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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 <sub>2</sub> e)			Net Present Value 2008–2020 (Million \$)	Cost-Effectiveness (\$/tCO <sub>2</sub> e)	Level of Support
		2012	2020	Total 2008–2020			
AFW-1	On-Farm Energy Efficiency	<i>Not Yet Quantified</i>					Pending
AFW-2	On-Farm Waste Energy Recovery	<i>Not Yet Quantified</i>					Pending
AFW-3	Expanded Use of Local Agricultural Products	<i>Not Yet Quantified</i>					Pending
AFW-4	In-State Liquid Biofuels Production	<i>Not Yet Quantified</i>					Pending
AFW-5	Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production	<i>Not Yet Quantified</i>					Pending
AFW-6	Terrestrial Carbon Sequestration	<i>Not Yet Quantified</i>					Pending
AFW-7	Conservation and Restoration of Forest and Agriculture Lands for Enhanced Carbon Sequestration	<i>Not Yet Quantified</i>					Pending
AFW-8	Advanced Recycling and Composting	<i>Not Yet Quantified</i>					Pending
AFW-9	Waste-to-Energy Reclamation	<i>Not Yet Quantified</i>					Pending
AFW-10	Water and Wastewater Energy Efficiency Improvements	<i>Not Yet Quantified</i>					Pending
	<b>Sector Total After Adjusting for Overlaps</b>						
	<b>Reductions From Recent Actions</b>						
	<b>Sector Total Plus Recent Actions</b>						

## AFW-1. On-Farm Energy Efficiency

### Policy Description

Renewable energy may be produced and used on-site at agricultural operations or regionally to the required 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.

Energy efficiency may also be determined indirectly through the use of organic fertilizers (manure) as compared to commercial fertilizers which require intensive energy inputs for production, transportation and application.

### 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.

### 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.

## 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 surplus nitrogen 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 Greenhouse Gas (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.

### Policy Design

**Goals:** Capture 15% of available energy from Animal Feeding operations through either 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; 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.

### 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.

## 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.

**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.

### 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.

## 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 the 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. 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. The state could also provide other 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.

### 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:** TBD

## 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 Warrentonville 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.

## AFW-5. Expanded Use of Biomass 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 production infrastructure. 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, South Carolina technically has the ability to produce an additional 1,961 MW, and the practical ability to produce an additional 491 MW.

### Policy Design

#### Goals:

Increase production of electricity, steam, and heat generation to utilize 25% of the practical and 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 practical available biomass (246 MW over the 2007 baseline). 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.

#### Timing:

Increase biomass electricity, steam, and heat generation to utilize an additional 10% of practical and 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.

#### Other:

Explore biomass utilization for electricity, steam, and heat generation using 100% biomass and/or co-firing with other feedstocks. [NOTE: This may parallel policy options in ES and RCI.]

## 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.

## 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.

1. 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.
2. 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.
3. 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 incentives to reduce acreage returning to conventionally tilled production or to suburban/urban development.
4. 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).

**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:** 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<sup>1</sup> (equivalent to about 3.3 MtCO<sub>2</sub>e/acre). Studies in California<sup>2</sup> and Pennsylvania<sup>3</sup> 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.

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.

### 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,

<sup>1</sup> Source: <http://southeastfarmpress.com/news/030106-Naderman-conservation/>

<sup>2</sup> 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>

<sup>3</sup> "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 Perkrum, M Oltmanns, U Kopke. ISOFAR International Society of Organic Agriculture Research, Verlag Publishing, Berlin, 2006.

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.

## AFW 6(b). Forest Management for Carbon Sequestration

### Policy Description

*The TWG has not provided changes to the default CCS Policy Description section of AFW-6 (b). A TWG sub-group volunteer for this option has reviewed the CCS default text, but has not suggested any changes. For the policy design, it has been suggested that the targets for AFW-6 (a) are also appropriate for this sub-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

**Goals:** By 2020, apply improved forest 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).

**Timing:** 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.

**Parties Involved:** not identified

**Other:** not identified

### 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.

## 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<sub>2</sub>) 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.<sup>4</sup> 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.<sup>5</sup> Land use changes resulting in forest conversion to other uses are generally believed to be a secondary source of net carbon release.<sup>6</sup> 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.<sup>7</sup> 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).

### 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

<sup>4</sup> 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>

<sup>5</sup> 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>

<sup>6</sup> 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](http://www.pewclimate.org/docUploads/sequest_Final.pdf)

<sup>7</sup> Need some text here.

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 9<sup>th</sup> 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).<sup>8</sup>

### 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.

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<sup>8</sup> 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.

## 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 materials (Note: SC does not include construction and demolition debris in the MSW recycling calculation), 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.

**Timing:** Achieve an MSW recycling rate of 35% 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 recycling rate in South Carolina was 30.4%, or 1.5 million tons. This also equates to a 2.0 lb/person/day rate. Based on the 30.4% recycling 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.<sup>9</sup> The 2004 composting rate in South Carolina was 1.3%, while the national composting rate for that year was 5.25%.<sup>10</sup>

### 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

<sup>9</sup> 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](http://www.scdhec.net/eqc/lwm/recycle/forms/swmr_06.pdf)

<sup>10</sup> 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](http://www.seas.columbia.edu/earth/wtert/sofos/Simmons_SOG06.pdf)

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.

## AFW-9. Waste-to-Energy Reclamation

### Policy Description

**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.

### 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 energy (LFGTE) projects.

**Timing:** By 2012, implement LFGTE at currently uncontrolled landfills 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 15<sup>th</sup> 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.<sup>11</sup>

### 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.

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<sup>11</sup> 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](http://www.seas.columbia.edu/earth/wtert/sofos/Simmons_SOG06.pdf)

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-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 (AWWA) Association Research Foundation and the Environmental Protection Agency (EPA) have launched initiatives to improve energy efficiency. The AWWA 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 AWWA Research Foundation

**Other:** Not applicable.

### 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).