Brief Descriptions of Catalog Items
Agriculture, Forestry, and Waste Management (AFW) Subcommittee

(Note that this listing is incomplete and will be fleshed out during the subcommittee process; subcommittee members are encouraged to provide input to the subcommittee facilitators on existing policies and programs, where relevant. Recently enacted policies and programs in Florida are listed where relevant in the policy options catalog notes. Additional details will be added to this document under each of the option descriptions, as they are provided.

AFW-1. PRODUCTION OF FUELS AND ELECTRICITY

1.1 Expanded Utilization of Biomass Feedstocks for Electricity, Heat, or Steam Production

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

Note: This is related to 6.1 Forestry Biomass and 9.1 Waste Biomass.

Recent Actions in Florida:

Executive Order (EO) 07-127 includes a request to the Public Service Commission (PSC) to establish a renewable portfolio standard (RPS) that would require utilities to obtain 20% of generation from renewable sources. Presumably this would create demand for biomass feedstocks.

1.2 In-State Liquid/Gaseous Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks and/or municipal solid and other waste (raw materials) to displace the use of fossil fuel. 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 gives the highest benefits. Algal bio-oil production could be thought of here in addition to 11.5.

Recent Actions in Florida:

Current efforts include

- Sales tax exemption for fueling equipment;
- Corporate income tax credit for production and fueling equipment;

- The Florida Department of Agriculture and Consumer Services (DACS) Farm-to-Fuel program, which in fiscal year (FY) 2007–2008 included $25 million in grants;
- Florida Department of Environmental Protection (FDEP) Renewable Energy Technologies Grant Program, which funded some liquid biofuels in FY 2006–2007; and
- $20 million during FY 2007–2008 to the University of Florida's (UF's) Institute of Food and Agricultural Sciences (IFAS) for cellulosic ethanol.

A pilot cellulosic ethanol plant is being built in Florida that will utilize bagasse and yard/hurricane waste. Expected date of opening is April/May 2009.

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. May consider new technologies as well, such as plasma arc technology.

Recent Actions in Florida:

E.O. 07-127 RPS request may create additional demand; further recent rulemaking by the PSC would enable net-metering for up to 2 megawatts (MW) in capacity and standard interconnection for all distributed renewables, thus furthering the likelihood of this technology.

1.4 Improving Energy Capture from Biomass Heat

Reduce emissions and increase heat efficiency from heat sources such as corn and other bio feedstocks. Continue to advance the biomass heating industry. Note: May overlap with RCI group (Residential, Commercial, and Industrial Fuel Sources).

1.5 Expand Production/Use of Bio-Based Materials and Chemicals

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

1.6 Improved Commercialization of Biomass Conversion Technologies

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

AFW-2. AGRICULTURE—LIVESTOCK

2.1.1 Manure Management—Manure Utilization

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), manure crusting, addition of additives to decrease the amount of nutrients lost, and improved methods for application to fields (for reduced nitrous oxide [N_2O] emissions). Application improvements include incorporation into soil instead of surface spraying or spreading.

2.1.2 Manure Management—Manure/Methane Capture

Implement digester and energy recovery projects at confined animal feeding operations (CAFOs) both to reduce methane emissions and to utilize the energy to displace fossil fuels. (To date, most of these projects have been implemented at dairies and swine operations.)

Recent Actions in Florida:

Florida law authorizes the development of best management practices (BMPs) for manure management and utilization as it relates to surface- and groundwater protection.

2.1.3 Manure Management—Utilize Biofilters to Control CAFO Emissions

The utilization of collection and control equipment such as biofilters at CAFOs can reduce methane emissions.

Recent Actions in Florida:

Manure management is required for CAFOs in Florida under various programs administered by the Department of Environmental Protection (e.g., National Pollutant Discharge Elimination System [NPDES]) and DACS, in order to protect water quality.

2.1.4 Manure Management—Increase Pasturing and Lower Densities

Increasing the area over which manure is deposited has the potential to reduce emissions of methane, since the manure is more likely to be decomposed aerobically than anaerobically.

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.

2.3 Technology Improvements to Increase Water Conservation

Encourage methods for water conservation (e.g. closed loop systems when siting new construction).

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, no-till cultivation, and crop rotation. Reducing summer fallow and increasing

winter cover crops are complementary 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.

Recent Actions in Florida:

Refer to the project sponsored by Environmental Defense. The paper is called "Opportunities for greenhouse gas reduction by forestry and agriculture in Florida." Sabine Grunwald has a section called "Role of Florida soils in carbon sequestration," which outlines the factors that Florida soils can contribute to carbon sequestration.

3.2 Nutrient Management

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of management practices and Generally Accepted Agriculture Management Practices (GAAMP). Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N_2O. Better nutrient utilization can lead to lower nitrous oxide emissions from runoff. Nutrient application should be taken to include commercial fertilizers, manure, or wastewater treatment biosolids.

Recent Actions in Florida:

IFAS, DEP, and DACS have developed BMPs for row crops in Florida, including irrigation, fertilization, and pest management practices.

3.3 Technology Improvements to Increase Efficiency

New technologies, cultivation methods, and harvesting methods have the potential to reduce GHG emissions when fossil fuel or electricity consumption can be reduced (note overlap with options under Options 5.1-5.3). Auto-steer guidance systems are an example as is auto swath technology, which uses global positioning system (GPS) to automatically turn the spray boom sections on or off when coming to an area of the field that has been sprayed or needs to be sprayed. Auto swath technology can be used for planting, fertilizing, and other operations. On odd-shaped fields, it can result in a 3%–5% savings. See http://www.agleader.com/products.php?Product=directcommand_l

Variable rate fertilizing and liming are also becoming more popular among farmers. The farmer has a local co-op grid sample the field, and then variable rate applies the fertilizer or lime in the areas of the field that need it. The areas of the field that do not need fertilizer or lime have none applied, which can result in a 50%–60% reduction in the amount of lime or fertilizer needed. See http://www.agleader.com/products.php?Product=directcommand_g

GreenSeeker normalized difference vegetation index (NDVI) technology. A farmer applies 50%–70% of his nitrogen at planting and then, in season, uses GreenSeeker to apply what the corn or wheat plant needs when it is growing—a more efficient way of applying nitrogen that will result in less nitrogen being over-applied. GreenSeeker NDVI is a new technology that is

still in its early testing stages, but it looks promising. See http://www.ntechindustries.com/greenseeker-RT200.html

Improvements may also encompass newer machines with better fuel efficiency, larger planters and combines, and genetically modified seed.

Note that this option has a similar counterparts in Options 5.1-5.3.

Recent Actions in Florida:

See 3.2

3.4 Water Management

Improve the efficiency of water use through implementation of BMPs and GAAMP. Excess water can lead to nitrogen runoff with subsequent emission to the atmosphere as N_2O. 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.

Recent Actions in Florida:

DEP has a nonpoint source management program for agriculture. IFAS, DEP, and DACS have identified the best way to manage for better crop production

3.5 Drainage Management

Improve drainage on agricultural lands to prevent ponding, which could lead to anaerobic soils and GHG emissions (methane).

Note: This may have limited applicability in Florida because permitting requirements already have a requirement for no standing water.

AFW-4. AGRICULTURE—LAND-USE CHANGE

4.1 Land-Use Management that Promotes Permanent 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 Conservation Reserve Program (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 returning either to conventionally tilled production or to suburban/urban development.

Recent Actions in Florida:

IFAS, DEP, and DACS have developed BMPs related to water quality protection associated with various agricultural concerns. CRP and easements.

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 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 conversion may be prevented through conservation land grants and conservation easements facilitated through nonprofit land preservation organizations.

Recent Actions in Florida:

Florida Rural and Family Lands Protection Act of 2001 authorizes the purchase of conservation easements by DACS for the purpose of preserving family farms. Other land acquisition/conservation easement programs include: Rural Lands Stewardship Program; Florida Forever; Natural Resources Conservation Service (NRCS)/Farm Bill.

AFW-5. AGRICULTURE—FARMING PRACTICES

5.1 Increase On-Farm Energy Production and Efficiency

Renewable energy can be produced and used on-site at agriculture operations. For example, installing solar or wind power; using hydro-powered generators for irrigation; converting diesel farm equipment to liquefied natural gas (LNG), compressed natural gas (CNG), or hybrid technology; increasing on-farm use of biofuels and other renewables; expanding farm energy audit programs; and updating machinery, equipment, and engines will reduce carbon dioxide emissions by displacing the use of fossil-based fuels,

5.2 Promotion of Farming Practices that Achieve GHG Benefits

Provide incentives to farmers for using production processes that achieve net GHG benefits. For example, by using biotech crops or some organic farming practices that could achieve reduced GHG emissions compared with conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemical inputs).

Recent Actions in Florida:

Required by Florida Statute 570.954, which promotes the farm-to-fuel initiatives. This promotes the use of Florida crops and agricultural wastes as a source of renewable energy.

5.3 Improved Harvesting Practices to Achieve GHG Benefits

Similar to Option 5.2, this option focuses on harvesting methods that could be used to lower fuel use, lower GHG emissions (e.g. agricultural burning), or other mechanisms to achieve net GHG benefits.

5.4 Programs to Support Local Farming / Buy Local

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. GHG reductions occur from reduced transportation-related emissions.

Recent Actions in Florida:

Florida Agricultural Promotional Campaign (FAPC) promotes local farming and agricultural products in Florida.

5.5 Promotion of Urban Agriculture, Community Gardens, and Green Roofs

Promote participation in urban agriculture programs that reduce GHGs by sequestering carbon and reduce cooling costs by mitigating urban heat islands. Programs also reduce transportation-related emissions by reducing food miles for urban consumers. Promote urban agriculture on vacant or abandoned lands. Need to be sensitive to greenbelt taxing issues.

AFW-6. FORESTRY—PRODUCTION OF FORESTRY ENERGY AND MATERIALS

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. Note: This is related to 1.1 Agricultural Biomass and 9.1 Waste Biomass.

Recent Actions in Florida:

Florida Division of Forestry promotes the development of woody biomass. See also 1.1 above.

6.2 In-State Liquid Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agricultural and/or forestry feedstocks (raw materials) to displace the use of fossil fuel. 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 Florida:

See 1.2.

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.

6.4 Improved Commercialization of Biomass Conversion Technologies

Improve the rate of technology development and market deployment of biomass conversion technologies including BGCC, pyrolysis, and plasma arc technologies. These technologies expand the application of renewable fuels derived from biomass.

6.5 Expanded Use of New, Reused, and Recycled Wood Products for Building Materials

Increase the amount of renewable wood products used for residential and commercial building. Using wood products in place of other building materials can increase carbon sequestration in wood products and displace GHG emissions associated with processing high-energy input materials such as steel, plastic, and concrete. Reduction potential is enhanced by promoting the use of locally grown wood because it has lower transport-associated emissions. Promote utilization of recycled or reusable wood products to reduce wood waste. Encourage certification programs, such as Leadership in Energy and Environmental Design (LEED) to put wood on an equal footing with other materials.

AFW-7. FORESTRY—BIOMASS PROTECTION AND MANAGEMENT

7.1 Forest Protection—Reduced Clearing and Conversion to Non-Forest 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 lost as a result of such a land-use conversion. Easements can be used to do this as well as conservation programs.

Recent Actions in Florida:

Florida has aggressively pursued the acquisition of conservation lands over the past 25 years preserving more than 2 million acres with more than $6 billion in funding for the Preservation 2000 program and its successor, the Florida Forever program. Note the recent 16,000 acre

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. Promote use of software programs that can be used by cities and communities to track urban forestry. Need to be sensitive to greenbelt taxing issues.

Recent Actions in Florida:

The Urban and Community Forestry Program in DACS helps promote urban forestry and provides grants. City Green and I-Tree are programs that cities and communities can use to measure urban trees.

7.3 Afforestation and/or Restoration of Non-Forested Land

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.

7.4 Forest Management for Carbon Sequestration

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, expansion of short-rotation woody crops (for fiber and energy), expanded use of genetically preferred species, modified biomass removal practices, fire management and risk reduction, and pest and disease management. This option can also cover improvements to silvicultural practices that result in net GHG benefits (potentially including water conservation, harvesting techniques, and nutrient application).

Recent Actions in Florida:

For silviculture, BMPs developed by DACS, DEP, and IFAS related to water quality protection and water conservation. Note: Florida currently has very high compliance with BMPs.

7.5 Mitigation of Forest Carbon Sequestration Loss and Emissions Due to Wildfire

Programs that reduce the potential for and severity of wildfires also reduce GHG emissions by lowering the forest carbon lost during the fire in addition to the subsequent losses of carbon sequestration potential in the area impacted by wildfire. Prescribed fires may increase carbon in soil. Mechanical removal of biomass may provide sources of biomass that can be used for conversion to energy.

Recent Actions in Florida:

Florida has a robust wildlands fire prevention program organized by the Division of Forestry in DACS and executed by several land management agencies, including the water management districts, DEP, the Fish and Wildlife Conservation Commission, and federal land managers.

7.6 Mitigation of Forest Loss Due to Insects / Disease

Programs that reduce insect damage to forests also reduce GHG emissions by maintaining the carbon sequestration achieved in healthy forests.

Recent Actions in Florida:

All land managing agencies in Florida use prescribed fire and other means in order to prevent insect and/or disease outbreaks.

AFW-8. FORESTRY—WOOD PRODUCTS AND WASTE

8.1 Improved Mill Waste Recovery—Utilization of Sawmill Residues and Emissions

Improve treatment and cleaning of waste materials from paper mills, which can then be reused to manufacture additional wood products. Ensure that sawmill by-products are recycled or beneficially used for energy. Promote opportunities for using mill CO_2 emissions to create chemical products, such as carbonates. Note: this links to 6.1 and 6.3.

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.

AFW-9. WASTE MANAGEMENT—WASTE MANAGEMENT STRATEGIES

9.1 Expanded Use of Municipal Solid Waste (Including Yard and Hurricane Waste 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 or steam production yields greatest net energy payoff. Note: This is related to 1.1 Agricultural Biomass and 6.1 Forestry Biomass. Note also the strong linkage to the energy supply sector, since waste to energy plants are active in the state.

Recent Actions in Florida:

Existing statutory prohibitions promote the separate collection of yard waste biomass.

9.2 In-State Liquid/Gaseous Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks and/or municipal solid and other waste (raw materials) to displace the use of fossil fuel. See 1.2 above.

Recent Actions in Florida:

See 1.2 and 6.2 above.

9.3 Advanced Recycling & Composting

Increase recycling and reduce waste generation in order to limit GHG emissions associated with landfill methane generation and with the production of raw materials. Increase recycling programs, create new recycling programs, provide incentives for the recycling of construction materials, develop markets for recycled materials, and increase average participation and recovery rates for all existing recycling programs. This option could also include increasing composting rates, which can result in lower net GHG emissions (note linkage to Option 9.7).

Recent Actions in Florida:

DEP administers a waste reduction program, which includes providing recycling grants to local government, a loan program for recycling businesses, and a recycling business assistance center. Florida law also stipulates that counties must implement a recycling program with a minimum objective of reducing municipal solid waste (MSW) disposal by 30%.

9.4 Promotion of Bioreactor Technology

A bioreactor landfill 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 Florida:

DEP and the UF Hinkley Center for Solid and Hazardous Waste Management are currently funding three demonstration projects in Florida (see www.bioreactor.org).

9.5 Source Reduction Strategies

Reduce the volume of waste from residential, commercial, and government sectors through programs that reduce the generation of wastes. Reduction of generation at the source reduces both landfill emissions and upstream production emissions.

Recent Actions in Florida:

The Pollution Prevention Program and the waste reduction section are involved with the implementation of waste reduction strategies throughout the state.

9.6 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.

9.7 Enhanced Management of Organic Waste

Reduces methane emissions associated with landfilling by reducing the biodegradable fraction of waste emplaced. Recently, an area of focus in the solid waste industry has been in increasing recycling of organic wastes (e.g., lawn and garden waste, food waste, wood, paper, and bio-based plastics) using different conversion technologies, including composting, anaerobic digestion, or hybrids of these technologies.

9.8 Improved Commercialization of Biomass Conversion Technologies

Improve the rate of technology development and market deployment of biomass conversion technologies including BGCC, pyrolysis, and plasma arc technologies. These technologies expand the application of renewable fuels derived from biomass. A range of renewable products can be developed from these processes, including gaseous and liquid fuels, biochar, chemical products, and methane 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.

AFW-10. WASTE MANAGEMENT—LANDFILL GAS STRATEGIES

10.1 Utilize or Flare Landfill Methane at Non-NSPS (smaller) sites

Encourage smaller landfills that do not fall under environmental protection regulations to capture and utilize or 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. Note overlap with 10.3 below.

Recent Actions in Florida:

DEP is able to regulate this activity through permitting.

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 Florida:

Promoted by the Hinkley Center for Solid and Hazardous Waste Management at the University of Florida.

10.3 Landfill Methane Energy Programs

Use the renewable energy created at landfills by anaerobic digesters (methane) to make electric power, space heat, or liquefied natural gas.

Recent Actions in Florida:

Florida is a partner in the U.S. Environmental Protection Agency's (EPA's) Landfill Methane Outreach Program

AFW-11. WASTE MANAGEMENT—WASTEWATER MANAGEMENT ACTIVITIES

11.1 Wastewater Treatment Plant (WWTP) Biosolids for Energy Production

Develop and implement methods for biosolids processing and use as a renewable energy source. For example, as a renewable fuel to be co-fired with other fuels in existing or new combustion units for the purpose of generating electricity, heat or steam. Note also that WWTP biosolids could be applied to agricultural soils (e.g. under Option 3.2)

11.2 Energy Efficiency Improvements at WWTPs and/or Potable Water Plants

Provide incentives for efficiency improvements. Encourage the setup 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).

The term "efficiency improvements" is defined, within the scope of wastewater management activities, as

- Conversion of secondary aeration processes to fine bubble diffusion and optimization of oxygen transfer efficiencies;
- Research and development of diffuser cleaning protocols;
- Research and development to increase removal of chemical oxygen demand (COD) in primary treatment tanks and clarifiers;
- Evaluation of steam usage in plant processes and biofilters, optimization of use, and promotion of alternatives; and
- Research and development of options to optimize denitrification in secondary treatment.

Financial and performance analyses that may be conducted to assist the implementation of this option include

- Creation of a leveraged state revolving loan fund program to capitalize energy efficiency in municipal wastewater treatment plants.
- Conduct benchmarking of energy use per million gallons treated in Florida to showcase good and deficient energy performance in this specific climate.

May also include researching ways to use wastewater biomass as an energy source rather than just as a soil carbon source.

11.3 Lower Waste Processing Needs

Develop and implement best practices for lowering water consumption and lowering waste production in the industrial, commercial, and residential sectors. Encourage and create incentives for research and development on methods or technologies to reduce 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 both at the WWTP as well as the potable water plant.

Recent Actions in Florida:

DEP (Pollution Prevention Program) and DEP wastewater programs.

11.4 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. Provide incentives to recover heat

from wastewater influent or effluent through the use of heat pumps. Investigate opportunities for waste heat recovery from biogas combustion units (turbines, engines, flares).

11.5 Algae and Bio-Oils

Provide financial incentives to research the production of bio-oils from algae or other microorganisms grown in wastewater effluents (which would reduce carbon, nitrogen, and phosphorus). This option could also be addressed under other liquid biofuels options (e.g., 1.2).