use.

ES-1.9 Landfill Gas Recovery

Solid waste management in the US is the largest source of the nation's anthropogenic emissions of methane, a potent greenhouse gas. Landfill gas (LFG) is created as solid waste decomposes in a landfill, and accounts for roughly one-third of US methane emissions. Instead of allowing LFG to escape into the air, it can be captured and destroyed by flaring, or used as an energy source by creating electricity from it. In addition to producing energy and reducing greenhouse gas emissions, using LFG helps to reduce odors and other hazards associated with landfill emissions, and it helps prevent methane from migrating into the atmosphere and contributing to local smog.

Landfill gas is extracted from landfills using a series of wells and a blower/flare (or vacuum) system. This system directs the collected gas to a central point where it can be processed and treated. As of December 2005, there are approximately 395 operational LFG energy projects in the United States and nearly 600 landfills that are good candidates for projects.

Federal New Source Performance Standards and Emissions Guidelines require that methane capture be implemented at larger landfills. This option would apply to smaller landfills that are not covered by Federal standards.

(Note, this option is being considered by the Agriculture, Forestry, and Waste group as well.)

Source: EPA Landfill Gas Outreach Program (LMOP) <http://www.epa.gov/lmop/>

ES-1.10 Waste to Energy

To reduce waste volume, local governments or private operators can implement a controlled burning process to convert waste into steam to fuel heating systems or generate electricity. The United States has about 89 operational MSW-fired power generation plants, generating approximately 2,500 megawatts, or about 0.3 percent of total national power generation. However, because construction costs of new plants have increased, economic factors have limited new construction.

Over one-fifth of the U.S. municipal solid waste combustors use refuse derived fuel (RDF). In contrast to burning the entire waste stream by introducing MSW "as is" into the combustion chamber, RDF facilities are equipped to recover recyclables (e.g., metals, cans, glass), then shred the combustible remainder into fluff for combustion.

A variety of pollution control technologies significantly reduce the gases emitted into the air, including scrubbers (which use a liquid spray to neutralize acid gases) and filters, (which remove tiny ash particles).

Combusting waste at extremely high temperatures also destroys chemical compounds and disease-causing bacteria. Regular testing can help ensure that residual ash is non-hazardous before being landfilled. About ten percent of the total ash formed in the combustion process is used for beneficial use such as daily cover in landfills and road construction.

Source: http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/sw_combst.htm

ES 2.1 Incentives for Combined Heat and Power

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

ES 2.2 Barrier Reductions for Combined Heat and Power

There are also numerous barriers to combined heat and power (CHP), including 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, exit fees, etc. 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
- Procurement policies
- Education/outreach

ES-2.3 Interconnection Rules for clean, distributed generation

A standardized interconnection rule is a policy to increase the amount of clean distributed generation (DG). Standardized interconnection rules, which are generally developed and administered by a state's public utility commission, establish clear and uniform processes and technical requirements for connecting DG systems to the electric utility grid. These rules are an important mechanism for improving the market conditions for clean DG as utility interconnection can be a critical component of a successful DG project.

Connecting to the grid enables the facility to: a) purchase power from the grid to supply supplemental power as needed, for example, during periods of planned system maintenance, b) sell excess power to the utility, c) maintain grid frequency and voltage stability, as well as utility worker safety. The primary objective of a standard interconnection rule is to obtain the benefits that clean DG can provide without comprising grid safety or reliability. This topic is of particular interest as the Energy Policy Act of 2005 (EPAAct 2005) directs states to consider upgrading their standards for interconnecting small generators within one year of enactment. (source: http://www.epa.gov/chp/pdf/interconnection_factsheet.pdf)

ES-2.4 Net metering

Net metering is a policy that allows owners of grid-connected distributed generation (generating units on the customer side of the meter, often limited to some maximum kW level) to generate excess electricity and sell it back to the grid, effectively “turning the meter backward.” This policy allows for low transaction costs (e.g., no need to negotiate contracts for the sale of electricity back to the utility) and is attractive to DG owners because they are compensated equal to their full cost of purchased electricity (i.e., the sum of wholesale generation, transmission and distribution, and utility administration costs) rather than just the utility’s avoided costs. This has the effect of paying retail electricity rates for the generation up to total on-site usage. These are considerably higher than wholesale prices available to other generators.

ES-2.5 Pricing Strategies

Pricing strategies can take many forms including:

- real-time pricing in which utility customer rates are not fixed, but reflect the varying costs that utilities themselves pay for power; especially during peak times.

- “time-of-use” rates, which are fixed rates for different times of the day and/or for different seasons;
- “increasing block” rates that are defined by blocks of consumption;
- green pricing whereby customers are given the opportunity to purchase electricity with a renewable or cleaner mix than the standard supply mix offered by the utility; and
- advanced metering to allow electricity consumers much greater opportunity to manage their electricity consumption.

Pricing strategies provides electricity consumers much greater opportunity to manage their electricity consumption in response to price signals. This encourages consumers to adjust demand, for example by turning off lighting or appliances, when the price reaches a threshold set by the consumer. A policy could be put into place to implement pricing strategies, and to incentivise or mandate advanced metering control technologies that allow appliance power management.

ES-2.6 Portfolio Standards for Power Retailers

Portfolio standards for power retailers is linked to the Renewables Portfolio Standard (RPS) concept as a way to address many predictable shortcomings of competitive electricity markets that are likely to hinder the commercial success of renewable energy resources. As a condition of doing business in the state, every retail power supplier including investor-owned utilities, municipal and cooperative utilities, direct access suppliers, and, potentially, self-generators above a certain size would be required to purchase "Renewable Energy Credits" (RECs) equivalent to some percentage of its total annual MWh energy sales. Retail suppliers could purchase RECs when they purchase renewable power, or they could purchase RECs separately either directly from a renewables generator or from a REC broker. Government involvement would be limited to certifying RECs (though it might be possible for the private sector to perform this function within a set of guidelines) and monitoring compliance. This approach is analogous to many successful market-based environmental laws, including the Clean Air Act Amendments of 1990, in which Congress set a declining national sulfur emissions cap and created tradeable sulfur dioxide permits. There are many other examples worldwide, covering everything from water allocation to fish catch limits. The key difference between the RPS and tradeable emissions permit programs is that, with emissions permits, the number of permits is finite and must be allocated, while RECs can be created whenever a new renewables facility generates power according to REC guidelines. (source: <http://www.awea.org/policy/rpsca.html>)

ES-3.1 Incentives for Advanced Coal (including IGCC and CCS)

Advanced fossil technologies are more efficient than conventional fossil technologies and, therefore, have lower CO₂ emission rates. Advanced fossil technologies combined with carbon capture and sequestration or reuse (CCS) could enable significantly lower CO₂ emissions. Policies for advanced fossil technologies may include mandates or incentives to use advanced coal technologies for new coal plants. A mandate might

require that new coal plants achieve a certain CO₂ emission rate that is only achievable with advanced technology. Alternatively, a mandate might require that all new coal plants be of a certain type, e.g., Integrated Gasification Combined Cycle (IGCC). A mandate might also be a requirement that a certain percentage of new coal plants be IGCC or employ advanced fossil technologies. Incentives may be in the form of direct subsidies or assistance in securing financing and/or off-take agreements. A combination of mandates and incentives is also possible.

Policies to encourage CCS 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 CCS technologies, financial incentives to capture and store carbon or to capture and reuse it, and/or mandates to capture and store carbon or capture and reuse it.

ES-3.2 Incentives for CO₂ pipelines for carbon capture and storage (CCS)

The ability to implement CCS at a given site may rely on the existence of an infrastructure for transporting the CO₂ to a suitable location for sequestration or reuse. The US currently has more than a thousand miles of CO₂ pipelines, which are primarily used for enhanced oil recovery (whereby CO₂ is pumped into old non-producing oil reservoirs to pump additional oil out of each well). This option would provide incentives for developing and investing in CO₂ pipelines to serve CCS operations. It would also help coordinate the creation of a CO₂ pipeline infrastructure with sites generating CO₂. Incentives for pipelines can relate to issues such as siting, permitting, rights-of-way, etc.

ES-3.3 Fuel Cell Development Incentives

Fuel cells are an important enabling technology for the hydrogen economy and have the potential to revolutionize the way we power our nation, offering cleaner, more-efficient alternatives to the combustion of gasoline and other fossil fuels. A fuel cell uses the chemical energy of hydrogen to cleanly and efficiently produce electricity, with water and heat as by products. Fuel cells have the potential to replace the internal combustion engine in vehicles and provide power in stationary and portable power applications because they are energy-efficient, clean, and fuel-flexible. Fuel cells are unique in terms of the variety of their potential applications; they can provide energy for systems as large as a utility power station and as small as a laptop computer. Hydrogen or any hydrogen-rich fuel can be used by fuel cells.

This options can entail various options for providing incentives for development and deployment of fuel cell technologies. North Carolina incentive program could be analogous to the California Fuel Cell Partnership (<http://www.fuelcellpartnership.org>), collaborative of auto manufacturers, energy companies, fuel cell technology companies, and government agencies. The CFCP is working to demonstrate fuel cell vehicles under real day-to-day driving conditions, examine fuel infrastructure issues, and prepare the California state market for fuel cell technologies.

ES-3.4 Combined H₂/electricity production

Hydrogen is not an energy source, but rather an energy carrier (like electricity). It must be produced from other energy resources, such as fossil fuels (coal, oil, gas), renewable electricity (wind, solar), renewable fuels (biofuels, LFG), or nuclear power. The net greenhouse gas implications of producing hydrogen depend on the energy resource from which it is produced. Hydrogen can be produced from renewable fuels or nuclear energy with low greenhouse gas emissions. In order to produce hydrogen from fossil fuels with low greenhouse gas emissions, it would be necessary to do it in conjunction with CCS.

This options would provide incentives to projects that help develop or deploy low-GHG hydrogen production technologies.

ES-3.5 Research and Development for Advanced Fossil Fuel Technologies

See option 1.8. In this case, R&D would be targeted at advanced fossil fuel technologies that are relevant to low-GHG energy. This includes Integrated Gasification Combined Cycle power with Carbon Capture and Sequestration and hydrogen production.

Source: US Department of Energy <http://www.energy.gov/energysources/fossilfuels.htm>

ES-3.6 Technology Standards for GHG Sources

Technology standards for GHG sources provide a set of measures that are analogous to technology standards for energy-consuming equipment, appliances, and other such purchases. They would provide information regarding the GHG emissions associated with the operation of the equipment. As with standards for energy-consuming equipment, standards for CO₂ sources could include several elements:

- Labeling standards, so that consumers know the GHG implications of purchasing and using equipment.
- Outreach, to help consumers understand the performance standards.
- Performance standards, so that manufacturers would be required to meet certain levels of GHG-emission performance
- Monitoring and compliance measures, to ensure effectiveness of the measure.

Sources: Alliance to Save Energy <http://www.ase.org/>

EPA Energy Star <http://www.energystar.gov/>

ES-4.1 New Nuclear Capacity and Licensing

As of the end of last year, there were 104 commercial nuclear generating units that are fully licensed by the U.S. Nuclear Regulatory Commission (NRC) to operate in the United States. Of these 104 reactors, 69 are categorized as pressurized water reactors (PWRs) totaling 65,100 net megawatts (electric) and 35 units are categorized as boiling water reactors (BWR) totaling 32,300 net megawatts (electric). Although the United States has the most nuclear capacity of any nation, no new commercial reactor has come on line since 1996 (this was the Watt's Bar reactor in Tennessee, owned and operated by the Tennessee Valley Authority which began commercial service in May 1996). The current Administration has been supportive of nuclear expansion, emphasizing its

importance in maintaining a diverse energy supply and its potential for producing electricity with negligible greenhouse gas emissions during operation. As of October 31, 2005, however, no U.S. nuclear company has yet applied for a new construction permit. (source: http://www.eia.doe.gov/cneaf/nuclear/page/nuc_reactors/reactsum.html)

ES-4.2 Nuclear Plant Relicensing

Nuclear plant relicensing allows a nuclear power plant to extend the life of the facility for twenty years past its original 40-year license term. The Nuclear Regulatory Commission (NRC), the nation's regulatory authority for nuclear power, considers the relicensing program one of its major cornerstones of current regulatory activity. The NRC has promulgated new regulations pertaining to the safety and environmental reviews associated with license renewal and has reported that they are consistently able to complete licensing action reviews typically within 30 months from start to finish. The NRC reports that there are many benefits of the renewal program that had not been anticipated such as licensees completing significant component upgrades and refurbishments, activities that they argue have significantly enhanced the safety and inspection procedures of plants with renewed licenses. In addition, the NRC argues that developing a successful license renewal process has breathed new life into the nuclear industry in the U.S. Detractors of nuclear plant relicensing argue that relicensing is ill-advised because nuclear power stations pose tempting terrorist targets and aging equipment will pose safety hazards for surrounding communities. (source: <http://www.nrc.gov/reading-rm/doc-collections/commission/speeches/2004/s-04-004.html>)

ES-4.3 Nuclear Plant Upgrading

A nuclear power plant upgrading is a process whereby a licensee receives approval from the NRC to operate a plant at a higher power level than the level authorized in the original license. The NRC has actually been reviewing and approving power uprates since the 1970's. With the advent of license renewal, however, the NRC has received more of these requests due to the refurbishment and replacement of major components that would enable operation at a higher power level. To date, the NRC has approved over 100 power uprate increases resulting in a gain of almost 4,200 megawatts electric at existing plants. Collectively, an equivalent of more than four large nuclear power plants has been gained through implementation of power uprates at existing facilities. Over the next five years or so, it is expected that a number of power uprates requests will be received by the NRC which, if approved, would add the equivalent of another two large nuclear plants to power supply. There have been a number of unanticipated operational concerns have resulted from the NRC's approval of plants operating at extended power levels. For example, several boiling water reactor units have experienced cracking in non-safety related steam dryer parts. (source: <http://www.nrc.gov/reading-rm/doc-collections/commission/speeches/2004/s-04-004.html>)

Relevant to the nuclear-related options (4.1, 4.2, 4.3), TWG member Peter MacDowell has submitted the following information sources for the TWG's consideration:

1. Jim Warren's Op-ed in the *Raleigh News and Observer*:
<http://www.ncwarn.org/Campaigns/New%20Harris%20Nukes%20-%20A%20Ruinous%20Approach%20to%20Climate%20Change.pdf>
2. Dr. Brice Smith, from *Insurmountable Risks: The Dangers of Using Nuclear Power to Combat Global Climate Change*
<http://www.ieer.org/reports/insurmountablerisks/summary.pdf>
3. David Fleming, *Why Nuclear Power Cannot be A Major Energy Source*,
http://www.feasta.org/documents/energy/nuclear_power.htm

ES-5.1 Efficiency Improvements and Repowering Existing Plants

Efficiency improvements refer to increasing generation efficiency at power stations through making incremental improvements at existing plants (e.g., introduction of combined cycle technology, advanced coal technologies) or through using more advanced technologies in place of current options when building new capacity. Repowering existing power plants refers to switching to lower or zero emitting fuels at existing plants, or for new capacity additions. This includes renewables (such as biofuels), or the use of natural gas in place of coal or oil.

ES-5.2-5.3 Transmission System Upgrading, Reduce T&D Loss

Satisfying the long-term demand for electricity requires not only new generating capacity, along with demand-side measures, but measures to improve transmission to reduce line losses and bottlenecks and enhance throughput. Entirely new transmission capacity may also be necessary. Siting new transmission lines can be a difficult process given their cost and their actual or perceived impact on health, environment, and the use, enjoyment, and value of property.

New construction and retrofit activities on the transmission grid could incorporate advanced composite conductor technologies, capacitance technologies, grid management software, and other technologies that may become available to increase transmission capacity that can increase line carrying capacity as much as threefold.

ES-5.4 Collaboration with other Southeast states

This refers to actions taken in coordination with other states in the Southeast to reduce GHG emissions from the power sector. A good example is the Regional Greenhouse Gas Initiative (RGGI) process. This is a cooperative effort by Northeastern and Mid-Atlantic states to reduce emissions of carbon dioxide, a greenhouse gas that causes global warming. Nine states are working together through the RGGI process to develop a regional cap-and-trade program covering carbon dioxide emissions from power plants. The participating states have agreed to establish a model CO₂ cap-and-trade rule by April 2005. States would use the model rule as the basis for their own rules to reduce CO₂ emissions from power plants. Staff from the nine participating states have drafted an action plan to accomplish the goal of establishing the model rule. RGGI agency heads endorsed the action plan on September 29, 2003. Representatives of the environmental

and energy regulators from RGGI states comprise the RGGI Staff Working Group (SWG), which is responsible for implementing the action plan. The action plan includes a regional stakeholder process to provide a sounding board on the structure and details of a regional carbon cap-and-trade program for the SWG. The RGGI stakeholder process engages a stakeholder group and a resource panel selected from among the participating states. (source: <http://www.dec.state.ny.us/website/dar/cpplan.html>)

ES-6.1 CO2 tax

A CO2 tax is a tax on every ton of CO2 emitted. Companies would either pass the cost on to consumers, change production to lower emissions, or a combination of the two. Either way, consumers would see the implicit cost of CO2 emissions in products and services and would adjust behavior to purchase substitute goods and services that result in lower CO2 emissions. Typically, a CO2 tax is put in place with an income tax reduction to offset the economic impact of the new tax. CO2 tax revenue could go completely to income tax reductions or part of it could go toward policies and programs to assist with CO2 reductions.

ES-6.2 GHG Cap and Trade

A carbon cap and trade works by setting a cap on total carbon emissions, and giving, auctioning or allocating allowances to emit carbon dioxide to energy producers, and permitting them to trade these allowances among themselves. A cap-and-trade is generally viewed as a more cost-effective way of reducing total emissions than a straight limit or a tax on carbon-based fuels.

Participants can range from a small group within a single sector to the entire economy and can be implemented upstream (at the level of fuel extraction or import) or downstream at the points where fuel is consumed.

A carbon cap could be implemented to indirectly promote renewable energy (although there are other ways to achieve the same result). For this to happen, it would be necessary to ensure that the CO₂ emissions trading scheme contain a cap that is tight enough to stimulate markets for renewable energy resources and that, in setting emission caps, lowers the tonnage allowed from fossil fuel generators by an amount based on projected electric power generation from renewables.

An example of a cap-and-trade system is the Regional Greenhouse Gas Initiative:

<http://www.rggi.org/>

<http://www.dec.state.ny.us/website/environmentdec/2006a/rggi032306.html>

ES-6.3 Generation Performance Standards

A generation performance standard (GPS) is typically a requirement that electricity utilities or load serving entities (LSE) sell electricity with an average emission rate below a specified mandatory standard. Utilities must take action to ensure that their generation mix meets the standard.

A variation of a GPS is to incorporate the standard within a cap and trade system in which permits are allocated by dividing the total cap by the total number of MWhs generated to arrive at the performance standard. Permits are then given to each participant based on its own generation multiplied by the performance standard. Generators with emission rates lower than the GPS would receive more allowances than they need. Generators with emission rates higher than the GPS would receive fewer allowances than needed. As electricity generation increases, everything else being equal, the number of permits per MWh would decline because of the cap.

A third variation of a GPS is to establish the standard and allocate allowances based on that standard every year. In this variation, as electricity generation increases, plants would receive more permits. Utilities could trade permits in order to achieve the standard, but there would be no fixed cap on emissions. This variation provides a financial incentive (via trading) for generators to reduce emissions so that they can sell unneeded permits to generators who have high emissions.

ES-6.4-6.5 GHG Offset/mitigation requirements for new/existing power plants

In various jurisdictions, laws have been enacted to require power plants (and sometimes other large energy facilities) to offset a some portion of their carbon dioxide emissions. This portion of emissions that must be offset can be specified in various ways, such as a fixed fraction of their total emissions, some constant amount per unit of power generated, emissions in excess of some specified base year, or emissions in excess of some established emission standard.

Offsetting emissions can be done through a range of emission reduction investments. For example, in response to the to the state of Oregon's emission regulation, power plants are investing in activities such as energy efficiency at a pulp mill, reforestation, wind power investments, building energy efficiency, cogeneration, and transportation efficiency. These offset projects can be made by the regulated power plant itself, or the power plant can pay a third party to identify, invest in, and manage the projects.

Generally (but not always) offsets are implemented in combination with a cap-and-trade system (see option 6.2).

Source: Oregon Standard for Power Plant Offsets

<http://www.oregon.gov/ENERGY/SITING/docs/ccnewst.pdf>

ES-6.6 Voluntary utility CO2 targets

Voluntary targets can take a number of different forms. A target can be voluntarily undertaken by a company outside the context of a government program for voluntary reduction and not be legally binding.

US companies are free to take on such voluntary CO2 reduction targets, and a number of them have done so. The Chicago Climate Exchange (CCX) is an example of a trading exchange driven by voluntary participants making and selling reductions. A target could

also be negotiated with the government through a program for voluntary reductions. The government might offer certain incentives, and companies voluntarily agree to reduction targets in exchange for receiving those incentives. Such agreements can be legally binding or not. Trading can be a component of any of these voluntary target variations. The most active trading, however, is likely to result with a negotiated but binding agreement.

Monitoring, reporting and verification systems need to be in place to ensure that reductions are actually being made, as this kind of system would not involve allocated permits. If a company reduced GHG emissions beyond its target, and these reductions are verified independently, then it could sell those excess reductions to other participating companies that had difficulty meeting the target. If targets are not binding, however, companies may or may not actually achieve their reduction targets.

ES-6.7 Rate restructuring

See Description under option 2.5.

ES-7.1 Brownfield redevelopment

Brownfield redevelopment refers to redevelopment by an electric power supplier of abandoned, idled and underused industrial and commercial facilities where expansion and redevelopment is burdened by real or potential environmental contamination. Brownfield redevelopment returns brownfields to productive economic use. The redevelopment of brownfields sites has the potential to increase economic opportunities for low-and moderate-income persons as part of the creation or retention of businesses, jobs and increases in the local tax base.

ES-7.2 Environmental (emissions) Disclosure

Emission disclosure consists of establishing requirements that GHG emitters publish their estimated GHG emissions on a regular (e.g., annual) basis. In addition to emissions, disclosure can also include an accounting of business risks due to climate change, such as assets in danger of weather-related damage, threats to market share, and risks of future regulation. Environmental disclosure allows investors and consumers to have information regarding a firm's GHG emissions and climate risks so as to better make purchasing and investment decisions. In the case of energy supply, environmental disclosure would take the form of providing consumers with information on carbon emissions per kWh in a form that it would help them make decisions about electricity purchases and consumption. It is effective particularly if coupled with the opportunity for consumers to select their electricity provider.

Sources: Carbon Disclosure Project www.cdproject.net/
World Economic Forum GHG Registry www.weforum.org/ghg

ES-7.3 Public Education

Public education about climate issues and emission reduction opportunities relating to energy supply would presumably need to be coordinated with broader education strategies. In the case of energy supply, it would relate to issues such as the problem of climate change, the potential for renewable technologies, opportunities for purchase of green energy, investment opportunities in low-GHG energy supply, popularization of existing incentives, etc.

In addition to targeting homeowners, education campaigns can target building managers, procurement officers, policy makers, investment community, etc.

ES-7.4 Codification and transfer of knowledge

When the implementation of a low-GHG technology could be practical and cost-effective, but is impeded by lack of information among specific actors, then the presentation and targeted transfer of knowledge can encourage implementation. Transfer of knowledge from academic laboratories to technology developers, or from technology developers to technology manufacturers, or from technology manufacturers to energy sector investors, for example, can help to accelerate technologies along the path from research to development to deployment.

ES-7.5 Technology and/or industrial extension services

This is a concept borrowed from the agricultural sector in which technical extension services are provided to farmers to assist in maximizing agricultural yield and minimization of pests or other factors that could inhibit production. When applied to power supply, it refers to the provision of specialized information that can assist in planning decisions regarding the reduction of GHG emissions through new maintenance protocols, introduction of advanced technology, options for fuel switching, etc.

ES-8.1 Center for low-carbon technology development

States can help to create a critical mass of research, development, and deployment efforts in a given field by establishing Centers for low-carbon technology development. Such a Center can provide linkages to academic research laboratories, R&D incentives, incubation space, opportunities for demonstration projects, and cross-fertilization that results from proximity.

ES-8.2 Demonstration projects for reducing GHGs

Demonstration projects can play an important role for technologies that are promising but are not yet commercial. Demonstration projects can provide valuable learning-by-doing, and help accelerate technological innovation.

Demonstration projects at the state level can help state industries to advance locally developed technologies. For example, a main purpose of Connecticut's Clean Energy Fund is to make funds available for demonstrating early stage clean energy projects.

Examples of the projects funded under the CCEF include a biomass gasifier, several fuel cells of various capacities and based on various technologies, and a waste-to-energy technology.

Sources:

CCEF: http://www.ctcleanenergy.com/investment/renewable_demonstration.html

ES-8.3 Legislative changes to require the NC Utility Commission to consider environmental and other factors in their decision making

Currently, PUC decision-making rules do not specifically account for GHG issues, either on the side of emissions or risk to climate change. This option would initiate a legislative change that would require the NC Utility Commission to consider environmental and other factors in their decision making process.

The NC General Statutes that pertain to the Utilities Commission can be found here: <http://www.ncga.state.nc.us/gascripts/Statutes/StatutesTOC.pl?Chapter=0062>

The Rules and Regulations of the North Carolina Utilities Commission can be found here: <http://www.ncuc.commerce.state.nc.us/ncrules/rulstoc.htm>

The duties of the commission are spelled out in Chapter 1 of the Rules and Regulations and then the Rules specifically regarding the Electric Utilities are found in Chapter 8.