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Agriculture, Forestry, and Waste Management Technical Work Group

Summary List of Recommended Priority Policy Options for Analysis

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2008–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2008–2020			
AFW-1	On-Farm Energy Efficiency						Pending
AFW-2	On-Farm Waste Energy Recovery						Pending
AFW-3	Expanded Use of Local Agricultural Products						Pending
AFW-4	In-State Liquid Biofuels Production						Pending
AFW-5	Expanded Use of In-State Biomass Feedstocks for Electricity, Heat, or Steam Production						Pending
AFW-6	Terrestrial Carbon Sequestration						Pending
AFW-7	Conservation and Restoration of Forest and Agriculture Lands for Enhanced Carbon Sequestration						Pending
AFW-8	Advanced Recycling and Composting						Pending
AFW-9	Waste-to-Energy Reclamation						Pending
AFW-10	Water and Wastewater Energy Efficiency Improvements						Pending
	Sector Total After Adjusting for Overlaps						
	Reductions From Recent Actions						
	Sector Total Plus Recent Actions						

AFW-1. On-Farm Energy Efficiency

Policy Description

Renewable energy may be produced and used on-site at individual agricultural operations or regionally through farm cooperatives to achieve better economy of scale. For example, on-farm production and use of solar heating and biofuels will reduce carbon dioxide emissions by displacing the use of fossil based fuels.

Energy conservation for agricultural operations will result in increased efficiency. For example, improved irrigation systems save both water and energy, and expanded use of precision agriculture systems will also result in reduced fossil fuel usage.

GHG benefits can also be achieved indirectly through better use of organic fertilizers (manure) to offset commercial fertilizers, which require intensive energy inputs for production, transportation and application. These indirect (lifecycle) benefits are covered within option AFW-6.

Policy Design

Goals:

Fossil fuel reduction goal: 20% reduction in petro-diesel use by 2020, over 2007 baseline.

Electricity reduction goal: 30% reduction, including both electricity efficiency and on-site generation using renewable energy, over 2007 baseline.

Timing:

Fossil fuel reduction goal: Achieve 5% reduction by 2012. Achieve the full policy goal by 2020.

Electricity reduction goal: Achieve 10% reduction by 2012. Achieve the full policy goal by 2020.

Parties Involved: SC Department of Agriculture; SC DNR – Conservation Districts; SCDHEC; SC Energy Office; Clemson University – Cooperative Extension Service; USDA – Natural Resources Conservation Service; USDA – Rural Development; SC Farm Bureau; Businesses providing energy efficiency and renewable energy equipment and services.

Other: As needed, identify incentives that encourage the energy reductions through audits, maintenance, equipment modification, and developing feedstocks and availability of renewable energy.

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

TBD – No recent policies or programs have been identified as of yet. The TWG and DHEC can work with CCS to identify existing or planned programs that address issues raised in this option.

Type(s) of GHG Reductions

Displacement of coal, natural gas, and other fossil fuels reduces emissions of fossil carbon. Increased energy efficiency decreases the amount of carbon emitted per unit of economic productivity. On-farm capture or production of renewable energy reduces the need for consumption of fossil energy, and displaces the associated fossil carbon emissions.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-2. On-Farm Waste Energy Recovery

Policy Description

Reduce the amount of methane emissions from livestock manure by installing manure digesters on livestock operation. Reduce the amount of excess nitrogen applied to crops from poultry litter by promoting gasification, pyrolysis and other thermochemical conversion methods for energy recovery. Energy from manure digesters is used to create heat or power, which offsets fossil fuel-based energy production and the associated GHG emissions. Thermochemical conversion and other methods of waste-to-energy may be more advantageous than anaerobic digestion. Energy from these processes will also reduce the GHG emissions and may be used to produce synthesis gas and hydrocarbon fuels. As with AFW-1, these energy recovery projects can be implemented at individual livestock operations or collectively at groups of operations in order to achieve better economies of scale.

Policy Design

Goals: Capture 15% of available energy from animal feeding operations (AFOs) through methane capture (anaerobic digestion), thermochemical conversion, or other renewable energy means.

Timing: By 2012, implement projects to capture 5% of available methane energy at hog farms and dairies, and 5% of surplus litter at poultry and turkey farms. By 2020, implement projects to capture 15% of methane energy and 15% of litter.

Parties involved: SC Department of Agriculture; SC DNR – Conservation Districts; SCDHEC; SC Energy Office; Clemson University – Cooperative Extension Service; USDA – Natural Resources Conservation Service; USDA – Rural Development; USDA – Agricultural Research Service; SC Farm Bureau; hog, dairy, and poultry farmers; Businesses providing energy efficiency and renewable energy equipment.

Other: As needed, identify incentives that encourage the renewable energy production on all AFOs in SC. Determine the optimal technologies and management methods from perspective of on-farm economics and GHG mitigation/reduction. Digester economics may improve with additional feedstocks beyond manure, including spoiled or culled produce and other agricultural residues. Note the potential linkage to AFW-9, which addresses energy recovery from municipal solid waste.

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

The USDA-Agricultural Research Service is conducting research on thermochemical waste-to-energy from animal manures for AFO waste streams. The State Energy Office has conducted analyses quantifying animal waste in South Carolina.

Type(s) of GHG Reductions

CH_4: methane is captured and typically combusted in an energy recovery system or flared. Small amounts of N_2O and CH_4 are emitted from the combustion process.

CO_2: carbon dioxide is reduced when the methane is converted to energy and that energy is used to offset fossil-based energy (e.g., coal-fired electricity, natural gas, etc.). Small amounts of N_2O and CH_4 are also reduced from the fossil-based energy that is offset.

N_2O: By avoiding land-application of surplus litter, nitrous oxide emissions are reduced by poultry-litter-to-energy installations. (Under wet conditions, excess nitrogen in soils increases the microbial reactions that release N_2O.)

Also, displacement of coal, natural gas, and other fossil fuels reduces emissions of fossil carbon. Increased energy efficiency decreases the amount of carbon emitted per unit of economic productivity. On-farm capture or production of renewable energy reduces the need for consumption of fossil energy, and displaces the associated fossil carbon emissions.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

NOTE: Do we have resource data for manure digesters?

Final Report on Availability of Poultry Litter as Biomass Energy, http://www.scbiomass.org/Publications/Poultry%20Litter%20Final%20Report.pdf (416 k PDF) “It is estimated that between 400,000 and 700,000 tons of poultry and turkey litter are produced per year.”

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-3. Expanded Use of Local Agricultural Products

Policy Description

Promote the production and consumption of locally produced agricultural commodities, which displace the consumption of commodities transported from other states or countries. GHG reductions occur from reduced transportation-related emissions and from local farms that institute GHG reduction practices that may not be instituted in other states or countries.

Policy Design

Goals: To increase the production, storage, and processing of locally grown animal products, grains, vegetables, and fruits and their consumption in South Carolina such that at least 25% of these products purchased in South Carolina are produced by South Carolina farmers and ranchers. Begin tracking this information so it is readily available for planning purposes.

Timing: To increase sales and consumption of local farm products by 50% and increase storage and processing capacity of locally grown farm products by 100% by 2012 above current levels. Increase purchasing of South Carolina-produced agriculture products to 25% of total purchased agriculture products in SC by 2020.

Parties Involved: SC Department of Agriculture; SC Farm Bureau; Palmetto Agri-Business Council; Clemson University – Cooperative Extension Service; US Department of Agriculture; Carolina Farm Stewardship Association; SC Food Policy Council.

Other: Continue funding for the South Carolina Department of Agriculture's marketing and branding program for South Carolina grown commodities. Furthermore, identify incentives that encourage retail chains in SC to sell locally grown products. The SCDA also needs to increase or facilitate development of, and support for, more local farmers markets which both increase the financial return for small producers and encourage more small producers. Note to TWG: CECAC struggled with the issue of what the current baseline is. TWG should make appropriate contacts to determine whether any information is available on this.

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

Seeds of Hope, a local farmers' market program in Columbia, has weekly markets at 12+ sites during the growing season. The USDA lists 63 farmers markets in the state.

The SC Agribusiness Development Program is responsible for the development of new products (both traditional and non-traditional) that add value to the state's agricultural products. Since 1994, the "South Carolina Quality" marketing program has worked with supermarket chains to purchase and sell fresh produce grown in South Carolina, specifically encouraging customers to

buy local produce in supermarkets. DOA also has the "Certified SC Grown" program to promote SC agricultural products.

Type(s) of GHG Reductions

CO_2: Reduction in CO_2 emissions due to a reduction in ton-miles required to bring out-of-state agriculture products to markets in South Carolina. Although not quantified in this analysis, it is possible that processing of products in-state may yield additional GHG benefits not related to the averted long-range transport of produce and other agricultural products.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-4. In-State Liquid Biofuels Production

Policy Description

The ultimate goal of South Carolina is to take full advantage of resources available in the state through agriculture, forestry, or other biomass feedstocks to displace the use of fossil fuels. South Carolina is in an excellent position to develop an in-state alternative fuels industry that will provide economic opportunities for rural communities looking for alternatives to a fading tobacco and cotton industry. Policies must be developed in South Carolina that will attract investors, retailers, and purchasers to produce and use the fuels in the state (Note the linkage of this option covering in-state production of biofuels with the TLU option covering consumption of biofuels through a low carbon fuel standard). The focus of this policy should be in-state biofuels production based on in-state feedstocks.

In 2006 and 2007, South Carolina passed attractive incentives that have been able to promote and expand this industry. To date, the incentives have been effective and a great deal of interest within the alternative fuels industry has been generated. Other potential incentives for alternative fuel producers include expanding existing tax credits for biodiesel and ethanol to include other low-GHG future fuels such as butanol and hydrogen.

Policy Design

Goals:

South Carolina's numerical targets for biodiesel and ethanol production by 2020 include:

Phase	Year	Gallons of biodiesel produced in South Carolina	Represents percentage of total diesel used in state (in FY 2007)	Gallons of ethanol produced in South Carolina	Represents percentage of total gasoline used in state (in 2006)
1	2010	81,000,000	10%	100,000,000	4%
2	2015	100,000,000	13.3%	150,000,000	6%
3	2020	125,000,000	16.6%	200,000,000	8%

Timing: See table above.

Parties Involved: State of South Carolina, farmers, biofuels producers, fuel retailers, fuel wholesalers, business owners, and relevant agriculture and trade associations.

Other: Note to TWG: CECAC requests that the costs and benefits be assessed at two different levels of implementation – one based on the goals in the table above; and the other at the level that the TWG feels is the upper bound of potential feedstock availability.

Implementation Mechanisms

The state could provide additional economic benefits such as:

- No state property tax for alternative fuel production facilities and a tax exemption on the purchase of equipment.
- A special exception for alternative fuel producers related to the Jobs Creation Tax Credit
- Higher state-owned pump alternative fuel requirements from B5 to B20 and provide greater state facility access to E85.
- Continue state funding for alternative fuel marketing and education programs.
- Maintain and enhance the current state tax rebates and state income tax credits for low-GHG emission alternative fuel production. Among the improvements needed in state legislation are presented in Act No. 83, 2007 include:

    1. SC Code 12-6-3600 – Remove the six month requirement prior to claiming tax credit.

    2. SC Code 12-6-3631 – Tax credit for R&D on alternative fuel feedstocks - remove the $100,000/year cap. Additionally, remove the limitation that each company can only claim $100,000 over all years.

    3. SC Code 12-6-3600 – Tax credit for ethanol and biodiesel production – remove $800,000/year cap.

    4. SC Code 12-6-3610 – Tax credit for ethanol and biodiesel dispensing equipment and amendment to include production equipment for intermediate steps of alternative fuel production (ex: crushing facilities) - remove $150,000/year cap.

    5. SC Code 46-3-260 - Secure funding for the SC Renewable Energy Grants and Loans program in subsequent years.

Related Policies/Programs in Place

South Carolina currently provides Biodiesel Production Tax Credits in the amount of $0.20 per gallon of biodiesel or ethanol produced from soybean oil or corn feedstocks and $0.30 per gallon of biodiesel or ethanol from feedstocks other than soybean oil and corn. There is also a 25% tax credit for the purchase and installation of equipment directly related to the production of ethanol and biodiesel.

Several on-going alternative fuel production facilities include:

- Carolina Biofuels - a new division of the Taylors, South Carolina-based company Carolina Polymers, rolled out their first load of biodiesel fuel on March 14, 2006. Carolina Biofuels manufacturing facilities are currently in full operation, and though starting at 10 million gallons of biodiesel fuel expect to grow to over 30 million gallons annually. A large percentage of the fuel produced at Carolina Biofuels is sold to World Energy Alternatives, LLC which is leading global supplier of biodiesel located out of Massachusetts. Carolina Biofuels supports South Carolina industry by using locally-grown soybeans to make their fuel, and as production ramps up, they will create between 20 and 30 jobs in the Taylors area.

- Southeast Biodiesel - In May 2007 the facility begin commercially selling biodiesel made from poultry fat in North Charleston. The company's grand opening was October 27, 2006. Southeast Biodiesel expects to begin by producing six million gallons and eventually increase production once there is more demand in the Charleston area. The company is currently selling biodiesel fuel to local shrimpers.
- Ecogy Biofuels, LLC – the company will build a biodiesel plant across the street from an existing soy oil crusher, Carolina Soya. Construction of the Ecogy Biofuels, LLC plant is expected to be completed and producing biodiesel at the close of 2007. The plant is being constructed to produce 30 million gallons of fuel annually. Ecogy Biofuels has begun research and development of alternative oils, including oils derived from algae.
- Aiken Biofuels – formerly known as Farmers and Truckers Biodiesel, this facility has converted a Warrenville clay warehouse in Aiken County to a 5 million gallon/year facility at a cost of approximately $1.4 million. The facility has the potential to expand to 20 million gallons/year and will use feedstocks such as soy oil, cotton seed oil, and animal fats to produce the biodiesel.
- Greenlight Biofuels - The Virginia based company plans to expand operations into South Carolina in 2008 with a 10 million gallon per year plant in Laurens. The $8.5 million facility will generate 15 jobs. Greenlight Biofuels will use vegetable oils, animals fats, and recycled restaurant grease to make the biodiesel which will be sold to local retail stations and also used for home heating oil and off-road motors.

Clemson University, the University of South Carolina, and other research institutions are working vigorously to develop a viable cellulosic ethanol industry. South Carolina has also formed an algae-to-biodiesel collaborative among state businesses to develop indigenous oil feedstocks. In-state retailers have also embraced alternative fuels and to-date South Carolina has 49 publicly-accessible E85 and 49 publicly-accessible biodiesel pumps. Additionally, beginning July 1, 2008 there will be in-state incentives for consumers to purchase vehicles that operate on E85. Despite the good intent of some of the in-state incentives there is an immediate need to clarify and correct legislation for alternative fuel producers in Act No. 83, 2007.

Additional recent programs and/or policies related to alternative fuel production in South Carolina are available through Act No. 83, 2007, Act. No.116, 2007, and the FY08 Budget Appropriations. These programs include:

- Tax credits for R&D into cellulosic ethanol and algae-derived biodiesel.
- Tax credit for equipment to produce renewable fuel.
- Low-interest loans for the production of transportation fuels from biomass (SC Renewable Energy Revolving Loan Program).
- One-time funding for the Dept. of Ag. Biofuels Marketing Program.
- One-time funding to purchase biodiesel and ethanol testing equipment to offer free ASTM testing for in-state producers as well as recurring funding for additional staff.

Type(s) of GHG Reductions

CO_2: Lifecycle emissions are reduced to the extent that biodiesel and ethanol is produced with lower embedded fossil-based carbon than conventional (fossil) fuel. Feedstocks used for producing biodiesel and ethanol can be made from crops or other biomass, which contain carbon sequestered during photosynthesis (e.g., biogenic or short-term carbon).

The primary feedstocks for biodiesel are vegetable oils (soy, canola, sunflower, algal, etc.) and alcohols (either methanol or ethanol). From a recent report (Hill et al., 2006),[1] biodiesel from soybeans contains 93% more useable energy than its petroleum equivalent and reduces lifecycle GHG emissions by as much as 41%. Higher oil production potential of different feedstocks (e.g., other oil crops, algae) will likely adjust the lifecycle GHG emissions further downward as they are developed as biodiesel sources. Local production of biodiesel also decreases the embedded CO_2e of biodiesel compared to importation of out of state vegetable oil supplies.

There are two different methods for producing ethanol based on two different feedstocks. Starch-based ethanol is derived from corn or other starch/sugar crops. Cellulosic ethanol is made from the cellulose contained in a wide variety of biomass feedstocks, including agricultural residue (e.g., corn stover), forestry waste, purpose grown crops (e.g., switchgrass), and municipal solid waste. Local production of ethanol also decreases the embedded CO_2e of ethanol compared to importation from the current U.S. primary ethanol producing regions. Current research indicates cellulose-based ethanol production provides up to 72%–85% reduction in GHGs compared to gasoline, whereas an 18%–29% reduction is measured from starch-based ethanol production compared to gasoline.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

[1] Hill et al., 2006, "Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels," *Proceedings of the National Academy of Sciences*, 103:11206–11210, July 25, 2006.

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-5. Expanded Use of In-State Feedstocks for Electricity, Heat, or Steam Production

Policy Description

Offset fossil fuel use with production of electricity, steam, and heat from biomass resources. Provide incentives for the development of new biomass production and collection infrastructure, as well as incentives for energy end users that are equitable throughout the economy. Local electricity, heat, or steam production yields greatest net energy payoff. According to a recent study by La Capra and the SC Electric Cooperatives, South Carolina currently has 360 MW of installed capacity for woody biomass. Based on available wood and agriculture residue inventories as well as energy crop production potential, South Carolina has the ability to more than double the current level of production.[2]

Policy Design

Goals: Increase production of electricity, steam, and heat generation to utilize 25% of the available wood and agriculture residue biomass by 2020, equivalent to 122MW over the 2007 baseline of 360MW of installed biopower capacity. By 2030, expand electricity, steam, and heat generation from biomass resources to utilize 50% of the available biomass (246 MW over the 2007 baseline).

Timing: Increase biomass electricity, steam, and heat generation to utilize an additional 10% of available resource by 2010, equivalent to 49 MW of increased capacity. By 2012, increased capacity should reach 68 MW, utilizing 14% of practical and available resource. By 2020, increased capacity should reach 122 MW, utilizing 25% of practical and available resource. By 2030, increased capacity should reach 246 MW, utilizing 50% of practical and available resource.

Coverage of Parties:

SC Department of Agriculture, South Carolina Forestry Commission, University of South Carolina, Clemson University and Extension agencies, SC State University, SC Energy Office, South Carolina Department of Health and Environmental Control – Air Quality Division, SC Biomass Council, SC Forestry Association and SC Forestry Commission, Palmetto Institute, SC Institute for Energy Studies, SC Public Service Commission, Office of Regulatory Staff, SC Department of Revenue, Electric Utilities and Rural Electric Cooperatives, Livestock & Poultry Producers, Crop Producers, and Timberland Owners.

[2] Need to cite the La Capra Study and clarify the production potential in lay terms: an additional 1,961 MW technical ability, and the practical ability to produce an additional 491 MW.

Other: Explore biomass production for utilization in electricity, steam, and heat generation using 100% biomass and/or co-firing with other feedstocks. [NOTE: This policy has parallel policy options in ES and RCI covering utilization of biomass; the focus here is on production]. Note to TWG, the CECAC would also like the TWG to include utilization of woody energy crops along with residues.

Implementation Mechanisms

A broad range of policy mechanisms and programs should be used to foster development of the industry and associated economic markets, including voluntary, incentive-based programs and regulatory requirements. These could include:

- Establish a state-level renewable electric portfolio standard (REPS), requiring a specific percentage of in-state generation to be fueled by biomass.
- Establish an interconnection standard that allows utility-scale combined heat and power production, and distributed generation fueled by biomass.
- Establish net metering rates by utilities, electric cooperatives, and municipalities that allow biomass energy to be price competitive (i.e., rates should be greater than avoided cost).
- Establish output-based emissions regulations (OBR) that encourage energy efficiency and biomass energy as air pollution control measures.
- Increase state-level incentives, especially those for construction of new utility-scale generating capacity using biomass resources.
- Establish competitive cost-share grant funding for feasibility studies for new utility-scale generating capacity using biomass resources.

Related Policies/Programs in Place

Legal Definition:

In South Carolina state law, biomass is defined as wood, wood waste, agricultural waste, animal waste, sewage, landfill gas, and other organic materials.

Incentives:

Incentive Payment:
Beginning July 1, 2008, a business is allowed an incentive payment for production of electricity or methane gas fuel in a facility not using biomass resources before June 30, 2008, or in a facility which produces at least twenty-five percent more electricity or methane from biomass resources than the greatest three-year average before June 30, 2008. This includes:

- 1 cent per kilowatt-hour (kWh) for electricity.
- 9 cents per therm for methane gas fuel.

Equipment Tax Credit:
Beginning July 1, 2007 there is a credit against the income tax for twenty-five percent of the costs incurred by a taxpayer for the purchase and installation of equipment used to create heat, power, steam, electricity, or another form of energy for commercial use from a fuel consisting of

no less than ninety percent biomass resource. Costs incurred by a taxpayer and qualifying for the credit allowed by this section must be certified by the State Energy Office, in consultation with the Department of Agriculture and the South Carolina Institute for Energy Studies. A taxpayer's credit utilization in any one year, for all expenditures allowed pursuant to this section, must not exceed six hundred fifty thousand dollars. Unused credits may be carried forward for fifteen years.

Conducive Policies:

In December 2006, the SC Public Service Commission (PSC) adopted a simplified interconnection standard for small distributed generation (DG). The standard addresses renewable-energy systems and other forms of DG up to 20 kilowatts (kW) in capacity for residential systems, and up to 100 kW in capacity for non-residential systems. The standard does not include provisions for three-phase generators, and limits the range of commercially viable interconnections.

Type(s) of GHG Reductions

Displacement of coal, natural gas, and other fossil fuels reduces emissions of GHGs. Increased energy efficiency of smaller-scale generating technologies decreases the amount of carbon emitted per unit of energy generated.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources:

The South Carolina Energy Office has quantified the following potential for taking advantage of biomass that is currently not being used for fueling a sustainable bioenergy industry:

- 14 million tons of green wood from forest thinnings.
- 621,000 tons of urban waste wood that currently goes into landfills.
- 1.2 million tons of agricultural residues from fields planted in corn, soybeans, and cotton.

There is a case study about cofiring biomass with coal at the DOE Savannah River Cofiring Project in South Carolina in 2004 on page 22 of a DOE Federal Energy Management Program document titled "Biomass Cofiring in Coal-Fired Boilers."

The South Carolina Electric Cooperative Association commissioned an informative study of biopower resource potential. Here is a link to the report, written by consultants GDS Associates and LaCapra Associates. http://www.energy.sc.gov/news.aspx?id=52 This study found 9.8 m dry tons per year of woody biomass potential, determined to have a cost of less than $65 per dry ton or about $4.00 per MMBtu.

The South Carolina Forestry Commission performs annual inventories of wood residues: http://www.state.sc.us/forest/prod.htm

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC] Sample Draft Policy Option Template

AFW-6. Terrestrial Carbon Sequestration

AFW-6(a). Soil Carbon Management (Agriculture)

Policy Description

There are four components of soil carbon management considered in this option: alternative cultivation practices (conservation-till, no-till, bio-char application, compost application, cover crops, etc.), manure management practices, crop conversion to increase sequestration potential, and rotational grazing.

The amount of carbon stored in the soil can be increased by the adoption of practices such as conservation and no till cultivation, cover cropping, and application of biochar and compost. Reducing summer fallow and increasing winter cover crops are complimentary practices that reduce the need for conventional tillage. The application of biochar (i.e., charcoal) and compost increases soil carbon content, stabilizes soil carbon, enhances drought resistance, and may improve production by boosting soil dynamics. By reducing mechanical soil disturbance, these practices reduce the oxidation of soil carbon compounds and allow more stable aggregates to form. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

Additionally, the implementation of manure management practices may reduce GHG emissions associated with manure handling and storage. Potential practices include but are not limited to composting of manure (to reduce methane emissions) and improved methods of field-application (for reduced nitrous oxide emissions). Application improvements include incorporation into soil, instead of surface spray/spreading, spreader calibration, and manure-management planning.

Convert marginal agricultural land used for annual crops to permanent cover such as grassland/rangeland, orchard, or forest, where the soil carbon and/or carbon in biomass is higher under the new land use. This option includes opportunities to keep CRP lands covered in perpetuity. Increased demand for corn-based ethanol and biodiesel feedstocks can act as an incentive for converting grassland to cropland. Adopt incentives to reduce acreage returning to conventionally tilled production or to suburban/urban development.

Heavy grazing can cause significant soil disturbance and result in carbon losses from soils. Rotational grazing where animals are moved from field-to-field on a regular basis reduces soil disturbance and improves soil carbon levels. Rotational grazing also can improve plant vigor.

Policy Design

Goals: By 2020, apply improved soil carbon management practices on 50% of acres that currently do not use these practices (see definition of improved soil carbon management practices in “Policy Description,” above). Note to TWG: need to consider a separate goal for manure management, as this element does not fit into the existing goal structure.

Timing: By 2012, apply improved soil carbon management practices on 20% of acres that currently do not use these practices. Achieve an increase to 50% of these acres by 2020.

Parties involved: SC Department of Agriculture; SC DNR – Conservation Districts; Clemson University – Cooperative Extension Service; USDA – Natural Resources Conservation Service; SC Farm Bureau; Farmers.

Other: Note to TWG: CECAC would like to see information on baselines to better understand the goals (e.g. current acres that utilize the above practices). Studies in North Carolina have found the potential to sequester one ton of carbon per acre through conservation tillage / no-till practices over a six-year period[3] (equivalent to about 3.3 $MtCO_2e$/acre). Studies in California[4] and Pennsylvania[5] have shown that improved soil carbon management techniques (i.e., cover cropping and application of compost and manure) can sequester dramatically more carbon than no-till practices alone. Moreover, it appears that the sequestration benefits of no-till are limited, whereas the longitudinal study in Pennsylvania saw no less accumulation of soil carbon sequestration over the 25 year period. *Are we inferring that accumulations occur indefinitely?*

Different methods to increase soil carbon content have different effects on soil fertility, disease management, and actual sequestration. Also, certain soil carbon management techniques may require greater energy input than others. Additionally, crop production cycle GHG emissions have not been quantified for all these improved soil carbon management practices. For these reasons, in-state research studies are needed to determine the optimal soil carbon management techniques in South Carolina's various soils, with the greatest GHG benefits.

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

Many farmers are participating in the no-till program. Each farm is eligible for up to $40,000 per year (max. 3 years) in fixed-rate incentives for participating in no-till farming of low-residue crops such as tobacco, vegetable crops, peanuts, cotton, soybeans, and silage crops.

Comprehensive Nutrient Management Plans are required, and some have been submitted to the Department. Regulation mandates that manure is applied at agronomic rates and that spreaders are calibrated. Many farms have composters for dead bird disposal. Some manure is used in this

[3] Source: http://southeastfarmpress.com/news/030106-Naderman-conservation/

[4] Source: "Conservation tillage and cover cropping influence soil properties in San Joaquin Valley cotton-tomato crop," by Jessica J. Veenstra, William R. Horwath, Jeffrey P. Mitchell and Daniel S. Munk. California Agriculture Journal, July-Sept. 2006. http://calag.ucop.edu/0603JAS/pdfs/ConservTillageTomato.pdf

[5] "The Rodale Institute Farming Systems Trial 1981 to 2005: Long Term Analysis of Organic and Conventional Maize and Soy-bean Cropping Systems," p15-30, in Long Term Field Experiments in Organic Farming, edited by J Rauppe, C Perkrun, M Oltmanns, U Kopke. ISOFAR International Society of Organic Agriculture Research, Verlaug Publishing, Berlin, 2006.

process. Composted material is applied at agronomic rate. Because of the high cost of commercial fertilizer, many farms are getting their land approved for manure applications.

Cost-sharing programs available for landowners to manage forestland. These include the Forest Renewal Program, Stewardship Incentives Program, Conservation Reserve Program, Forest Land Enhancement Program, Wildlife Habitat Incentive Program, Environmental Quality Incentive Program, and others. Through these programs landowners can receive advice from foresters, biologists, soil scientists, and other experts along with cost sharing that pays, on average, about 40% of the cost of site preparation, planting, soil stabilization, wildlife habitat improvement, and some intermediate management practices.

Type(s) of GHG Reductions

CO_2: Reducing tillage and soil disturbance slows the breakdown of plant material on the soil surface and in the root zone, accelerating the microbial processes that stabilize carbon and protecting carbon from oxidation, inhibiting the release of carbon back into the atmosphere. Depending on how the adoption of alternative cultivation methods affects the overall crop production cycle, additional CO_2 reductions can occur through lower fossil fuel consumption in farm equipment. The conversion of agricultural lands to grassland cover, as well as the implementation of rotational grazing will increase terrestrial carbon sequestration.

N_2O: To the extent that fossil fuel consumption is lowered through the cultivation methods implemented under this policy, N_2O emissions from fuel combustion will be lowered. It is important to note that research also indicates the potential for higher N_2O emissions as soil organic carbon levels increase.[6] Nutrient management programs that reduce the application of manure and fossil-derived fertilizers reduce emissions that occur as a result of nitrogen run-off and leaching.

CH_4: To the extent that fossil fuel consumption is lowered through the cultivation methods implemented under this policy, CH_4 emissions from fuel combustion will be lowered. More efficient applications of manure (or other organic fertilizers) have the potential to reduce methane emissions.

Also, full life-cycle analysis on crop inputs is needed: For examples, displacement of chemical inputs through the use of bio-char, compost, manure, cover-cropping, or mechanical weed control will reduce emissions of fossil CO2 associated with manufacture of these chemical inputs.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

[6] Li et al., "Carbon Sequestration in Arable Soils is Likely to Increase Nitrous Oxide Emissions, Offsetting Reductions in Climate Radiative Forcing," *Climate Change* (2005) 72:321–338.

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW 6(b). Forest Management for Carbon Sequestration

Policy Description

This option includes a range of forest management activities that promote productivity and increase the rate of carbon dioxide sequestration in biomass, soils, and in harvested wood products. Practices may include: increased stocking of poorly stocked lands, age extension of managed stands, thinning and density management, fertilization and waste recycling, expanding short rotation woody crops (for fiber and energy), expanded use of genetically preferred species, modified biomass removal practices, fire management and risk reduction, pest and disease management.

Establish forests on land that has not historically been forested (e.g., agricultural land) ("afforestation"). Promote forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover ("reforestation"). In addition, implement practices such as soil preparation, erosion control, and stand stocking to ensure conditions that support forest growth. These practices should also include urban forestry, including urban tree planting and enhanced maintenance programs.

Policy Design

Goals: *Forest Management:* By 2020, apply improved forest management practices on 50% of acres that currently do not use these practices (see definition of improved forest management practices in "Policy Description," above).

Reforestation: Need a goal here on number of acres on which projects will be implemented or other measurable goal;

Urban Forestry: Need a goal here on number of trees to be planted, increase in canopy cover, or other measurable goal.

Timing: *Forest Management:* By 2012, apply improved forest management practices on 20% of acres that currently do not use these practices. Achieve an increase to 50% of these acres by 2020.

Reforestation:

Urban Forestry:

Parties Involved: not identified

Other: not identified

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

Assistance available to pay partial costs of prescribed burning, reforestation, stand improvement, and other practices. Some poultry litter and municipal sludge are utilized as forest fertilizer. 21,000 acres of forestland will be included in a program to restore the longleaf pine. SC will implement the use of improved seedlings for higher production. For example, Arborgen and Cellfor are developing tree varieties to capture more carbon. SC forestry commission offers assistance and guidance for those seeking to perform prescribed burns to mitigate wildfire risk. Programs such as "Firewise Communities" educate homeowners about wildfire prevention and provide wildfire hazard assessments. There is a current USFS program for reducing wildfire hazard and putting the biomass toward beneficial use.

SC Forestry Commission uses several state and federal cost-share programs and technical assistance for landowners.

Tree City USA is a program sponsored by the National Arbor Day Foundation that provides direction, technical assistance, and publicity for urban and community forestry programs. Currently, 40 SC cities are participating in the Tree City USA program.

Type(s) of GHG Reductions

CO_2: Carbon sequestration from new forest growth. Sequestration in durable wood products and fossil fuel offsets from forest based energy (not quantified, outside of analysis period). Prevention of emissions from forest conversions and improved retention of soil carbon over agriculture

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-7. Conservation and Restoration of Forest and Agriculture Lands for Enhanced Carbon Sequestration

Policy Description

Forests can play a substantial role in climate change by sequestering, or storing, large quantities of carbon (by absorbing CO_2) as they grow and releasing it when they die. Trees are powerful, relatively low cost concentrators of carbon. Young forests sequester carbon at a high rate, roughly proportional to forest growth in biomass. Old growth forests have a large balance of carbon stored over time in wood and soil.[7] Forests set aside to promote old growth result in long term carbon storage balance due to a negligible rate of additional carbon sequestration because of natural loss and decay at about the same rate as they are growing.[8] Land use changes resulting in forest conversion to other uses are generally believed to be a secondary source of net carbon release.[9] Much of the carbon stored in forest biomass and soils can be lost immediately as a result of such land use conversion in addition to the loss in potential carbon sequestration.

In agricultural lands, soil carbon levels can be higher than those converted to developed use. By conserving both agricultural and forest lands, GHG emissions can also be reduced indirectly by influencing more efficient development patterns (leading to lower vehicle-miles traveled). Therefore, a suitable policy for carbon sequestration is to incorporate methodologies that reduce the rate at which the existing base of South Carolina forest and agricultural acreages are cleared and converted to developed uses. Another appropriate policy to sequester carbon is to encourage the manufacture and use of durable wood products sequestering carbon over the life of the wooden product. This increases the value of the land in forest use, which reduces the potential for conversion.

In SC, forest acreage increased from 12.4 million acres to 12.7 million acres based on the most recent USFS survey.[10] Conversion of cropland acreage to forest acreage can produce GHG benefits by adding above and below ground biomass (sequestering carbon) to the converted area. Also, the converted area is likely to sequester more carbon annually as forested area than cropland. This option also covers programs aimed at protecting forested areas that were previously converted (e.g., from active crop lands).

Policy Design

Goals: Reduce the rate at which forest and agricultural lands are converted to developed use by 50% by 2020 from current levels.

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[7] R.A. Sedjo. 2001. Forest carbon sequestration: Some issues for forest investments. Discussion Paper 01-34. 26 pp. Resources for the Future. Washington, DC. Available at: http://www.rff.org/Documents/RFF-DP-01-34.pdf

[8] B. Sohngen, R. Mendelsohn, and R. Sedjo. 1998. The Effectiveness of forest carbon sequestration strategies with system-wide adjustments. Available at: http://www-agecon.ag.ohio-state.edu/peole/sohngen.1/forests/effectc.pdf

[9] R.N. Stavins and K.R. Richards. 2005.The cost of US forest-based carbon sequestration. Pew Center for Global Climate Change. Available at: http://www.pewclimate.org/docUploads/sequest_Final.pdf

[10] Need some text here.

Timing: By 2012, reduce the rate of conversion by 20% from current levels. By 2020, reduce the rate of conversion by 50%.

Parties Involved: SC Forestry Commission, SC Parks Recreation & Tourism, SC Department of Natural Resources, SC Conservation Bank, SC Department of Agriculture, Santee Cooper, SC Farm Bureau, US Fish & Wildlife Service, US Forest Service, US Park Service, Clemson University, NGOs (including but not limited to SC Forestry Association, Ducks Unlimited, The Nature Conservancy, Lowcountry Open Land Trust, Congaree Land Trust, etc.)

Other: SC forest and agricultural land conversion 9th in US at 539,700 acres from 1992-97; rate of increased conversion of 30.2% increasing from 13.0% (1982-87) and 14.1% (1987-92).[11]

Implementation Mechanisms

Policy design considerations include (1) emphasis of grant and partnership opportunities to utilize fee title acquisition to acquire additional State Forest, State Park and Wildlife Management Area lands from willing sellers while incorporating sound forest management plans optimizing forest carbon sequestration on acquired acreage; (2) emphasis of opportunities to sequester additional carbon through voluntary private land conservation easements to decrease land conversion and protect forest and agricultural acreage from development; (3) emphasis of opportunities to voluntarily optimize forest productivity by increasing forest stand density thereby sequestering additional carbon; exploration of opportunities to reward forest landowners with tax credits for increasing carbon sequestration on privately owned forest lands [Note to TWG: this should probably be moved to AFW-6 under Forest Management program implementation]; (4) emphasis of opportunities and programs to convert idle agricultural acreage to forest land and more rapid reforestation of cut-over forest acreage, and (5) utilization of state income tax credit for donations or bargain sales of conservation easements including the potential increase of tax benefits to incentivize forestland owners.

Fee Title Acquisitions, Private land Conservation Easements, Stand Density Improvement, Landowner Incentives, Infusion of additional funds into the SC Conservation including earmarking some or all of the increase to go to projects that conserve lands where the proposed uses will increase carbon sequestration.

Related Policies/Programs in Place

A change in Federal tax law is in place for land put into conservation easement through 2007 allowing property owners to offset half of tax liability for 15 years. SC Conservation Bank.

Type(s) of GHG Reductions

CO2: Conservation of agricultural lands retains the ability of the land to sequester carbon in soil and biomass.

[11] London, James B. and Nicole L. Hill. 2000. Land conversion in South Carolina: State makes top 10 list. Jim Self Center on the Future. Clemson University. 6 p.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

Hurricanes, societal costs, tradeoffs, leakage

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]

AFW-8. Advanced Recycling and Composting

Policy Description

Increase the use of recycling and composting as waste diversion methods in order to limit greenhouse gas emissions associated with landfill methane generation and to increase production efficiencies of raw materials and new products. In order to achieve the goals set forth below, it will be necessary to: increase awareness of the value of recycling, develop consistent recycling programs across counties, promote "best practices" comparisons across counties and between other states, increase recycling programs, create new recycling programs, provide incentives for the recycling of construction & demolition (C&D) waste[12], develop markets for recycled materials and compost, and increase average participation/recovery rates for all existing recycling and composting programs.

Policy Design

Goals: Increase recycling of MSW, as defined by the EPA, in the state to a total of 35% by 2020. Increase composting to 10% by 2020. [Note to TWG, based on the policy description footnote, is a separate goal needed for C&D waste?; also CECAC would like to see a range of benefits/costs estimated for the current goal, as well as a 50% recycling goal]

Timing: Achieve an MSW recycling rate of 30% and a composting rate of 5.25% by 2012.

Parties Involved: Municipal and county government, private solid waste and recycling management companies, commercial, industrial and institutional generators, and SC DHEC.

Other: Out of an estimated 4.9 million tons of MSW generated in the state of South Carolina in 2006, 3.2 million tons were landfilled. The 2006 diversion rate in South Carolina was 30.4%, or 1.5 million tons (diversion includes recycling, composting, and waste to energy combustion). Based on the 30.4% diversion rate, the current disposal rate is 4.4 lb/person/year. The 2012 35% recycling goal yields a disposal rate of 3.5 lb/person/year.[13] The 2004 composting rate in South Carolina was 1.3%, while the national composting rate for that year was 5.25%.[14]

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

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[12] Note: SC does not include construction and demolition debris within the calculation of recycling rates for MSW recycling. *If the C&D waste is emplaced at specified C&D landfills?*

[13] SC DHEC. "South Carolina Solid Waste Management Annual Report; Fiscal Year 2006." Accessed on November 20, 2007 from: http://www.scdhec.net/eqc/lwm/recycle/forms/swmr_06.pdf

[14] P. Simmons, N. Goldstein, S. M. Kaufman, N.J. Themelis, and J. Thompson, Jr. "The State of Garbage in Amercia." *BioCycle*. April 2006. Accessed on August 24, 2007 from http://www.seas.columbia.edu/earth/wtert/sofos/Simmons_SOG06.pdf

Related Policies/Programs in Place

Recycled Market Development Advisory Council is a source of recent actions for Advanced Recycling. Another program to promote business recycling (the "Smart Business Program"). DHEC is also issuing a new rule covering composting. This rule is due to be out in late July and covers wood waste only. Dept. of Commerce is currently considering incentives for recycling, especially business recycling. DOC is also considering waste-to-energy options and compost options. The South Carolina Recycling Market Development Advisory Council managed by the Department of Commerce maintains an ongoing program to explore market opportunities for recycled materials in SC. The RMDAC has recently produced a study of the "Economic Impact of the Recycling Industry in South Carolina." The RMDAC meets bi-monthly to "raise awareness of the current state of recycling in South Carolina through various marketing strategies." The Annual Report of the RMDAC is a resource for an overview of the current status of the recycling industry in SC. [Note to TWG, the CECAC would like to see information on current levels of recycling by county; should be available through DHEC]

Type(s) of GHG Reductions

CH_4, CO_2: Methane reductions from avoided methane emissions from waste placed into landfills; GHG reductions from lower energy consumption associated with a reduction of wastes generated (e.g. energy used to create products or packaging); GHG reductions from lower energy consumption associated with utilizing recycled materials for production versus raw (virgin) materials.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]Sample Draft Policy Option Template

AFW-9. Waste-to-Energy Reclamation

Policy Description

Promote the use of anaerobic digesters and energy recapture for waste materials other than municipal solid waste at landfills (e.g. food processing waste, yard waste, other organics; Note the linkage to AFW-2, whereby some organics from this waste stream could be co-managed with livestock wastes). Also, for waste that is landfilled, promote the use of landfill gas to energy (LFGTE) projects. These projects will help prevent the emission of methane while producing clean energy. Anaerobic digesters make a two-fold contribution to climate protection: the usual unchecked discharge of methane into the atmosphere is prevented; and the burning of fossil fuels is replaced with renewable energy (biogas). Use the clean, renewable energy created at landfills by anaerobic digesters to make electric power, space/process heat, and liquefied/compressed natural gas. Note that this policy is not promoting waste combustion to energy projects.

Policy Design

Goals: Increase the number of uncontrolled municipal solid waste landfills recovering methane as an energy source, such that 50% of the landfill gas being generated at uncontrolled landfill sites is controlled by 2020. This can be done through development of additional landfill gas to LFGTE and anaerobic digester projects.

Timing: By 2012, implement LFGTE/digester projects at currently uncontrolled landfills or other sites, such that 20% of methane released at these sites is recovered as an energy source; by 2020, achieve full implementation of the policy.

Parties Involved: Municipal and county governments, private solid waste management companies, local economic development agencies, SC DHEC, SC Department of Commerce, SC Energy Office, non-government organizations, and public interest groups.

Other: No distinction is made between the direct use of landfill methane (e.g., for heat or steam) and the use of methane for electricity generation. South Carolina's Energy Office is a State Partner of the EPA Landfill Methane Outreach Program (LMOP). Through this partnership, it was determined that 30 landfills in South Carolina can potentially recover methane as an energy source. Based on current LMOP data, however, only 5 sites are generating electricity from landfill methane. According to the 15th edition of *The State of Garbage*, published by Biocycle and Columbia University, out of 3.2 million tons of MSW landfilled in SC in 2004, 228,000 tons of waste were recovered for energy.[15]

[15] P. Simmons, N. Goldstein, S. M. Kaufman, N.J. Themelis, and J. Thompson, Jr. "The State of Garbage in America." *BioCycle*. April 2006. Accessed on August 24, 2007 from http://www.seas.columbia.edu/earth/wtert/sofos/Simmons_SOG06.pdf

Implementation Mechanisms

TBD – [CCS drafts based on TWG inputs; this can be developed as they go along, and can start early or late as they prefer; the level of detail can vary on TWG approval]

Related Policies/Programs in Place

SC Alternative Energy bills establish tax incentives for industrial purchase of equipment to use landfill gas. Legislature passed S.1245, providing manufacturers with tax credits for 25% of cost of landfill gas energy equipment.

A state-owned utility is currently producing approximately 20 MW of electricity in SC from landfill methane gas. SC has six existing landfill methane to energy facilities. One facility provides power directly for manufacturing processes. More are in the pipeline.

Type(s) of GHG Reductions

Methane Destruction: Flaring or production of energy from landfill gas results in the destruction of methane.

GHGs Reduced via Fossil Fuel Reductions: Use of landfill gas for generating heat/steam or electricity can offset fossil fuel use (e.g., natural gas, coal), which will reduce emissions of CO_2, CH_4, and N_2O from the combustion of fossil fuels.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]Sample Draft Policy Option Template

AFW-10. Water and Wastewater Energy Efficiency Improvements

Policy Description

The collection and treatment of waste water and the treatment and delivery of drinking water cost around $4 billion per year and makes up 3% of the nation's energy use. Goals of 10-25% energy efficiency would be savings of $400 million to $1 billion which translates into energy savings between 5 and 12.5 billion kWh. The efficiency in energy would also help in reducing GHG emission. Most facilities that carry out these operations were designed during periods of lower energy costs and/or in adequate considerations for GHG emissions to the environment. Simple improvements such as replacement of older equipment can realize savings. Organizations like the American Water Works (AWRA) Association Research Foundation and the Environmental Protection Agency (EPA) have launched initiatives to improve energy efficiency. The AWRA Research Foundation has launched the National Municipal Water and Wastewater Facility Initiative in December 2004 and the EPA has the Energy Star partnership.

Policy Design

Goals: Develop an energy conservation, management and efficiency plan to increase energy efficiency of plant operations by 25%; Use wastewater digester gas to produce energy where feasible.

Timing: 15% by 2012; 25% by 2020.

Parties Involved: Municipal and private/investor-owned water and wastewater treatment operators, EPA Energy Star program and the AWRA Research Foundation

Other: Not applicable.

Implementation Mechanisms

Policy design considerations include (1) Compliance with current drinking water standards (2) Water quality standards for waste water for discharge to streams/rivers and other water bodies.

The efficiency improvements will come from some or all of the following steps: (a) Variable frequency drives on any machine that has a variable load; (b) Efficient motor systems; (c) Lighting in these facilities are efficient high performance lighting; (d) Maintenance plans for heating and cooling and ventilation; (e) Proper monitoring of dissolved oxygen.

Related Policies/Programs in Place

South Carolina offers tax incentives for residential / business purchase of solar heating and cooling systems. The tax credit for such equipment is 25% of the installation cost, with a $3500 annual tax credit limit (Amount over the tax can be rolled over to subsequent years).

Type(s) of GHG Reductions

CO_2: A portion of electricity used by WWTPs in South Carolina is generated through the combustion of fossil fuels, a process that releases CO_2 into the atmosphere. Additionally,

methane combusted on-site for the purposes of flaring or energy generation releases CO_2, as well as small amounts of CH_4 and N_2O. However, since CO_2 has a lower global warming potential (GWP) than CH_4, the practice of combusting methane at WWTPs results in a net reduction of GHGs when expressed in CO_2e.

CH_4: WWTPs that utilize anaerobic digestion as a method of wastewater treatment emit methane. However, as this analysis will show, there is a potential for facilities to capture this methane and combust it to produce heat and electricity.

Estimated GHG Reductions and Net Costs or Cost Savings

TBD – [CCS should provide a worksheet and other reference material as needed for transparency]

Data Sources: [TBD by CCS on TWG approval]

Quantification Methods: [e.g. Full life-cycle analysis with supply/demand equilibrium adjustments on TWG approval]

Key Assumptions: [TBD, as needed on TWG approval]

Key Uncertainties

TBD – [as needed and approved by the TWGs]

Additional Benefits and Costs

TBD – [as needed and approved by the TWGs]

Feasibility Issues

TBD – [as needed and approved by the TWGs]

Status of Group Approval

Pending – [until CECAC moves to final agreement at meeting #5 or #6]

Level of Group Support

TBD – [blank until CECAC meeting #5]

Barriers to Consensus

TBD – [blank until final vote by the CECAC]