Brief Description of Catalog Items

Agriculture, Forestry, and Waste Management Technical Working Group

(Note that this listing is incomplete and will be fleshed out during the TWG process; working group members are encouraged to provide input to the TWG facilitators on existing policies and programs, where relevant. Recently enacted policies and programs in Maryland 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 Use of Biomass Feedstocks for Electricity 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.

Recent Actions in MD: Renewable Portfolio Standard requires that 9.5% of all electricity be from renewable sources by 2022. Biomass, solar and wind are in Tier 1. Renewable Electricity Production credit (need more information).

1.2 In-state Liquid 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 diesel. 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 MD: Renewable Fuels Initiative Act provides incentives for biofuels produced by small grain, soybean and other agricultural products. There are caps in place: ethanol - 15mm gallons with 10mm being distilled from small grains; biodiesel – 5mm gals. with 2.0mm from soybeans. Farmers have option of investing in biodiesel plants. The Incentive program ends in 2017. There is a Renewable Fuels Taskforce at the state level.

1.3 Manure Digesters/Other Waste Energy Utilization

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

Recent Actions in MD: Clean Energy Incentive Act includes incentives for methane use in heat and electricity production.

AFW-2 AGRICULTURE – Livestock

2.1.1. Manure Management: Manure Utilization

2.1.2. Manure Management: Manure/Methane Capture

2.1.1. Implement manure management practices that reduce GHG emissions associated with manure handling and storage. Potential practices include but are not limited to manure composting (to reduce methane emissions) and improved methods for application to fields (for reduced nitrous oxide emissions). Application improvements include incorporation into soil, instead of surface spray/spreading.

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

Recent Actions in MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production.

2.2 Changes in Animal Feed

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

Recent Actions in MD:

2.3 Rotational Grazing/Improve Grazing Crops and/or Management

Heavy grazing can cause significant soil disturbance and result in carbon losses from soils. Rotational grazing where animals are moved from field-to-field on a regular basis reduces soil disturbance and maintains soil carbon levels. Rotational grazing also can improve plant vigor and enhances soil carbon levels.

Recent Actions in MD:

2.4 Utilize Biofilters to Control CAFO Emissions

The utilization of collection and control equipment such as biofilters at confined animal feeding operations (CAFOs) can reduce methane emissions.

Recent Actions in MD:

2.5 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 versus anaerobically.

Recent Actions in MD:

AFW-3 AGRICULTURE – CROP PRODUCTION

3.1 Soil Carbon Management

The amount of carbon stored in the soil can be increased by the adoption of practices such as conservation and no till cultivation. Reducing summer fallow and increasing winter cover crops are complimentary practices that reduce the need for conventional tillage. In addition, the

application of biochar (i.e., charcoal) may also increase soil carbon content and stabilize soil carbon. By reducing mechanical soil disturbance, these practices reduce the oxidation of soil carbon compounds and allow more stable aggregates to form. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

Recent Actions in MD:

3.2 Nutrient Management

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of management practices. Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N_2O. Better nutrient utilization can lead to lower nitrous oxide emissions from run-off.

Recent Actions in MD:

3.3 Technology Improvements to Increase Efficiency

New technologies and cultivation methods have the potential to reduce GHG emissions when fossil fuel or electricity consumption can be reduced. Auto-steer guidance systems are an example. Also, auto swath technology, using 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. This can be used for planting, fertilizing, etc. On odd shaped fields it can be a 3-5% savings: http://www.agleader.com/products.php?Product=directcommand_l.

Variable rate fertilizing and liming is also becoming more popular among Maryland farmers. The farmer has a local Co-op grid sample the field and then variable rate applies the fertilizer or lime as need in the areas of the field that need it. The areas of the field that do not need the fertilizer or lime have none applied on them. This can be as much as 50 to 60% reduction in the amount of lime or fertilizer needed.
http://www.agleader.com/products.php?Product=directcommand_g.

Green Seeker NDVI technology. A farmer applies 50 to 70% of his nitrogen at planting and then in season uses the Green Seeker to apply what the corn or wheat plant needs when it is growing. A more efficient way of applying nitrogen and will result in less nitrogen being over applied. This is a new technology that is still in its early testing stages, but looks to be promising. http://www.ntechindustries.com/greenseeker-RT200.html.

Note that this option has a similar counterpart in Option 5.1.

Recent Actions in MD:

3.4 Water Management

Improve the efficiency of water use through implementation of best management practices. Excess water can lead to run-off of nitrogen 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 MD:

3.5 Drainage Management

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

Recent Actions in MD:

AFW-4 AGRICULTURE-LAND USE CHANGE

4.1 Land Use Management that Promotes Grassland Cover

Convert marginal agricultural land used for annual crops to permanent cover such as grassland/rangeland, orchard, or forest, where the soil carbon and/or carbon in biomass is higher under the new land use. Includes opportunities to keep CRP lands covered in perpetuity. Increased demand for corn-based ethanol and biodiesel feedstocks can act as an incentive for converting grassland to cropland. Adopt mechanisms to prevent theses acres from either returning to conventionally tilled production or to suburban/urban development.

Recent Actions in MD: Discussions surrounding whether and how these perennial cover crops may be harvested for biomass feedstocks is taking place at the state level.

4.2 Preserve Open Space/Agricultural Land

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

Recent Actions in MD:

AFW-5 AGRICULTURE-FARMING PRACTICES

5.1 Reductions in On-Farm Energy Use

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

Recent Actions in MD: The Clean Energy Incentive Act may provide incentives for installing renewable energy systems. One of many of Maryland Transportation Initiatives encourages diesel retrofits. (More research is necessary to find specific language that would directly relate to this policy option.) Maryland Farm Energy Audit Program can assist in assessing energy use and efficiency on farms.

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, some organic farming practices could achieve reduced GHG emissions compared to conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemical inputs).

Recent Actions in MD:

5.3 Programs to Support Local Farming/Buy Local

Promote the production and consumption of locally produced agricultural goods, which displace the consumption of those transported from other states or countries. GHG reductions occur from reduced transportation-related emissions.

Recent Actions in MD:

AFW-6 FORESTRY – PRODUCTION OF FUELS AND ELECTRICITY IN FORESTRY

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

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

Recent Actions in MD:

6.2 In-State Liquid Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks (raw materials) to displace the use of fossil diesel. 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 MD: The Renewable Fuels Incentive Act prescribes incentives for the use of biomass to produce ethanol and biodiesel. Currently forestry biomass has a 5 cents per ton incentive while small grains has a 20 cents per ton pay back.

6.3 Improved Energy Capture from Wood Waste Combustion

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

Recent Actions in MD:

6.4 Improved Commercialization of Biomass Gasification and Combined Cycle

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

Recent Actions in MD:

AFW-7 FORESTRY – BIOMASS PROTECTION AND MANAGEMENT

7.1 Forest Protection – Reduced Clearing and Conversion to Nonforest Cover

Reduce the rate at which existing forest 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.

Recent Actions in MD:

7.2 Urban Forestry

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

Recent Actions in MD:

7.3 Afforestation/Reforestation

Establish forests on land that has not historically been forested (e.g., agricultural land) ("afforestation"). Promote forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover ("reforestation"). In addition, implement practices such as soil preparation, erosion control, and stand stocking to ensure conditions that support forest growth.

Recent Actions in MD:

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, expand short rotation woody crops (for fiber and energy), expanded use of genetically preferred species, modified biomass removal practices, fire management and risk reduction, pest and disease management.

Recent Actions in MD:

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.

Recent Actions in MD:

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 MD:

AFW-8 FORESTRY – WOOD PRODUCTS AND WASTE

8.1 Improved Mill Waste Recovery – Utilization of Sawmill Residues & Emissions

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

Recent Actions in MD:

8.2 Improved Logging Residue Recovery

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

Recent Actions in MD:

8.3 Expanded Use of Wood Products for Building Materials

Increase the amount of renewable wood products used for residential and commercial building. The use of 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 due to lower transport-associated emissions.

Recent Actions in MD:

AFW-9 WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES

9.1 Advanced Recycling

Increase recycling and reduce waste generation in order to limit greenhouse gas emissions associated with landfill methane generation and with the production of raw materials. Increase recycling programs, create new recycling programs, provide incentives for the recycling of construction materials, develop markets for recycled materials, and increase average participation/recovery rates for all existing recycling programs.

Recent Actions in MD:

9.2 Promotion of Bioreactor Technology

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

Recent Actions in MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production.

9.3 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 as well as upstream production emissions.

Recent Actions in MD:

9.4 Resource Management Contracting

Unlike traditional solid waste service contracts, resource management (RM) compensates waste contractors based on performance in achieving an organization's waste reduction goals rather than the volume of waste disposed. As a result, RM aligns waste contractor incentives with the

goals to explore innovative approaches that foster cost-effective resource efficiency through prevention, recycling, and recovery.

Recent Actions in MD:

9.5 Waste Coal Recapture

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

Recent Actions in MD:

9.6 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 increase recycling of organic wastes (lawn & garden waste, food waste, wood, paper, etc.) using different conversion technologies, including composting, anaerobic digestion, or hybrids of these technologies.

Recent Actions in MD:

9.7 Promotion of New & Existing Technologies for Waste Energy Conversion

New processes include biomass gasification and pyrolysis. A range of renewable products can be developed from these processes, including gaseous and liquid fuels, biochar, and chemical products. Existing processes include waste combustion and energy recovery (as electricity, steam or both).

Recent Actions in MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production.

AFW-10 WASTE MANAGEMENT – LANDFILL GAS STRATEGIES

10.1 Flare Landfill Methane at non-NSPS (smaller) sites

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

Recent Actions in MD:

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 MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production that may apply here, but there is concern from small potential producers that digester costs are not adequately off set by current incentives.

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 MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production that may apply here.

AFW-11 WASTE MANAGEMENT – WASTEWATER MANAGEMENT ACTIVITIES

11.1 Energy Efficiency Improvements

Provide incentives for efficiency improvements. Encourage the set up 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.
- Evaluate steam usage in plant processes and biofilters. Optimize use and find alternatives.
- 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 WWTPs.
- Establish a "fair cost of service" pricing tariff for transmission and distribution of remotely sited wind power.
- Facilitate optimization of energy management by requiring all utility meter data to be available without extra charge on a monthly basis.
- Provide incentives to install interval meters to get whole load profile and make data available online an din real-time.
- Conduct benchmarking of energy use per million gallons treated in Maryland to showcase good and deficient energy performance in this specific climate.

Recent Actions in MD: Maryland is a member of the Regional Greenhouse Gas Initiative (RGGI – called Reggie), a consortium of 9 northeastern and mid-Atlantic states committed to reducing greenhouse gases through a cap and trade program for electricity producers. Reducing demand has specific emphasis in Maryland, thus energy efficiency and conservation play a strong role.

11.2 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/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.

Recent Actions in MD:

11.3 Install Digesters and Turbines or Engines

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

Recent Actions in MD: The Clean Energy Incentive Act includes incentives for methane use in heat and electricity production.

11.4 Restoration of Soil Organic Carbon from Application of WWTP Biosolids

Evaluate the restoration and sequestration of carbon in soil through land application of biosolids. Research and develop a mechanism to remove algae from WWTP ponds and apply solids to restore/sequester soil carbon.

Recent Actions in MD:

11.5 Heat Recovery

Provide incentives to recover heat from wastewater influent or effluent through the use of heat pumps.

Recent Actions in MD:

11.6 Algae and Bio-Oils

Provide financial incentive to research the production of bio-oils from algae grown in wastewater effluents (would reduce carbon, nitrogen and phosphorus).

Recent Actions in MD: