



## Brief Description of Catalog of State Actions

### Agriculture, Forestry, and Waste Management

Descriptions of policy options prepared by the Center for Climate Strategies (CCS) and South Carolina Department of Health and Environmental Control (DHEC) based on actions undertaken or considered by South Carolina and other states, including regional, state, local and private actions.

(Recently enacted policies and programs in South Carolina are listed where relevant [*see italics*]. Note that this listing is incomplete and will be fleshed out during the TWG process; working group members are encouraged to provide input on existing policies and programs, where relevant.)

#### **AFW-1 PRODUCTION OF FUELS, PRODUCTS, AND ELECTRICITY IN AGRICULTURE**

##### **1.1 Expanded Use of Biomass Feedstocks for Electricity, Heat and Steam Production**

Increase the amount of biomass available for generating electricity and displacing the use of fossil energy sources. Local electricity, heat, or steam production yields greatest net energy payoff.

*Recent Actions in SC: 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).*

##### **1.2 In-State Liquid Biofuels & Bioproducts Production**

Increase production of biofuels (e.g. ethanol, butanol and/or biodiesel) and bioproducts (e.g. biopolymers, biochar) from agriculture 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. Increased production and consumption in state give the highest benefits.

*Recent Actions in SC: 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 Warrenton 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.*

### **1.3 Manure Digesters/Other Waste Energy Utilization**

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.

*Recent Actions in SC:*

## **AFW-2 AGRICULTURE – Livestock**

### **2.1 Manure and Nutrient Management**

Implement manure management practices that 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.

*Recent Actions in SC: 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.*

### **2.2 Changes in Animal Feed**

Livestock emit methane directly as a result of digestive processes (enteric fermentation). Research suggests that changes in the energy content of feed and other dietary changes can reduce methane emissions from enteric fermentation. By optimizing nitrogen (protein) utilization in the feed, nitrogen levels in the manure can be reduced, which in turn reduce the potential for nitrous oxide emissions.

*Recent Actions in SC:*

### **2.3 Rotational Grazing/Improve Grazing Crops and/or Management**

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.

*Recent Actions in SC:*

## **AFW-3 AGRICULTURE – CROP PRODUCTION**

### **3.1 Soil Carbon Management**

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. This option may also complement GHG reduction benefits realized by AFW 1.1 by using carbon-conscious cultivation methods to produce feedstocks for electricity, biofuels, and bioproducts.

*Recent Actions in SC: 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.*

### **3.2 Nutrient and Water Management**

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of management practices. Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N<sub>2</sub>O. By managing and improving water consumption and nutrients spread on crops, there will be a minimal loss of carbon from the soil. Reduced water consumption can result in lower energy use for water pumping. Better nutrient utilization can lead to lower nitrous oxide emissions from run-off.

*Recent Actions in SC:*

### **3.3 Promotion of Silviculture**

Silviculture is a hybrid of silviculture (growing trees) with livestock pasturing. An example is a pilot program currently occurring in Georgia, where pine trees are planted within existing pasture lands. GHG benefits occur via higher levels of above and below ground carbon from the trees

and the use of these trees in harvested wood products. Livestock benefits could also occur via the shade provided by the trees.

*Recent Actions in SC:*

## **AFW-4 AGRICULTURE-LAND USE CHANGE**

### **4.1 Land Use Management that Promotes Grassland Cover**

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 these acres from either returning to conventionally tilled production or to suburban/urban development.

*Recent Actions in SC: 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.*

### **4.2 Preserve Open Space/Agricultural Land**

Reduce the rate at which agricultural lands are converted to developed uses, while protecting private property rights and responsibilities. This retains the above- and below-ground carbon on these lands, as well as the carbon sequestration potential of these lands. Transportation emissions will be reduced indirectly through more efficient development and lower vehicle use. Agricultural land conversion may be prevented through conservation land grants and conservation easements facilitated through non-profit land preservation organizations.

*Recent Actions in SC: Conservation Land Bank (CLB) and various land trusts protect South Carolina's farmlands, forests, and wetlands through the use of purchases and easements. 100,000 acres have been protected through easements or purchase through CLB (5,800 acres of farmland).*

### **4.3 Conversion of Croplands to Forests/ Protection of Previous Cropland to Forest Conversions**

Conversion of cropland to forests produces 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).

*Recent Actions in SC:*

### **4.4 Utilization of Currently Impaired Agricultural Lands**

This options covers programs aimed at utilizing agricultural lands that are unproductive, or currently impaired in some way, allowing them to continue to store carbon and maintain open space.

*Recent Actions in SC:*

## **AFW-5 AGRICULTURE-FARMING PRACTICES**

### **5.1 Reductions in On-Farm Energy Use**

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.

*Recent Actions in SC:*

### **5.2 Organic Farming**

Provide incentives to farmers for growing organic products. Organic farming may result in reduced GHG emissions compared to conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemical inputs).

*Recent Actions in SC: The South Carolina Organic Certification Assistance Program is a cost share program that assists the organic grower in the cost of becoming certified under the National Organic Program. Clemson University has the Sustainable Agriculture Advisory Committee, which promotes organic farming methods. Also, the Carolina Farm Stewardship Association.*

### **5.3 Programs to Support Local Farming/Buy Local**

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.

*Recent Actions in SC: 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.*

## **AFW-6 FORESTRY – PRODUCTION OF FUELS, PRODUCTS AND ELECTRICITY IN FORESTRY**

### **6.1 Expanded Use of Biomass Feedstocks for Electricity, Heat and Steam Production**

Increase the amount of biomass available from forests for generating electricity and displacing the use of fossil energy sources.

*Recent Actions in SC: Many recent actions listed for AFW 1.1 also apply for this option.*

## 6.2 In-State Liquid Biofuels & Bioproducts Production

Increase production of ethanol and/or biodiesel fuel (or other fuels, such as butanol) and bioproducts (such as biopolymers and biochar) from forestry feedstocks (also note feedstocks from the agriculture and waste management sectors) to displace the use of fossil fuels. For example, 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.

*Recent Actions in SC: Many recent actions listed for AFW 1.2 also apply for this option.*

## 6.3 Improved Energy Capture from Wood Waste Combustion

Reduce emissions and increase heat efficiency from heat sources such as wood burning stoves and furnaces.

*Recent Actions in SC:*

## 6.4 Improved Commercialization of Biomass Gasification and Combined Cycle

Improve the rate of technology development and market deployment of biomass gasification and combined cycle (BGCC) technologies. These technologies expand the application of renewable fuels derived from biomass.

*Recent Actions in SC: USC is installing a biomass gasification system to supply steam to the campus.*

# AFW-7 FORESTRY – BIOMASS PROTECTION AND MANAGEMENT

## 7.1 Forest Protection – Reduced Clearing and Conversion to Nonforest Cover

Reduce the rate at which existing forests are cleared and converted to developed uses. Much of the carbon stored in forest biomass and soils can be immediately lost as a result of such a land use conversion in addition to the loss in carbon sequestration potential.

*Recent Actions in SC: A change in Federal tax law is in place, only for land put into a conservation easement in 2006 and 2007, which lets the property owner offset half his tax liability for 15 years. The TWG notes that during the 1990s, SC ranked at the top of U.S. States for losses of forested lands to urban development.*

## 7.2 Urban Forestry

Maintain and improve the health and longevity of trees in urban and residential areas to protect and enhance the carbon stored in tree biomass. Indirect emissions reductions may also occur by reducing heating and cooling needs as a result of planting shade trees.

*Recent Actions in SC: 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.*

## 7.3 Afforestation/Reforestation

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.

*Recent Actions in SC: SC Forestry Commission uses several state and federal cost-share programs and technical assistance for landowners.*

#### **7.4 Forest Management for Carbon Sequestration**

This option includes a range of forest management activities that promote forest productivity and increase the rate of carbon dioxide sequestration in forest biomass and 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.

*Recent Actions in SC: 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.*

### **AFW-8 FORESTRY – WOOD PRODUCTS AND WASTE**

#### **8.1 Improved Mill Waste Recovery**

Improve treatment and cleaning of waste materials from paper mills, which can then be re-used to manufacture additional wood products. Ensure that sawmill byproducts are recycled. Such byproducts may be useful feedstocks for the production of electricity, biofuels, and bioproducts described by AFW 6.1.

*Recent Actions in SC: Almost all forest product mills use waste for steam or energy, or sell waste to mills that do, so all is utilized.*

#### **8.2 Improved Logging Residue Recovery**

Use more efficient logging methods to fully utilize harvested trees, which will minimize carbon losses from wood damaged during harvesting and maximize the potential for carbon sequestration in harvested wood products. Process the logging remains efficiently.

*Recent Actions in SC:*

#### **8.3 Expanded Use of Engineered Wood Products (for building materials and other products)**

Increase the amount of renewable wood products used for residential and commercial building or other products. The use of wood products in place of other non-wood products can increase carbon sequestration in wood products and displace GHG emissions associated with the production of high embedded-energy materials such as steel and concrete. Promoting the use of locally grown wood enhances reduction potential by reducing transportation related emissions.

*Recent Actions in SC: State and regional trade associations interested in promoting 'Southern Yellow Pine' over competitors.*

## **AFW-9 WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES**

### **9.1 Advanced Recycling and Composting**

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.

*Recent Actions in SC: 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.*

### **9.2 Promotion of Bioreactor Technology**

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.

*Recent Actions in SC: SC has had at least one landfill operating as a bioreactor (Aiken?).*

### **9.3 Source Reduction Strategies**

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.

*Recent Actions in SC:*

#### **9.4 Resource Management Contracting**

Unlike traditional solid waste service contracts, resource management (RM) compensates waste contractors based on performance in achieving an organization's waste reduction goals rather than the volume of waste disposed. As a result, RM aligns waste contractor incentives with the goals to explore innovative approaches that foster cost-effective resource efficiency through prevention, recycling, and recovery.

*Recent Actions in SC:*

#### **9.5 Waste Coal Recapture**

Promote research and implementation of recovering waste coal. Waste coal is a usable material that is a byproduct of previous coal processing operations. Emissions are reduced relative to the mining of new coal.

*Recent Actions in SC:*

#### **9.6 Prevent Landfilling of Unprocessed Organic Material**

Reduces 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.

*Recent Actions in SC:*

### **AFW-10 WASTE MANAGEMENT – LANDFILL GAS STRATEGIES**

#### **10.1 Flare Landfill Methane at non- New Source Performance Standards (NSPS), i.e. Smaller Sites**

Encourage smaller landfills that do not fall under existing Federal or State environmental regulations to capture and flare methane gas. Flares are used to safely combust toxic and volatile gases from landfills and they convert methane gas, which has a relatively high global warming potential, to carbon dioxide.

*Recent Actions in SC: Various local governments are running non-NSPS flares.*

#### **10.2 Methane and Biogas Energy Programs**

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).

*Recent Actions in SC: 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.*

#### **10.3 Landfill Methane Energy Programs**

Use the clean, renewable energy created at landfills by anaerobic digesters to make electric power, space heat, and liquefied natural gas.

*Recent Actions in SC: 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.*

## **AFW-11 WASTE MANAGEMENT – WASTEWATER MANAGEMENT STRATEGIES**

### **11.1 Energy Efficiency Improvements**

Provide incentives for efficiency improvements. Encourage the development of energy policies, energy audits, and energy cost tracking. Identify and implement energy improvements such as using energy efficient equipment and generating on-site power (e.g. solar power, micro-hydro power).

*Recent Actions in SC: 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).*

### **11.2 Lower Waste Processing Needs**

Develop and implement best practices for lowering water consumption and lowering waste production at the industrial, commercial, and residential levels. Encourage and create incentives for research and development on reducing water consumption and waste production. Provide education to reduce water consumption and waste production. Lower water consumption and waste production lead to lower GHG emissions.

*Recent Actions in SC:*

### **11.3 Install Digesters and Turbines or Engines**

Provide incentives to install anaerobic digesters to treat municipal waste and create methane. Install turbines or reciprocating engines to generate electricity from the methane. Reductions occur via methane control and offsetting fossil energy use.

*Recent Actions in SC:*