Agriculture, Forestry, and Waste Management (AFW) Technical Work Group

Summary List of Draft Priorities for Analysis—2015 and 2025

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2025 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2015	2025	Total 2009–2025			
AFW-1	Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
AFW-2	Afforestation and Restoration of Non-Forested Lands	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	A. Forest Landscape						
	B. Urban Forestry						
AFW-3	Forest Management for Carbon Sequestration	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
AFW-4	Expanded Use of Agriculture, Forestry, and Waste Management (AFW) Biomass Feedstocks for Electricity, Heat, and Steam Production	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	A. Long-Rotation Forests						
	B. Short-Rotation Forests						
	C. Other Energy Crops						
	D. Municipal Solid Waste (MSW) Biomass						
	E. Agriculture and Forestry Residues						
AFW-5	Promotion of Farming Practices That Achieve GHG Benefits	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	A. Soil Carbon Management						
	B. Land-Use Management That Promotes Permanent Cover						
	C. Nutrient Management						
	D. Improved Harvesting Methods to Achieve GHG Benefits						
AFW-6	Reduce the Rate of Agricultural Land and Open Green Space Conversion To Development	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
AFW-7	In-State Liquid/Gaseous Biofuels Production	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	A. Long-Rotation Forests						
	B. Short-Rotation Forests						
	C. Other Energy Crops						
	D. MSW Biomass						
	E. Agriculture and Forestry Residues						

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2025 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2015	2025	Total 2009–2025			
AFW-8	Promotion of Advanced Municipal Solid Waste (MSW) Management Technologies (Including Bioreactor Technology)	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
AFW-9	Improved Commercialization of Biomass to Energy Conversion and Bio-Products Technologies	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	A. Manure Digestion/Other Waste Energy Utilization						
	B. WWTP Biosolids Energy Production						
	C. Other Biomass Conversion Technologies						
	D. Bio-Products Technologies & Use						
AFW–10	Programs to Support Local Farming/Buy Local	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*	Pending
	Sector Totals						
	Sector Total After Adjusting for Overlaps*						
	Reductions From Recent Actions	–	–	–	–	–	
	Sector Total Plus Recent Actions	–	–	–	–	–	

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; TBD = to be determined.

* See below for discussion of overlap adjustments

Note that negative costs represent a monetary savings.

Overlap Discussion:

The amount of carbon dioxide (CO_2) emissions reduced or sequestered and the costs of a policy option within the Agriculture, Forestry, and Waste (AFW) sector may overlap with some of the quantified benefits and costs of policy options within other sectors.

Every effort will be made to determine where those overlaps occur and to eliminate double counting. As displayed in the chart above, the AFW sector totals will be reduced accordingly.

Biomass Supply:

Several options call for a supply of in-state biomass. The supply and demand for state biomass resources are assessed in Table 1 below to ensure there are sufficient resources to meet the policy option goals.

Table 1. Florida Climate Action Team policies: biomass supply and demand assessment

Biomass Resource	Annual Biomass Supply (Dry Tons)	Notes
Logging Residue	1,300,000	Source: *Florida Biomass and Bioenergy Overview*, Southeastern Sun Grant Initiative, May 2007.
Urban Wood Waste	4,600,000	Source: *Florida Biomass and Bioenergy Overview*, Southeastern Sun Grant Initiative, May 2007.
Primary Mill Residue (Unused)	4,000	2005 NREL Report. Derived from the USDA Forest Service's Timber Product Output database for 2002, includes mill residues burned as waste or landfilled.
Agricultural Residue	3,597,000	2005 NREL Report. Estimated using 2002 total grain production, crop to residue ratio, moisture content, and taking into consideration the amount of residue left on the field for soil protection, grazing, and other agricultural activities.
Switchgrass		2005 NREL Report estimates a potential 507,000 tons of switchgrass could be grown on CRP lands.
Willow and Hybrid Poplar		2005 NREL Report estimates a potential 389,000 tons of willow or hybrid poplar could be grown on CRP lands.
Other Woody Energy Crops		Potential to grow 2,080,000 tons on marginal mining lands. Estimated based on 160,000 acres (from Southeastern Regional Biomass Energy Program 2003 Annual Report*) and 13 dry tons/acre.†
Poultry Litter		
Municipal Solid Waste (MSW) Fiber		
Wood Pulp		
Yard and Landscape Waste Debris		
Total Annual Biomass Supply		
AFW-4. Expanded Use of Agriculture, Forestry, and Waste Management (AFW) Biomass Feedstocks for Electricity, Heat, and Steam Production	To be quantified	
AFW-7. In-State Liquid/Gaseous Biofuels Production	To be quantified	
AFW-9. Improved Commercialization of Biomass to Energy Conversion and Bio-Products Technologies	To be quantified	
Total Annual Biomass Demand		

USDA = U.S. Department of Agriculture; NREL = National Renewable Energy Laboratory; CRP = Conservation Reserve Program.

* Southern States Energy Board, Southeastern Regional Biomass Energy Program. 2003 (Oct.). 3rd year field operations & maintenance support for Central Florida short rotation woody crop (SRWC) tree farm. Available at: http//www.treepower.org/papers/annualreport-2003.doc

† Midpoint between high (16 dry tons/acre) and low (10 dry tons/acre), estimates from University of Florida (UF), http://www.treepower.org/yields/main.html.

AFW-1. Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses

Policy Description

Florida has one of the highest growth rates in the nation. By 2060, it is projected that approximately 7 million acres of additional land will be converted from rural to urban uses in Florida, including almost 2.7 million acres of current agricultural lands and 2.7 million acres of existing habitat. This growth will create enormous pressure to develop the landscape. Developed areas contain lower amounts of biomass and its associated carbon. Developed areas also sequester less CO_2 than forested areas.

Furthermore, when landowners don't have incentive to retain ownership, they often not only sell for development, but also sell a forested tract by smaller parcels, making effective forest management impractical. Managed stands sequester carbon faster than non-managed stands, and sequester carbon long-term in durable products.

This policy seeks to reduce the rate at which existing forests are cleared, fragmented, and converted to developed uses, while also providing mechanisms that ensure healthy forest management. Much of the carbon stored in forest biomass and soils can be lost as a result of such a land-use conversion. There are a variety of public and private conservation programs, which can be used to halt this landscape conversion. This policy will emphasize the value of existing forest cover and their importance as carbon stocks.

Note that this policy has overlap with AFW-2 Afforestation and Restoration of Non-Forested Lands, and AFW-3 Forest Management for Carbon Sequestration.

Policy Design

Goals: Stabilize current statewide forest-cover acres and achieve no net loss in carbon stocks by 2015.

Timing: See above.

Parties Involved: Florida private forestland owners, Florida Division of Forestry (DOF), Florida Forestry Association (FFA), Florida Fish and Wildlife Conservation Commission (FWC), University of Florida (UF) Institute of Food and Agricultural Sciences (IFAS) extension, Natural Resources Conservation Service (NRCS), nongovernmental agencies, Regional Planning Councils (RPCs), other state land management agencies, U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (US FWS), U.S. Army Corp of Engineers (USACE), other federal land management and technical assistance agencies, the Nature Conservancy, forest industry, real estate investment trusts (REITs), timber investment management organizations (TIMOs), and private landowners, state government, U.S. federal government.

Other: Based on the USFS Forest Inventory and Analysis (FIA) data, Florida lost 74.3 thousand acres of forestland (16,221.2 to 16,146.9 million acres), resulting in a 0.5% forestland lost from

1995 to 2005. During the same time period, the timberland (forestland capable of producing merchantable timber) acreage increased by 901.2 thousand acres (14,650.7 to 15,551.9 million acres), which corresponds to a 6.2% increase over a 10-year period. However, that does not mean forestland conversion is not occurring in Florida. It means that for this period of time acreage was planted with trees, offsetting almost all of the forestland converted to other land uses throughout the state, and that some of the acreage previously classified as forestland is now classified as timberland.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

Estimated GHG Reductions and Net Costs or Cost Savings

TBD—[Center for Climate Strategies (CCS) should provide a worksheet and other reference material, as needed, for transparency.]

Data Sources: [TBD by CCS on Technical Work Group (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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-2. Afforestation and Restoration of Non-Forested Lands

Policy Description

Establish forests on land that has not historically been forested (e.g., agricultural land, "afforestation"). Promote forest cover and associated carbon stocks by regenerating lands previously forested ("reforestation"). In addition, implement practices (e.g., soil preparation, erosion control, and stand stocking) to ensure conditions that support forest growth. Additional benefits include public recreation, water quality, wildlife habitat, and enhanced biodiversity.

Maintain and improve the health and longevity of tree canopy cover in urban and residential areas to protect and enhance the carbon stored in tree biomass, to absorb air pollution and increase oxygen supplies, and to reduce heating and cooling needs as a result of increased shading. Promote use of software programs that can be used by cities and communities to track and assess the ecological and economic benefits of urban forestry.

Note that this policy has overlap with AFW-1: Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses and AFW-3 Forest Management for Carbon Sequestration.

Policy Design

Goals: TBD

Forested Landscape: Increase the area of forested lands in Florida by 2.5% annually through 2025 through reforestation and afforestation.

Urban Forestry (Primary Goal): Plant and maintain enough trees in urban areas to offset 2008 metropolitan carbon emissions by 10% by 2025.

Urban Forestry (Secondary Goal): Increase the tree canopy coverage in all developed areas [population >500 residents per square mile] to 30% by 2025.

Timing: See above.

Parties Involved: Florida private forestland owners, DOF, FL Forestry Association, FWC, UF IFAS, NRCS, nongovernmental agencies, RPCs, other state land management agencies, USFS, US FWS, USACE, other federal land management and technical assistance agencies, the Nature Conservancy, forest industry, REITs, TIMOs, and private landowners, state government, and U.S. federal government.

Other: For urban forestry, the two goals overlap in terms of GHG benefits. Each will be quantified, and the goal with the largest benefit included in the summary table at the front of this document.

Intensifying reforestation and afforestation efforts in Florida's forests could increase the amount of greenhouse gas (GHG) reduction. According to 2006 data, approximately 152,000 acres are reforested annually in Florida by deliberate efforts, and an additional 34,000 acres are reforested

annually by naturally occurring forest self-regeneration. The total of 186,000 acres reforested and afforested annually represents 1.2% of all forestlands in Florida. Artificial reforestation (planting trees after final forest harvest) and afforestation (planting trees on agricultural and other lands) should be performed to establish adequate tree densities. Pine forests should be planted at a minimum of 605 or 726 trees per acre to assure adequate survival, tree growth, tree form and subsequent timber quality and quantity. Rapidly growing young pine trees sequester large quantities of CO_2; while stands that are not adequately stocked provide only a fraction of potential GHG reduction and woody biomass production for renewable energy production and other uses.

Establish a baseline for urban forest carbon storage and sequestration rates in Florida's top 10 metropolitan areas (based on population). By quantifying carbon storage and sequestration rates in these areas, it will be possible to establish appropriate long term goals to determine number of trees required to offset carbon emissions and reduce energy consumption in urban areas. Currently in Tampa, the urban forest only offsets approximately 1% of carbon emissions associated with human activity. A goal should be set that for urban forests to offset carbon emissions at the 2008 population levels by 10% by 2025.

Increased tree canopy coverage can be accomplished by a combination of tree planting projects, delineating natural areas in new developments, preservation of suitable specimen and groups of specimen trees on parcels during development, and adequate care of existing trees in developed areas.

Need to be sensitive to greenbelt taxing issues.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

TWG Suggestion:

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-3. Forest Management for Carbon Sequestration

Policy Description

Encourage management activities that promote forest productivity and increase the amount of carbon sequestered in forest biomass, soils, and in long-lived wood products. Practices may include thinning and density management, prescribed burning and risk reduction, and management of insects and disease. Reduce the severity of wildfires to reduce GHG emissions by lowering the forest carbon lost during a fire and by maintaining carbon sequestration potential. Similarly, reducing damage from insects, disease, and invasive plants reduces GHG emissions by maintaining the carbon sequestration potential of healthy forests.

Note that this policy has overlap with AFW-1: Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses and AFW-2 Afforestation and Restoration of Non-Forested Lands.

Policy Design

Goals:

Practice improved forest management for carbon sequestration to achieve an increase of at least 10% in productivity for the state's forestry plantations by 2025.

Nonfederal publicly managed forested lands will increase their carbon sequestration potential by X% by 2025.

Timing:

Parties Involved:

Other: The level of carbon sequestration potential in the second goal covering publicly-managed forests will be determined based on further discussion within the TWG after some initial analysis has occurred on the potential for GHG benefits on these lands.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

TBD Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-4. Expanded Use of Agriculture, Forestry, and Waste Management (AFW) Biomass Feedstocks for Electricity, Heat, and Steam Production

Policy Description

Increase the amount of biomass available from agriculture, forestry, and municipal solid waste (MSW) for generating electricity and displacing the use of fossil energy sources. Local electricity or steam production yields the greatest net energy payoff. This biomass should be used in an environmentally acceptable manner, considering proper facility siting and feedstock use (e.g., proximity of users to biomass, impact on water supply and quality, control of air emissions, solid waste management, cropping management, nutrient management, soil and non-soil carbon management, and impact on biodiversity and wildlife habitat). The objective is to create concurrent reduction of CO_2 due to displacement of fossil fuel, considering life cycle GHG emissions associated with viable collection, hauling, energy conversion, and energy distribution systems.

Issue long-term sustainable supply of reasonable cost biomass for generating electricity, heat, and steam. Promote enhanced growth of long rotation, short rotation and dedicated energy crops, as well as collection of biomass residues.

Provide incentives that will result in an increase in the use of waste-to-energy (WTE) and other waste-based energy technologies, and the recovery of landfill methane (CH_4) gas. These technologies make a two-fold contribution to climate protection: the discharge of CH_4 and other GHG into the atmosphere is reduced, and the burning of fossil fuels is replaced with recovered energy.

Policy Design

Goals:

Primary: Increase the current generation of renewable energy from biomass feedstocks by 500% by 2025.

Secondary: By 2025 sugar cane, sweet sorghum, and other potential energy crops should increase by 10%. The acres of land producing ecologically sustainable energy crops are to increase up to an additional 300,000 acres by 2025, increase the current generation of renewable energy from WTE facilities by 20% by 2025, and increase the number of uncontrolled MSW landfills recovering CH_4 as an energy source, such that 50% of the landfill gas generated is controlled by 2020.

Timing:

Parties Involved: Municipal and county governments, private solid waste management companies, local economic development agencies, Florida Department Environmental Protection (DEP), the Florida Energy Commission (FEC), nongovernmental organizations, public interest groups, Public Service Commission (PSC), private and public landowners, electrical utilities,

DOF, Florida Department of Agriculture and Consumer Services (FDACS), and water management districts.

Other: Out of approximately 200 open and closed landfills in the state, only about 13 sites are currently recovering landfill CH_4 for energy use. Currently 11 WTE plants are operating in Florida, generating 513 megawatts (MW) of electricity.

Overall, policies need to decrease the risk and uncertainties associated with having sustainable supplies of good quality biomass at reasonable costs for the planned lifetime of the electrical, heat, or steam producing facility. It is likely a wide array of policies will be needed that influence land and conversion facility owners to dedicate themselves to using biomass feedstocks to produce renewable power.

Note the strong linkage to the energy supply sector, since WTE plants are active in the state. Also may consider new technologies, such as plasma arc.

Consider the following feedstock sources:

- *Long-Rotation Forests*—Need to promote the use of wood for electricity, steam, and heat in Florida by providing subsidies, tax credits, or payment schemes that enable landowners to conduct proper thinning and removals that benefit the health of the forest and decrease the chances of catastrophic wild fire. Promote the development of biomass utilizing faculties in appropriate locations that contain sufficient biomass, but do not already contain commercial conversion facilities, by providing infrastructure needed to support the development and transport of woody biomass. Promote development and deployment of advanced forest management practices (e.g., faster growing genetic stock with improved wood properties for conversion to electricity, steam and heat) that sustainably increases yields of biomass across the rotation.
- *Short-Rotation Forests*—Need to promote the development and commercial deployment of select and dedicated-forest tree species in Florida by providing the following possibilities: (1) establish guarantees or give subsidies for converting land near enough to facilities to short rotation forests, offering low cost loans to first time growers (i.e., overcome initial lack of cash flow); (2) landowner technical assistance programs; (3) promote stable and efficient markets for wood and residues from short rotation forests by creation of incentives for producing electricity, steam, and heat from this source of biomass; (4) create opportunities for conversion facility owners to partner with existing landowners to establish long-term supply agreements; and (5) development equipment and methods that can efficiently harvest and transport stems and residues to facilities that produce electricity, steam, and heat.
- *Other Energy Crops*
- *MSW Biomass*
- *Agriculture and Forestry Residues*—Promote the use of forest residues by developing the technical means and improving the financial returns that make use of these residues commercially viable. Possibilities include: promoting research into harvesting, collection and compaction for transportation, and subsidies to promote their use at conversion facilities.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

TWG Suggestion:

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-5. Promotion of Farming Practices That Achieve GHG Benefits

Policy Description

The amount of carbon stored in the soil can be increased by the adoption of practices, such as conservation, no-till cultivation, and crop rotation. Provide incentives to farmers for using production practices that achieve net GHG benefits, such as no-till cultivation or biotechnology crops requiring reduced chemical or fuel use. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

Convert marginal agricultural land used for annual crops to permanent cover (e.g., such as grassland/rangeland, grove, or forest) where the soil carbon or carbon in biomass is higher under the new land use. Provide incentives to producers to prevent grassland from returning either to conventionally tilled production or to suburban/urban development.

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of FDACS Best Management Practices (BMPs) manuals and support of biotechnology crops. Excess nitrogen not metabolized by plants can leach into groundwater and be emitted to the atmosphere as nitrous oxide (N_2O). Better nutrient utilization can lead to lower N_2O emissions from runoff.

Policy Design

Goals:

Soil Carbon Management—By 2025, implement cultivation practices to enhance soil carbon levels on 40% of the acreage not already using these practices.

Agriculture Land Conversion—By 2025, convert XX acres of marginal agricultural land to higher sequestration permanent cover.

Nutrient Management—Increase efficiency of fertilizer use by 25% in 2025, compared with business as usual (BAU).

Improved Harvesting Methods—Increase efficiency of energy use in harvesting by XX% by 2025.

Timing: See above.

Parties Involved: UF IFAS, Florida Farm Bureau (FFB), all commodity groups, FDACS, USDA-NRCS, and DEP.

Other: Numeric goals for agricultural land conversion and harvesting to be set after initial analysis of reduction potentials for these goals.

Voluntary, incentive-based programs are preferred over command and control regulation.

Also water quality/quantity, economics and other environmental benefits need to be taken into consideration when adopting certain practices.

Research, extension, technology, and biotechnology must be embraced for increased yields and improved harvesting techniques.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-6. Reduce the Rate of Agricultural Land and Open Green Space Conversion To Development

Policy Description

Reduce the rate at which agricultural lands and open green space are converted to developed uses, while protecting private property rights and responsibilities. This retains the above- and belowground carbon on these lands, as well as their carbon sequestration potential. Transportation emissions will be reduced indirectly through more efficient development and lower vehicle use. Agricultural land and open green space conversion may be prevented through fee title acquisitions or conservation easements.

Policy Design

Goals: Reduce the rate at which agricultural lands and open green spaces are converted to development by protecting one acre of agricultural land or open green space for each acre lost to development: a 50% reduction in the level of losses that would otherwise occur.

Timing: Achieve the goal throughout the policy period.

Parties Involved: FDACS; USDA, DEP, FWC, DCA; water management districts, and nongovernmental organizations.

Other:

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-7. In-State Liquid/Gaseous Biofuels Production

Policy Description

Increase production of ethanol, bio-diesel, and transportation fuel (compressed natural gas) from agriculture, forestry feedstocks or MSW and other waste (raw materials) to displace the use of fossil fuel. Promote the development of technologies and production systems that use MSW biomass to produce liquid or gaseous biofuels, and the use of biomass in conjunction with other resources to produce ethanol. Bio-diesel and compressed natural gas use will offset fuel derived from petroleum and will lead to decreased fossil fuel-based CO_2 emissions. Provide market incentives to develop biofuels technologies from the multiple feedstocks.

Policy Design

Goals:

Primary: Maximize the production of liquid and gaseous biofuels in Florida, such that by 2025 the state utilizes 20% of available biomass supply per year to produce biofuels with significantly lower embedded GHG emissions compared with conventional fuel products.

Secondary: Produce enough in-state biofuel to offset 25% of Florida's consumption of liquid fuels that are fossil fuel-based by 2025, using GHG-superior feedstocks. Replace 2% of petro-diesel with biofuel by 2012 and 10% of gasoline with ethanol by 2010.

Timing: See above.

Parties Involved: Municipal and county governments, private solid waste management companies, local economic development agencies, DEP, FEC, nongovernmental organizations, public interest groups, and PSC.

Other: Primary and secondary goals are to be achieved. However, some revision to either goal might be needed after some initial analysis of feedstock availability and the quantities of biofuels necessary to offset forecast consumption.

Consider the following feedstock sources:

- *Long-Rotation Forests*—Need to promote the use of wood for liquid biofuels in Florida by providing subsidies, tax credits, or payment schemes that enable landowners to conduct proper thinning and removals that benefit the health of the forest and decrease the chances of catastrophic wild fire. Promote the development of biomass utilizing facilities in appropriate locations that contain sufficient biomass, but don't already contain commercial conversion facilities, by providing infrastructure needed to support the development and transport of woody biomass. Promote development and deployment of advanced forest management practices (e.g., faster growing genetic stock with improved wood properties for conversion to electricity, steam, and heat) that sustainably increases yields of biomass across the rotation.

- *Short-Rotation Forests*—Need to promote the development and commercial deployment of select and dedicated-forest tree species in Florida by providing the following possibilities: (1) establish guarantees or give subsidies for converting land near enough to facilities to short rotation forests, offering low cost loans to first time growers (i.e., overcome initial lack of cash flow); (2) landowner technical assistance programs; (3) promote stable and efficient markets for wood and residues from short rotation forests by creation of incentives for producing electricity, steam, and heat from this source of biomass; (4) create opportunities for conversion facility owners to partner with existing landowners to establish long-term supply agreements; and (5) development equipment and methods that can efficiently harvest and transport stems and residues to facilities that produce liquid biofuels.
- *Other Energy Crops*—The state should not incur costs and impacts associated with invasive plant species by encouraging, permitting, or incentivizing use of these species for carbon feedstocks.
- *MSW Biomass*
- *Agriculture and Forestry Residues*—Promote the use of forest residues by developing the technical means and improving the financial returns that make use of these residues commercially viable. Possibilities include: promoting research into harvesting, collection and compaction for transportation, and subsidies to promote their use at conversion facilities.

Overall, policies need to decrease the risk and uncertainties associated with having sustainable supplies of good quality biomass at reasonable costs for the planned lifetime of the electrical, heat, or steam producing facility. It is likely a wide array of policies will be needed that influence land and conversion facility owners to dedicate themselves to using biomass feedstocks to produce renewable power.

Utilization of liquid and gaseous biofuel plants in close proximity to energy crops will cause reduction in the amount of energy required for transportation and fossil fuel use.

Combine technologies to enable ethanol production by utilizing cellulosic biomass extracted from solid waste streams, and agricultural and forestry crops and residues.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-8. Promotion of Advanced Municipal Solid Waste (MSW) Management Technologies (Including Bioreactor Technology)

Policy Description

Promote the development and implementation of solid waste management technologies and practices that minimize or reduce GHG emissions. These technologies include those that improve fuel efficiency in the collection, transport, and disposal of solid waste, including procurement of more fuel-efficient vehicles, to reduce the consumption of fossil fuels and related CO_2 emissions. Waste management technologies are needed that will enhance landfill gas collection and production, such as bioreactor technology, to accelerate landfill gas production and waste stabilization.

There is some level of overlap between this option and the MSW landfill gas goal under AFW-4.

Policy Design

Goals: Decrease GHG emissions from cradle-to-grave solid waste management practices by 25% (collection, transportation and disposal) from BAU by 2025.

Timing: See above.

Parties Involved: Local governments conducting solid waste collection and disposal, private solid waste management companies, vehicle and equipment suppliers, fuel suppliers, state regulatory agencies (DEP, PSC), federal agencies (US EPA), regulated electrical utilities, public interest groups, and the public-at-large (rate-paying public).

Other: A substantial component of the carbon footprint of solid waste management is the fuel consumed in collecting and transporting waste. Because the amounts of fuel consumed are significant from an economic standpoint, many public and private sector operations are already trying to maximize their efficiency. Nevertheless, there may be opportunities to seek further improvement, and because of the magnitude, even small improvements will yield substantial reductions. Software providing modern computer-aided routing may not be available to all entities collecting waste, particularly local governments collecting waste with their own forces. Creating a mechanism to assist those entities that do not have, and perhaps cannot afford, routing software may yield benefits.

The fleets of solid waste collection vehicles are managed to maximize their operating hours, and these vehicles may have a typical useful life of 7–10 years. As vehicle and equipment manufacturers develop more fuel-efficient stock, it may be helpful to examine a program to incentivize early replacement of vehicles with more fuel-efficient models. An opportunity may arise to do a life cycle and carbon footprint analysis of tax incentives for replacing older collection vehicles with newer more efficient ones.

Smaller landfills, and landfills that closed prior to the regulatory requirements that mandated the installation of collection systems for landfill gas, may still be creating impacts on GHG levels

through the uncontrolled release of landfill gas. The collection and management of this landfill gas will be an environmental benefit, even if the quantities collected are not sufficient to support a viable landfill gas to energy project. A combination of incentives that produce GHG-reduction credits for collecting and managing the gas at sites that would otherwise be exempt, together with a review to determine if additional regulation is required, can quantify the costs and benefits of collecting gas at these types of facilities.

A bioreactor landfill is essentially an in-landfill activity conducted at a standard Subtitle D sanitary landfill in which liquid, temperature, and air and landfill gas collection are managed in a controlled manner to achieve a more rapid stabilization of the biogenic waste constituents (food, greenwaste, and paper). A bioreactor landfill will produce more landfill gas over a shorter period of time than a standard Subtitle D landfill. This may make the economic viability of landfill gas to energy projects more attractive. To optimize the rapid waste stabilization of these wastes, moisture, gas composition, gas flow, and temperature must be carefully maintained and monitored.

Whether a landfill is managed as a standard Subtitle D landfill, or as a bioreactor, the efficiency of landfill gas collection should be maximize to limit release of CH_4 to the atmosphere. This would include installing collection systems for landfill gas earlier than the time frames required in current regulations, which stipulate installation after waste has been in place for 5 years. Economic factors that make the production of energy from landfill gas attractive may be as important in encouraging the maximum efficiency of collection systems as regulatory requirements.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-9. Improved Commercialization of Biomass to Energy Conversion and Bio-Products Technologies

Policy Description

Improved commercialization of biomass to energy conversion and bio-products technologies:

- Manure digestion/other waste energy utilization,
- Wastewater treatment plant (WWTP) biosolids energy production,
- Other biomass conversion technologies, and
- Bio-products technologies and use.

The CH_4 emissions inherent from the anaerobic decomposition process of manure and other wastes may be captured and used as an energy source. In so doing, it is possible to both reduce CH_4 emissions and to offset fossil-based energy. However, the cost of emission capture and energy production may be higher than the value of the energy collected, making this option cost prohibitive for producers operating in a tight margin business. This option covers programs to increase the number of CH_4 capture and energy recovery projects using manure or other waste. CH_4 digesters could be on-farm or a regional-type digester could be employed.

Develop and implement methods for WWTP biosolids processing and use as a renewable energy and nutrient source, including but not limited to, co-firing with other fuels in existing or new combustion units for the purpose of generating electricity, heat, or steam, and application of WWTP biosolids to agricultural soils.

Improve the rate of technology development and market deployment of biomass and MSW conversion technologies, including biomass gasification combined cycle (BGCC) electricity generation, pyrolysis, and plasma arc technologies.

Increase the amount of renewable products and chemicals produced and used (including building materials that reduce GHG emissions) over conventional petroleum-based products. Promote the use of crop residues and MSW as a source of material for reuse (e.g., in building materials, packaging, or other materials).

Policy Design

Goals:

Utilize 20% of available CH_4 from livestock manure for energy production by 2025.

Utilize 50% of available WWTP solids for energy production or soil application by 2025.

Utilize 50% of available biomass and MSW as energy sources (after accounting for biomass needs under AFW-4 and AFW-7) by 2025.

Produce and utilize 150,000 tons of bio-based products by 2025.

Develop emerging technologies, including BBCC, pyrolysis and plasma arc, for more efficiency by 2025.

Timing: See above.

Parties Involved: Livestock producers, FFB, Sunbelt Milk Producers, Florida Cattlemen's Association (FCA), Florida Electric Cooperatives Association (FECA), UF IFAS, FDACS, DEP, and USDA-NRCS.

Other: It should be noted that CH_4 digesters are a proven technology, but Florida does present some specific challenges. Also any digester that would be constructed must ultimately be managed, which could cause an additional burden on livestock producers without the proper assistance.

A range of renewable products can be developed from these biomass conversion processes, including gaseous and liquid fuels, biochar, chemical products, and CH_4 to methanol. Existing processes include waste combustion and energy recovery (as electricity, steam, or both) or ethanol plants using co-products for heating and drying, rather than relying on outside energy sources.

Improve the utilization and development of bio-products for insulation and packaging material. Significant increase of bio-product technology is to be made available by 2017 for commercial, industrial and residential use.

Increased development of emerging technologies will ultimately increase commercialization of such technologies.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

TWG Suggestion:

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote by the Action Team]

AFW-10. Programs to Support Local Farming/Buy Local

Policy Description

Promote the production and consumption of locally produced agricultural goods, including transportation and heating fuel and plastics, which displace the consumption of those transported from other states or countries.

Policy Design

Goals: Encourage the production of locally produced agricultural goods by 2025. Additional research is needed by the TWG to identify an appropriate goal for this option. As described under "Other" below, Florida has ongoing programs in this area believed to successfully support in-state consumption of locally produced agricultural goods. Potentially, there are some opportunities to increase local consumption of Florida dairy and meat products. The TWG requests additional input from the Action Team on areas to target. As in most states, data on agricultural product imports into the state are lacking.

Timing:

Parties Involved:

Other:

The FDACS Division of Marketing and Development has promoted the production and consumption of locally grown or produced goods through the Florida Agricultural Promotional Campaign, and through support to local Community Farmers' Markets.

Over the last 8 years the Florida retail campaign has focused considerable resources to promote the Fresh from Florida agricultural products in local markets, including more than 1,250 retail outlets in Florida: Publix, Winn Dixie, Albertson's, Sweet Bay, Harvey's, and Sedano. Retailers strategically place local stores to serve customers normally within a 5–10 mile radius. This system is the best means of moving sufficient quantities of fresh product into an efficient distribution system already in existence.

The campaign supports the Community Farmers' Markets by providing a kit on "How to Organize, Operate and Market Farmers' Markets in Florida." This kit offers resources, including sample market rules, vendor applications, and a sample questionnaire for farmers. Marketing and management advice to these organizations are provided as requested. These farmers' markets are promoted through the maintenance of a directory and Web site. There is also a Web site being developed that list Community Supported Agriculture operations. The Farmers' Market Nutrition programs provide monetary support to these markets in the participating sixteen counties.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

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 TWG]

Additional Benefits and Costs

TBD—[as needed and approved by the TWG]

Feasibility Issues

TBD—[as needed and approved by the TWG]

Status of Group Approval

Pending.

Level of Group Support

TBD—[blank until Action Team meeting #5]

Barriers to Consensus

TBD—[blank until final vote]