Brief Description of Catalog of State Actions Agriculture, Forestry, and Waste Management (AFW) Technical Work Group (TWG)

AFW-1 AGRICULTURE—PRODUCTION OF FUELS AND ELECTRICITY

1.1 Expanded Use of Biomass Feedstocks for Electricity or Steam Production

Arkansas could 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 AR:

1.2 In-State Liquid Biofuels Production

Increased production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks and/or municipal solid and other waste (raw materials) could displace the use of fossil diesel. Arkansas could also promote the development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels to improve the embedded energy content of ethanol. Increased in-state production and consumption gives the highest benefits.

Recent Actions in AR:

Biodiesel Suppliers and Producers

Act 87 (26-52-401)—The act provides a tax credit for biodiesel suppliers in Arkansas, and incentives in the form of grants for biodiesel producers in the state.

Alternative Fuels Development Program

Act 873 —The act creates the Arkansas Alternative Fuels Development Program, to be administered by the Arkansas Agriculture Department with the purpose of providing grant incentives for alternative-fuel producers and distributors and feedstock processors. The act also creates the Arkansas Alternative Fuels Development Fund and repeals obsolete sections of the Arkansas Code related to alternative fuels.

1.3 Manure Digesters/Other Waste Energy Utilization

Installing manure digesters on livestock operations can reduce the amount of methane emissions from livestock manure. 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 AR:

1.4 Encourage Cogeneration at Ag-Biomass Energy Sites

This strategy encourages the capture of waste heat at facilities using biomass (or fossil fuels), wherever possible. The waste heat could be used for cogeneration of electricity or other purposes that displace fossil fuel use.

Recent Actions in AR:

AFW-2 AGRICULTURE—LIVESTOCK

2.1 Manure Management

2.1. Potential manure management practices that reduce GHG emissions associated with manure handling and storage include (but are not limited to) manure composting (to reduce methane emissions), movement of manure from nutrient-rich to nutrient-deficient areas, and improved methods for application to fields (for reduced nitrous oxide [N_2O] emissions). Application improvements include incorporating manure into soil instead of surface spraying/spreading. Also, implementing digester and energy recovery projects at confined animal operations reduces methane emissions and uses the energy to displace fossil fuels. To date, most of these projects have been implemented at dairies and swine operations.

Recent Actions in AR:

Poultry Litter

Act 1061 (HB 1654)—The act declares various areas of the state to be nutrient surplus areas for phosphorus and nitrogen, authorizes the Arkansas Soil and Water Conservation Commission to make rules concerning management of nutrients in nutrient surplus areas, and creates penalties for violations of the act.

Poultry Feeding—Management Plans

Act 2294 (SB 1160)—This act requires that, after January 1, 2007, poultry litter be applied to soils or associated crops within a nutrient surplus area in accordance with a nutrient-management plan or poultry-litter management plan.

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. Optimizing nitrogen (protein) utilization in the feed can reduce nitrogen levels in the manure, which in turn reduces the potential for N_2O emissions.

Recent Actions in AR:

2.3 Rotational Grazing/Improve Grazing Crops and/or Management

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

Recent Actions in AR:

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 AR:

2.5 Increase Pasturing and Lower Densities

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

Recent Actions in AR:

AFW-3 AGRICULTURE—CROP PRODUCTION

3.1 Soil Carbon Management

Adopting such practices as conservation and no-till cultivation can increase the amount of carbon stored in the soil. 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 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, noting that different soil carbon policies may be required for different parts of Arkansas. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

Recent Actions in AR:

3.2 Nutrient Management

Nutrient management practices improve the efficiency of fertilizer use and other nitrogen-based soil amendments. Excess nitrogen not metabolized by plants can leach into surface water and groundwater and/or be emitted to the atmosphere as N_2O. Better nutrient utilization can also lower N_2O emissions from runoff.

Recent Actions in AR:

Nutrient Management Certification Program

Act 1059 (HB 1652)—The act creates a nutrient management education, training, and certification program within the Arkansas Soil and Water Conservation Commission, defines "nutrient surplus area," and makes the program mandatory inside nutrient surplus areas and voluntary outside nutrient surplus areas.

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, as well as auto swath technology, which uses a global positioning system 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 technology can be used for planting, fertilizing, etc. On odd-shaped fields, it can produce a 3%–5% savings. http://www.agleader.com/products.php?Product=directcommand_l.

Variable-rate fertilizing and liming is also becoming more popular among farmers. The farmer has a local co-op grid sample the field and then, using a variable rate, applies the appropriate amount of fertilizer or lime 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, which can reduce as much as 50%–60% in the amount of lime or fertilizer needed. http://www.agleader.com/products.php?Product=directcommand_g.

Farmers using Green Seeker normalized differential vegetative index technology apply 50%–70% of their nitrogen at planting and then, in season, use the Green Seeker to apply what the corn or wheat plant needs when it is growing. This efficient method of applying nitrogen avoids the overapplication of fertilizer. This new technology is still in its early stages, but it looks promising. http://www.ntechindustries.com/greenseeker-RT200.html.

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

Recent Actions in AR:

3.4 Water Management

Water Management has two main components: Drainage and Irrigation. The use of surface versus ground water is an issue along with captured water. Excess water can lead to runoff of nitrogen, with subsequent emission to the atmosphere as N_2O. Implementing best management practices improves the efficiency of water use. Managing and improving water consumption and nutrients spread on crops will result in a minimal loss of carbon from the soil. Reduced water consumption can also reduce energy use for water pumping. The reuse of water also becomes a nutrient management issue and must be considered when implemented. Water purification is an energy intensive process that is an issue for farmers and land users in addition to other sectors such as the residential, commercial and industrial sectors (this is related to options under RCI

TWG as well as AFW-3 and AFW-11). As such water use in rural, suburban and urban areas must all be included. The impact of cat fish farms on GHG emissions could also be investigated.

Recent Actions in AR:

3.5 Drainage Management

Improving drainage on agricultural lands prevents ponding, which can lead to anaerobic soils and methane emissions.

Recent Actions in AR:

3.6 Promote Use of Surface Water Over Ground Water

Encourage land users to use surface water rather than ground water. Benefits include many ancillary benefits along with reduced pumping energy consumption.

Recent Actions in AR:

AR has invested significant funding and technical support (in addition to local and federal funding) towards using surface water as opposed to ground water. Three projects currently under way are:

a. Bayou Meto Water Management District
b. Boeuff Tensas Water Management District
c. White River Irrigation District

Each of the above projects is in various stages of development in their goals to utilize surface water instead of groundwater for irrigation purposes.

AFW-4 AGRICULTURE—LAND-USE CHANGE

4.1 Land-Use Management That Promotes Permanent Cover

Marginal agricultural land used for annual crops can be convert 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. This strategy includes opportunities to keep Conservation Reserve Program lands covered in perpetuity.

Increased demand for corn-based ethanol and biodiesel feedstocks can act as an incentive for converting grassland to cropland. The state could adopt mechanisms to prevent theses acres from either returning to conventionally tilled production or to suburban/urban development.

Recent Actions in AR:

Farm Bill may become relevant. Opportunities may exist under the farm land bill for Arkansas to become more competitive at obtaining discretionary grants.

4.2 Preserve Open Space/Agricultural Land

This strategy reduces the rate at which agricultural lands are converted to developed uses, while protecting private property rights and responsibilities. In doing so, it 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 AR:

Farm Bill may become relevant. Opportunities may exist under the farm land bill for Arkansas to become more competitive at obtaining discretionary grants.

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 liquefied natural gas/compressed natural gas or hybrid technology will reduce carbon dioxide (CO_2) emissions by displacing the use of fossil-based fuels.

Recent Actions in AR:

5.2 Promotion of Farming Practices That Achieve GHG Benefits

The state could provide incentives to farmers for using production processes that achieve net GHG benefits. For example, some organic farming practices could reduce GHG emissions compared with conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemicals).

Recent Actions in AR:

5.3 Programs To Support Local Farming/Buy Local

The production and consumption of locally produced agricultural goods displace the consumption of goods transported from other states or countries, and thus reduce transportation-related GHG emissions.

Recent Actions in AR:

5.4 Technical Assistance and Education

Provide technical assistance and education to landowners to improve land management practices and techniques. This could be achieved through better utilization of Arkansas extension groups (e.g. University of AR).

Recent Actions in AR:

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

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

Increasing the amount of biomass available from forests for generating electricity can displace the use of fossil energy sources.

Recent Actions in AR:

Electric Public Utility Renewable Energy Resources

Act 755 (HB 2812)—The act authorizes the Arkansas Public Service Commission to require a regulated electric public utility to consider renewable energy resources as part of its resource plan. If the commission approves the renewable energy resource, it may allow the utility to implement a surcharge to recover a portion of the cost of that resource.

6.2 In-State Liquid Biofuels Production

This strategy increases production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks (raw materials) to displace the use of fossil diesel. It promotes 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 AR:

Alternative Fuels Development Program

Act 873 (HB 1379)—The act creates the Arkansas Alternative Fuels Development Program, to be administered by the Arkansas Agriculture Department, with the purpose of providing grant incentives for alternative fuels producers, feedstock processors, and alternative fuels distributors. The act also creates the Arkansas Alternative Fuels Development Fund and repeals obsolete sections of the Arkansas Code related to alternative fuels.

6.3 Improved Energy Capture Within the Forestry Products Industry

This strategy reduces emissions and increases heat efficiency from heat sources, such as wood-burning stoves and furnaces.

Recent Actions in AR:

6.4 Improved Commercialization of Biomass Gasification and Combined Cycle

Improving the rate of technology development and market deployment of biomass gasification and combined-cycle technologies will expand the application of renewable fuels derived from biomass.

Recent Actions in AR:

6.5 Encourage the Use of Energy Crops as a Feedstock for Energy Production

Increase the availability of short rotation woody energy crops for generating electricity to displace the use of fossil energy sources. (Linked to AFW-6.1 and AFW-7.4)

Recent Actions in AR:

AFW-7 FORESTRY—BIOMASS PROTECTION AND MANAGEMENT

7.1 Forest Protection—Reduced Clearing and Conversion to Nonforest Cover

Much of the carbon stored in forest biomass and soils can be lost as a result of clearing and converting forests (including wetland forests and bottom land forests) for developed uses. This strategy reduces the rate of such conversion.

Recent Actions in AR:

7.2 Urban Forestry

Maintaining and improving the health and longevity of trees in urban and residential areas protects and enhances the carbon stored in tree biomass. Indirect emission reductions may also occur by reducing heating and cooling needs as a result of planting shade trees.

Recent Actions in AR:

7.3 Afforestation/Reforestation

This strategy establishes forests on land that has not historically been forested, such as agricultural land ("afforestation"); promotes forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover ("reforestation" or "restoration"); and implements such practices as site preparation, erosion control, and stand stocking to ensure conditions that support forest growth.

Recent Actions in AR:

7.4 Forest Management for Carbon Sequestration

Forest management activities promote forest productivity and increase the rate of CO_2 sequestration in forest biomass and soils and in harvested wood products. Additionally, specific trees could be selected that sequester other non-GHG chemicals in addition sequestering CO2. Practices may include increased stocking of poorly stocked lands, age extension of managed

stands, thinning and density management, fertilization and waste recycling, expanded short rotation of 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.

Recent Actions in AR:

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

Programs that reduce the potential for and severity of Forest Fire 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 affected by Forest Fire.

Recent Actions in AR:

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 potential of healthy forests.

Recent Actions in AR:

AFW-8 FORESTRY—WOOD PRODUCTS AND WASTE

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

This strategy improves the 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; and promotes opportunities for using mill CO_2 emissions to create chemical products, such as carbonates.

Recent Actions in AR:

8.2 Improved Logging Residue Recovery

Using more efficient logging methods to fully utilize harvested trees minimizes carbon losses from wood damaged during harvesting, maximizes the potential for carbon sequestration in harvested wood products, and processes the logging remains efficiently.

Recent Actions in AR:

8.3 Expanded Use of Wood Products for Building Materials

Increasing the amount of renewable wood products used for residential and commercial building can increase carbon sequestration in wood products and displace GHG emissions associated with processing high-energy input materials, such as steel, plastic, and concrete. Also, using locally grown wood can lower transport-associated GHG emissions.

Recent Actions in AR:

Energy and Natural Resource Conservation Act: The act encourages the use of wood in green buildings and requires certain state buildings to meet specified environmental construction standards (AR Code 22-3-1801). The Leadership in Energy and Environmental Design (LEED) was reformed in Arkansas to explicitly encourage the use of wood products in green buildings (previously it was eligible but not encouraged). The addition by the Arkansas legislature specifically includes the use of products that promote the sequestration of carbon. This reform was initiated by Arkansas and a number of other states have since followed suit.

AFW-9 WASTE MANAGEMENT—WASTE MANAGEMENT STRATEGIES

9.1 Advanced Recovery and Recycling

Increasing waste recovery and recycling and reducing waste generation limits GHG emissions associated with landfill methane generation and with the production of raw materials. Additional actions include increasing recycling programs, creating new recycling programs, providing incentives for recycling construction materials, developing markets for recycled materials, and increasing average participation/recovery rates for all existing recycling programs.

Recent Actions in AR:

Recycling Goals

Act 94 (HB 1055)—The act adds a new goal to the year 2000 recycling goals for Arkansas, which is to recycle 40% of the municipal solid waste by the end of 2005 and 45% of the municipal solid waste by the end of 2010. The term "municipal solid waste" is defined.

Solid Waste Management and Recycling Fund

Act 1325 (SB 575)—This act provides that grants from the Solid Waste Management and Recycling Fund may be used for the cost of "recycling programs." Previous law permitted grants to be used for "recycling programs and market development."

9.2 Promotion of Bioreactor Technology

A bioreactor landfill is essentially in-landfill composting activity at a Subtitle D (municipal solid waste) sanitary landfill in which liquid, temperature, and air (for aerobic processes) are managed in a controlled manner to rapidly stabilize the food, green waste, and paper waste constituents. To optimize the rapid stabilization of these wastes, moisture, gas composition and 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 AR:

9.3 Source-Reduction Strategies

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 landfill emissions, as well as upstream production emissions.

Recent Actions in AR:

Revolving Loan Program

Act 213 (HB 1255)—The act expands the use of the Revolving Loan Fund administered by the Department of Environmental Quality to include waste-reduction practices and increases the maximum amount of loans available.

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 of. 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 AR:

9.5 Waste Coal Recapture

This strategy promotes research and implementation of recovering waste coal. Waste coal is a usable material that is a by-product of previous coal-processing operations. Emissions are reduced relative to the mining of new coal.

Recent Actions in AR:

9.6 Enhanced Management of Organic Waste

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

Recent Actions in AR:

Statewide Solid Waste Management Plan

Act 1376 (SB 970)—Titled "The Statewide Solid Waste Management Plan Act," this act requires the Arkansas Department of Environmental Quality to develop a statewide solid

waste management plan to establish minimum requirements for all regional solid waste management plans.

9.7 Promotion of New and Existing Technologies for Waste Energy Conversion

New processes for converting waste energy 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 AR:

9.8 No Net Increase in Imported Waste

This option would limit the import of waste from other states, and would require that waste imports be monitored within Arkansas (e.g., via landfilled waste) and that mechanisms be adopted to avoid GHG emissions of imported waste.

Recent Actions in AR:

AFW-10 WASTE MANAGEMENT—LANDFILL GAS STRATEGIES

10.1 Flare Landfill Methane at Non-NSPS (Smaller) Sites

This strategy encourages smaller landfills that do not fall under environmental protection regulations (i.e., new source performance standards [NSPS]) to capture and flare methane gas. Flares are used to safely combust toxic and volatile gases from landfills. They convert methane gas, which has a relatively high global warming potential compared with CO_2.

Recent Actions in AR:

10.2 Methane and Biogas Energy Programs

These 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). They help prevent methane emissions, while producing clean energy. Anaerobic digesters make a twofold contribution to climate protection: they prevent the usual unchecked discharge of methane into the atmosphere, and replace the burning of fossil fuels with renewable energy (biogas).

Recent Actions in AR:

10.3 Landfill Methane Energy Programs

These 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 AR:

AFW-11 WASTE MANAGEMENT—WASTEWATER MANAGEMENT ACTIVITIES

11.1 Energy Efficiency Improvements

This strategy provides incentives for efficiency improvements; encourages the setup of energy policies, energy audits, and energy cost tracking; and identifies and implements 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 (R&D) of diffuser cleaning protocols.
- R&D to increase removal of chemical oxygen demand in primary treatment tanks and clarifiers.
- Evaluation of steam usage in plant processes and biofilters; optimize use and find alternatives.
- R&D of options to optimize denitrification in secondary treatment.

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

- Create a leveraged state revolving-loan fund program to capitalize energy efficiency in municipal wastewater treatment plants (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 a whole-load profile and make data available online and in real time.
- Conduct benchmarking of energy use per million gallons treated in Arkansas to showcase good and deficient energy performance in this specific climate.

Recent Actions in AR:

11.2 Lower Waste Processing Needs

This option would 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 R&D on methods and technologies for reducing water consumption and waste production; and provide education to reduce water consumption and waste production to lower GHG emissions.

Recent Actions in AR:

11.3 Install Digesters and Turbines or Engines

This strategy provides incentives to install anaerobic digesters to treat municipal waste and create methane, and install turbines or reciprocating engines to generate electricity from the methane. Reductions occur via methane control and offsetting fossil-based energy use.

Recent Actions in AR:

11.4 Restoration of Soil Organic Carbon From Application of WWTP Biosolids

This option would evaluate the restoration and sequestration of carbon in soil through land application of biosolids and other byproducts, and support R&D toward a mechanism to remove algae from WWTP ponds and apply solids to restore/sequester soil carbon.

Recent Actions in AR:

11.5 Heat Recovery

This option provides incentives to recover heat from wastewater influent or effluent through the use of heat pumps.

Recent Actions in AR:

11.6 Algae and Bio-Oils

This option provides financial incentives to research the production of bio-oils from algae grown in wastewater effluents, which would reduce carbon, nitrogen, and phosphorus).

Recent Actions in AR:

11.7 Engineering Process Improvements

Promote improvements to the WWTP engineering processes, including incentives or consideration for measuring oxygen in WWT.