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Agriculture, Forestry, and Waste Management Technical Work Group

Summary List of Draft Priority Policy Options for Analysis

Revised Option #	Draft Policy Option Name	Straw Proposal Volunteers
AFW-1	On-Farm Energy Efficiency	**Stephen Henry,** John Bonitz, Russel Ott
AFW-2	On-Farm Waste Energy Recovery	Stephen Henry, John Bonitz, Russel Ott
AFW-3	Expanded Use of Local Agricultural Products	Dan Tufford, Russel Ott
AFW-4	In-State Liquid Biofuels Production	**Erika Hartwig,** John Bonitz, Johnny Williamson
AFW-5	Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production	Erika Hartwig, Bob Giangiorgi, John Bonitz, **Carlton Owen**
AFW-6	Terrestrial Carbon Sequestration	Bob Perry (f), Guy Sabin (f), John Bonitz (a), Erica Westbrook (a)
AFW-7	Conservation and Restoration of Forest and Agriculture Lands for Enhanced Carbon Sequestration	Guy Sabin, **Bob Perry**, Dan Tufford, Bob Scott
AFW-8	Advanced Recycling and Composting	**Bob Giangiorgi**, Scott Fennell
AFW-9	Waste-to-Energy Reclamation	Edwin Lesley, Scott Fennell
AFW-10	Water and Wastewater Energy Efficiency Improvements	**Venkat Lakshmi**, Dan Tufford

Sample Draft Policy Option Template

AFW-1 On-Farm Energy Efficiency

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Renewable energy can be producing and used on-site at agriculture operations. For example, installation of solar or wind power, use of hydro-powered generators for irrigation, and converting diesel farm equipment to LNG/CNG or hybrid technology will reduce carbon dioxide emissions by displacing the use of fossil based fuels.

Policy Design

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Goals:

- **Fossil fuel reduction goal:** 20% reduction in petro-diesel use by 2020.
- **Electricity reduction goal:** 40% includes reductions from electricity efficiency and on-site generation using renewable energy (solar, wind, hydro).

Timing:

- **Fossil fuel reduction goal:** Achieve 5% reduce consumption by 2012. Achieve the full policy goal by 2020.
- **Electricity reduction goal:** Achieve 10% reduce consumption by 2012. Achieve the full policy goal by 2020.

Parties Involved: Colorado Rural Electric Associations (REAs), State Agriculture Organizations, Governors Office of Energy Management and Conservation, Colorado Department of Agriculture, Businesses providing energy efficiency and renewable energy equipment.

Other: As needed, identify incentives that encourage the growing and supply of feedstocks, and the utilization of ethanol in transportation markets across the state.

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.

Types(s) of GHG Reductions

CO_2: GHG reductions that occur as a result of a decline in on-farm energy use are largely comprised of CO_2, which is the byproduct of combustion of diesel fuel to run farm equipment, such as tractors, and the indirect byproduct of the generation of electricity that is used for irrigation pumps, lighting, food processing, and other agricultural processes.

CH_4 and N_2O: These gases are also emitted through the different forms of combustion that create energy for use on farms. The greenhouse effects of these gases are normalized and included in the GHG reduction potential calculations that are expressed as units of CO_2e (carbon dioxide equivalent).

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-2 On-Farm Waste Energy Recovery

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Reduce the amount of methane emissions from livestock manure by installing manure digesters on livestock operations. Energy from the manure digesters is used to create heat or power, which offsets fossil fuel-based energy production and the associated Greenhouse Gas (GHG) emissions.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of a Policy Design from North Carolina.

Goals: Capture 20% of available methane from confined animal operations by 2020 for use in energy projects. The policy is designed to apply to hog farms and dairies in the state.

Timing: By 2010, implement projects to capture 5% of available methane energy at hog farms and dairies. By 2020, implement projects to capture 20% of methane energy.

Parties Involved: NC Farm Bureau, Department of Environment and Natural Resources. (DENR), NC Department of Agriculture and Consumer Services ((NCDA&CS), livestock producers

Other: Due to the levels of emissions and the cost effectiveness estimated for applying this option to livestock operations in NC, this policy is designed to address hog farms primarily and could also cover dairy producers.

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.

Types(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.

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-3 Expanded Use of Local Agricultural Products

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: 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.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of a Policy Design from Vermont.

Goals: To increase the production, storage, and processing of locally grown animal products, grains, vegetables and fruits and their consumption in Vermont *such that 30% of these products purchased by Vermonters are produced in the state.*

Timing: To increase sales *and consumption* of local farm products by 50% and increase storage and processing capacity of locally grown farm products by 20% by 2012 **above current levels**. *Increase purchasing of Vermont-produced agriculture products to 30% of total purchased agriculture products in Vermont by 2028.*

Parties Involved: Center for Sustainable Agriculture at UVM, Agency of Agriculture, VT Department of Economic Development, Vermont farmers and industry associations.

Other: Promote the use waste heat generated from farm or industry practices to increase the levels of year-round vegetable and fruit production.

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.

Types(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]

Sample Draft Policy Option Template

AFW-4 In-State Liquid Biofuels Production

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Increase production of biofuels (e.g. ethanol, butanol and/or biodiesel) from agriculture, forestry, or other biomass feedstocks (from the forestry or waste management sectors) to displace the use of fossil fuels. Promote the development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels to improve the embedded energy content of ethanol. Bio-oils can also be produced from forest biomass. Increased production and consumption in state give the highest benefits.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of a Policy Design from Vermont.

Goals: The goal levels and timing for increasing production of biofuels in Vermont are shown in the table below.

Phase	Year	Gallons of biodiesel produced in Vermont	Represents percentage of total distillate used in state (in 2006)	Gallons of cellulosic ethanol produced in Vermont	Represents percentage of total gasoline used in state (in 2006)
1	2010	1,000,000	0.4%	0	0%
2	2015	14,500,000	6%	10,000,000	3%
3	2028	50,000,000	21%	50,000,000	15%

Timing: See table above.

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

Other: The goals above are incremental to business as usual (BAU) production, which include the planned Biocardel plant described in the Feasibility Issues section below.

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

South Carolina currently provides Biodiesel Production Tax Credits in the amount of $0.20 per gallon of biodiesel sold that is produced mostly from soybean oil. The amount of the tax credit is $0.30 per gallon for biodiesel sold that is produced from feedstock other than soybean oil. The maximum quantity of incentivized fuel is three million gallons per year per facility, for a maximum of five years.

South Carolina offers a tax credit of $0.075 per gallon for every gallon of ethanol produced before denaturing. Ethanol producers are also eligible for a tax credit of twenty cents per gallon of ethanol produced above the original designed production capacity of the facility.

There is a potential for a biodiesel plant in Aiken County. This plant – to be operated by Farmers and Truckers Biodiesel – will be converted from a Warrenville clay warehouse at a cost of $1.4 million. The potential output for the Aiken County plant will be 20 million gallons per year.

An ethanol plant in the Batesburg –Leesville area is currently pending. This plant would provide 100 jobs, produce 108 gallons of ethanol and 400,000 tons of feed per year, at a cost of $200 million. E-85, Inc. has applied for an air quality permit to construct and operate a new ethanol facility in Dillon, SC. This facility would produce 383,000 tons of feed and 110.3 million gallons of ethanol per year.

Additional recent programs and/or policies in SC:

- Tax credits for R&D into cellulosic ethanol and algae-derived biodiesel.
- Incentive payment for production of methane gas fuel from biomass.
- Tax credit for building/renovating facility for producing renewable fuel.
- Low-interest loans for the production of transportation fuels from biomass (SC Renewable Energy Revolving Loan Program).
- Recurring funding for Dept. of Ag. Biofuels Marketing Program.
- Recurring funding for Dept of Ag. Renewable fuel regulation and testing.
- Funds to upgrade biodiesel and ethanol testing equipment; Dept. of Ag.

Types(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*, volume 103, pp. 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]

Sample Draft Policy Option Template

AFW-5 Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Increase the amount of biomass available from agricultural and forestry feedstocks for generating electricity, heat, steam, and bioproducts (e.g. biopolymers, biochar) – displacing the use of fossil energy sources. Local electricity, heat, or steam production yields greatest net energy payoff.

Policy Design

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Goals: Increase agricultural biomass use for electricity, steam, and heat generation to utilize 10% of available biomass by 2010, 25% of available biomass by 2020, and 50% of available biomass by 2030.

Timing: See above.

Parties Involved: NCDA&CS, NCSU, NCA&T, Cooperative Extension, NC State Energy Office, DAQ, Utilities Commission, Electric Utilities, Livestock & Poultry Producers, and Crop Producers.

Other: Explore biomass utilization for electricity, steam, and heat generation using 100% biomass and/or co-firing with other feedstocks (as described in the ES and RCI options cited above).

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

There are several fuel pelletizing projects being considered in the State. Incentive payments are available for biomass electricity. There is a tax credit for the purchase and/or installation of equipment to create heat, electricity, power or steam from biomass. In addition, there are low-interest loans available for the production of energy from biomass (SC Renewable Energy Revolving Loan Program).

Types(s) of GHG Reductions

CO_2: Savings occur as a result of displacing fossil fuel use in the production of electricity or steam.

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-6 Terrestrial Carbon Sequestration

AFW-6(a) – Soil Carbon Management

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: There are four components of soil carbon management considered in this option: alternative cultivation practices (conservation-till, no-till, biochar application, 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. Reducing summer fallow and increasing winter cover crops are complimentary practices that reduce the need for conventional tillage. In addition, the application of biochar (i.e., charcoal) may also increase soil carbon content and stabilize soil carbon. 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 manure composting (to reduce methane emissions) and improved methods for application to fields (for reduced nitrous oxide emissions). Application improvements include incorporation into soil, instead of surface spray/spreading.

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. 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 mechanisms to prevent theses acres from either 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 maintains soil carbon levels. Rotational grazing also can improve plant vigor and enhance soil carbon levels.

Policy Design

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Goals: By 2020, apply soil management practices on 50% of cultivated lands that currently do not use these techniques.

Timing: By 2010, apply soil 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: NC Department of Agriculture (CEFS), NC Department of Environement and Natural Resources (DENR), NCSU (CALS, CNR), NC Extension, other agricultural organizations and associations.

Other: Studies in NC have found the potential to sequester one ton of carbon per acre through conservation tillage/no-till practices over a six-year period[2] (equivalent to about 3.3 $MtCO_2e$/acre). Studies in California[3] and Pennsylvania[4] have shown that certified organic production methods of row crops sequester dramatically more carbon than conventional practices. Both studies independently concluded that fully-tilled organic production can sequester 1000 lbs per acre per year.[5] Soil carbon accumulations up to 28,000 lbs per acre were observed in the 25-year field trial performed at the Rodale Institute.

A recent study in the United Kingdom[6] found that some organic production techniques have higher energy inputs or land requirements than conventional techniques (sometimes due to lower yields, longer production cycles for livestock like poultry). Because increases in soil carbon content do not fully reflect crop production cycle GHG emissions (due to changes in tillage practices, application of chemicals, etc.), research and pilot studies will be needed to determine

[2] Available at http://southeastfarmpress.com/news/030106-Naderman-conservation/.

[3] 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.

[4] Chapter in book: "The Rodale Institute Farming Systems Trial 1981 to 2005: Long Term Analysis of Organic and Conventional Maize and Soy-bean Cropping Systems," pp15-30, in *Long Term Field Experiments in Organic Farming*, edited by J Rauppe, C Perkrun, M Oltmanns, U Kopke. ISOFAR - International Society of Organic Agricultural Research, Verlaug Publishing, Berlin, 2006.

[5] Source: Interview with Dr Paul Hepperly, Rodale Institute, February 8, 2007.

[6] *Environmental Impacts of Food Production and Consumption,* Manchester Business School, prepared for the Department for Environment, Food and Rural Affairs, December 2006, http://www.defra.gov.uk/science/project_data/DocumentLibrary/EV02007/EV02007_4601_FRP.pdf.

which organic cropping systems in NC achieve net GHG benefits (see Feasibility Issues section below).

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 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.

Types(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.[7] 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.

[7] 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.

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.

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 6(b) – Forest Management for Carbon Sequestration

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: 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 may also include urban forestry.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of an afforestation/reforestation Policy Design from North Carolina.

Goals: Initiate afforestation/restoration projects on 540,000 acres by 2020.

Timing: By Fall 2007 planting season have candidate acreage identified (by county) in cooperation with NRCS, FSA and NC SWCD and NC DFR.[8] By 2010, achieve afforestation projects on 40,000 acres. Achieve a total of 540,000 acres of afforestation projects by 2020.

Parties Involved: Seek to establish a unified cooperative alliance of farm (NC Farm Bureau), forest landowner (NC Woodlands, North Carolina Forestry Association)**,** agencies (NC DFR, NC DA), utilities (Duke, Progress Energy), and industrial and non-governmental organizations to promote and implement the coordination needed to reach this historic goal.

Other: Afforestation, the planting of trees on lands that have not recently supported forests, has both carbon sequestration and other environmental benefits—storing over one ton of carbon per acre each year (on-site, not including off-site storage and offsets in products). Afforestation delivers other important benefits such as improved wildlife habitat, reduced soil erosion and fertilizer runoff, and new recreational opportunities. There is a large opportunity for afforestation on agricultural, brownfields, and other lands in NC (possibly greater than 1.5 million acres).[9] These lands are relatively productive for forestry, as the croplands have typically been previously

[8] Natural Resources Conservation Service & Farm Services Agency (USDA), North Carolina Soil and Water Conservation Districts and Division of Forest Resources.

[9] Conservation Compliance: the Clock is Running. Cook, M. and D. Hoag. 1997 SoilFacts, AG-439-23, at http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-23/. Accessed 10/3/2006.

fertilized with mineral nutrients. The average cost-sharing for forestation success in the NC Forest Development Program (FDP) averages between $90 and $200 per acre.[10] The FDP has been the major funding mechanism for state assistance to landowners foresting their lands (~90% of all acres cost shared by currently active NCDFR administered forestation programs[11]) and has reached approximately 85% of NIPF landowners doing forestation over the last 6 years (1999-2005).[12]

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.

Types(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]

[10] Forest Development Program, Annual Accomplishment Summary, 2006, Joann Hocut, NC Division of Forest Resources.

[11] Ibid.

[12] Chris Hopkins' synthesis of Forest Statistics for North Carolina, 2002 and FDP reports.

- **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-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 CO2) 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. [13] 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.[14] Land use changes resulting in forest conversion to other uses are generally believed to be a secondary source of net carbon release.[15] 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. Therefore a suitable policy for carbon sequestration is to incorporate methodologies that reduce the rate at which the existing base of South Carolina (SC) 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.

In SC, forest acreage increased from 12.4 million acres to 12.7 million acres based on the most recent USFS survey.[16]

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., returned to active cultivation).

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

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

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

[16]

Policy Design

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; (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.

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

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). [17]

Implementation Mechanisms

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.

[17] 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.

Types(s) of GHG Reductions

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

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]

Sample Draft Policy Option Template

AFW-8 Advanced Recycling and Composting

Policy Description

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Increase recycling and reduce waste generation in order to limit greenhouse gas emissions associated with landfill methane generation and with the production of raw materials and new products.

Increase recycling programs, create new recycling programs, provide incentives for the recycling of construction materials, develop markets for recycled materials, and increase average participation/recovery rates for all existing recycling programs.

Reduce the volume of waste from residential, commercial, and government sectors by including recycling, reuse, and composting. Reduction of generation at the source reduces both landfill emissions as well as upstream production emissions.

Reduce methane emissions associated with landfilling by reducing the biodegradable fraction of waste emplaced. It is often included as an element of advanced recycling and composting programs.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of a recycling Policy Design from North Carolina.

Goals: Increase per capita recovery in the state 25% by 2020.

Timing: Achieve a 10% increase in per capita recovery by 2010 and a 25% increase in per capita recovery by 2020.

Parties Involved: Municipal and county government, private solid waste and recycling management companies, commercial, industrial and institutional generators, and NC Department of Environment and Natural Resources.

Other: For the purpose of calculating per capita recovery, yard waste (yard trash as defined in G.S. 130A-290) and other vegetative debris are not included. Yard waste is banned from disposal in MSW and C&D landfills and experiences large annual fluctuations in both generation and recovery.

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

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.

Types(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

The "Policy Description" is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text: Encourage and promote the use of anaerobic digesters and energy recapture for waste materials other than municipal solid waste at landfills (e.g. food processing waste). 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 heat, and liquefied natural gas.

A bioreactor landfills is essentially in-landfill composting activity at a Subtitle D sanitary landfill in which liquid, temperature, and air (for aerobic processes), are managed in a controlled manner to achieve rapid stabilization of the food, greenwaste, and paper-waste constituents. To optimize the rapid waste stabilization of these wastes, moisture, gas composition, gas flow, and temperature must be carefully maintained and monitored. Bioreactor technology is used to accelerate waste stabilization, enhance gas production and collection, control leaching, reduce volume, and minimize long-term liability of waste.

Policy Design

The "Policy Design" is the other part of the Straw Proposal. The "Goals" represent the **numerical** targets that the TWG feels are attainable by the end of the policy period (2020), and will provide sufficient carbon benefits. The "Timing" bullet is a place for the TWG sub-group to insert an incremental target (2012), or multiple incremental targets. The "Parties Involved" bullet includes a list of organizations (specific or otherwise) that could be affected by this proposed option, or are parties to the implementation of the option. Please see example below of a Policy Design from North Carolina.

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 is controlled by 2020. This can be done through development of additional landfill gas to energy (LFGTE) projects. For sites where LFGTE is not feasible, implement flaring controls to achieve the goal.

Timing: By 2010, implement LFGTE at 10 sites not currently using these technologies; by 2020, achieve full implementation of the policy (50% coverage of generated LFG).

Parties Involved: Municipal and county governments, private solid waste management companies, local economic development agencies, NC Department of Environment and Natural

Resources, NC Department of Commerce, NC Utilities Commission, 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.

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.

Types(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 carbon emission. Most facilities that carry out these operations were designed during periods of lower energy costs and/or not adequate considerations for carbon emissions to the environment. Simple improvements such as replacement of older equipment can realize in 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

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.

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

The efficiency improvements will come implementation of 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).

Types(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]