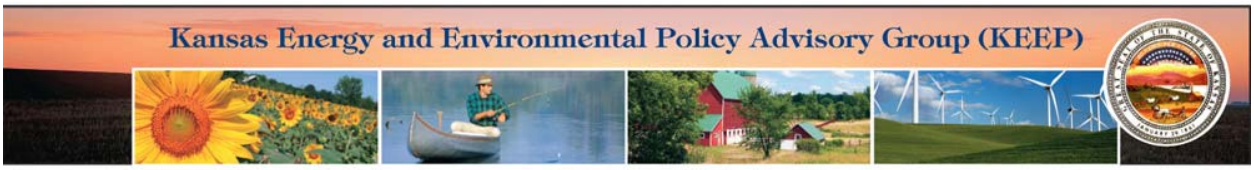

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Agriculture, Forestry, and Waste Management (AFW) Technical Work Group

List of Sub-group Volunteers for Priority Policy Options for Analysis

Revised Option #	Policy Option	Straw Proposal Volunteers
AFW-1	Expanded Utilization of Biomass Feedstocks for Electricity, Heat, or Steam Production	Miles Stotts, Adrian Polansky
AFW-2	In-State Liquid Biofuels Production	**Adrian Polansky**, Charles Rice
AFW-3	Promotion of Agricultural Practices That Achieve GHG Benefits	Adrian Polansky, **Steve Baccus**, Charles Rice
AFW-4	Manure Management and Waste Energy Utilization	Steve Baccus, **Mark Knight**, Bud Ludwig
AFW-5	Forest and Rangeland Carbon Protection and Management	**Charles Rice**, Tracy Streeter?
AFW-6	Methane and Biogas Energy Programs	**Charlie Sedlock**, Bill Upman, Bud Ludwig

Bold type indicates sub-group leader.

Summary List of Pending Priority Policy Options for Analysis

Policy No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2015	2025	Total (2010–2025)			
AFW-1	Expanded Utilization of Biomass Feedstocks for Electricity, Heat, or Steam Production	*Not Yet Quantified*					Pending
AFW-2	In-State Liquid Biofuels Production	*Not Yet Quantified*					Pending
AFW-3	Promotion of Agricultural Practices That Achieve GHG Benefits	*Not Yet Quantified*					Pending
AFW-4	Manure Management and Waste Energy Utilization	*Not Yet Quantified*					Pending
AFW-5	Forest and Rangeland Carbon Protection and Management	*Not Yet Quantified*					Pending
AFW-6	Methane and Biogas Energy Programs	*Not Yet Quantified*					Pending

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

Note: The numbering used to denote the above pending priority policy options is for reference purposes only; it does not reflect prioritization among these important draft policy options.

AFW-1. Expanded Utilization of Biomass Feedstocks for Electricity, Heat, or Steam Production

Policy Description

CCS NOTE: Highlighted items in the Policy Description and Policy Design sections are text submissions from the sub-groups that CCS recommends removing from these sections, inserting this text into the Implementation Mechanisms section during the next step of the process.

This option is intended to increase the amount of biomass available from agriculture (including forestry, row-crop agriculture and rangeland) and the municipal solid waste stream for displacing the use of fossil energy sources and generating heat, steam and/or electricity. Local energy production and utilization yields greatest net energy payoff, as it reduces or eliminates transportation and/or transmission costs.

The biomass should be used in a sustainable, 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 carbon dioxide due to the displacement of fossil fuel while considering life cycle GHG emissions associated with viable collection, hauling, energy conversion, and energy distribution systems.

Improved utilization of biomass from agriculture may be enhanced by increasing production efficiency and/or planting more acres, *and/or* by using excess residue from crop production and improving utilization of food processing residues and by-products.

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. Other types of technology development might include cellulosic ethanol, anaerobic digestion to produce methane, and refuse-derived and wood-fuel pellets.

Increase funding for bioenergy research, including the production of sustainable feedstocks, collection/processing/transport systems, and end use technologies. The Biosciences Authority is a potential source of funding for this type of research.

Policy Design

Goal(s):

• *Agricultural Residues*—Increase the use of agricultural residues for electricity, steam, and heat generation to utilize 5% of available in-state agricultural residue biomass by 2015 and 10% of available biomass by 2025.

• *Energy From Livestock Manure and Poultry Litter*—By 2025, utilize 10% of available energy from livestock manure and poultry litter for renewable electricity, heat, and steam

generation. *Note potential overlap with AFW-1.*
• *Energy Crops*—Increase the production of energy crops to produce biomass feedstock for electricity, steam, and heat generation to 10% by 2025. *Note potential overlap with AFW-2.*
• *Energy From the municipal solid waste stream* - By 2025, increase the utilization of solid waste to produce electricity, heat and steam from municipal solid waste. This could be accomplished using a variety of methods, from combusting MSW as directly as fuel (or supplemental fuel) for generating electricity, steam or heat, or indirectly as means to make fuel, as by pyrolisis or gasification.
• *Cogeneration*—By 2025, ensure that facilities using biomass for electricity, heat, and steam production are capturing and utilizing 10% of waste heat (co-generation).

Timing: As described above.

Parties Involved: Agriculture landowners, rangeland and forest owners and managers, utilities, and energy-using industries. MSW will include waste generators, haulers, processors and landfills, in addition to utilities and energy-consuming industries. Research and technology development include the Kansas Bioscience Authority and Academic Institutions.

Other: Data needs:
Acres/volumes of feedstock crops: corn, switchgrass
Volumes of manure;
Volumes of waste:

- crop residue,
- wood mill waste,
- wood solid wastes, pallets
- mixed combustible MSW

Should goals be expressed in increasing the acres planted for feedstock or on the tons of biomass available for use?

AFW-2. In-State Liquid Biofuels Production

Policy Description

CCS NOTE: Highlighted items in the Policy Description and Policy Design sections are text submissions from the sub-groups that CCS recommends removing from these sections, inserting this text into the Implementation Mechanisms section during the next step of the process.

Kansas ethanol plants currently produce nearly 500 million gallons of ethanol per year, while biodiesel plants produce 1.2 million gallons of biodiesel per year. To reduce our consumption on foreign oil and our emissions of CO2, an increase is needed in production of ethanol and/or biodiesel fuel from agriculture and forestry feedstocks, as well as municipal solid and other waste (raw materials) to displace fossil fuel. The development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels will improve the embedded energy content of ethanol. Increased production and consumption of biofuels in-state will achieve the greatest benefits.

Bioenergy feedstocks and biofuel production processes need to be integrated to serve multiple Greenhouse Gas (GHG)-beneficial objectives. For example, manure from confined animal operations (CAFO's) can be used as a methane energy source to fuel starch-based and cellulosic ethanol production (lowering the embedded GHGs of the ethanol); wet distillers grains from the ethanol production process can be used as feed to livestock (thereby reducing transport and drying related GHG emissions). Other integrated bioenergy production facilities are practical, where multiple agricultural or energy production systems are linked to provide a large net GHG reduction. Biomass is found throughout the United States, not just in the Midwest, and can be used to provide energy in different forms. In Kansas a variety of feedstocks are available at various times of the year to lower deterioration of biomass. The state also has several regions that receive little rainfall, which can help maintain biomass quality.

Improved utilization of biomass from agriculture may be enhanced by increasing production efficiency and/or planting more acres, *and/or* by using excess residue from crop production and improving utilization of food processing residues and by-products. New drought-technology crops will help reduce water needs in the drier regions of Kansas.

Several technologies have been utilized by the ethanol industry to improve efficiency and productivity of the plants thus reducing the carbon footprint and making better use of natural resources. For example, an ethanol production facility is utilizing corn amylase, which has shown to help reduce water and energy needs at a Kansas ethanol plant. By 2011, Abengoa will have a commercial facility to produce ethanol from lignocellulosic biomass. The plant will be located in Hugoton, Kansas, and will provide 110 million gallons of ethanol per year.

Policy Design

Goals: Achieve 12% use of renewable fuels by 2012 and by 30% by 2025.

Timing: As described above.

Parties Involved: Agricultural interests, food processing industries, auto industries, fuel industries, environmental/sustainability interests, relevant state regulatory authorities (KDHE, KDA), and the Departments of Revenue and Commerce.

Other: Growth in the used of biomass fuels needs to be linked to the health of Kansas' agricultural, food processing, and to sustainable agricultural and forest management practices.

AFW-3. Promotion of Agricultural Practices That Achieve GHG Benefits

Policy Description

It has been estimated that 20-40% of targeted emission reductions can be met by agricultural soil carbon sequestration and a reduction in other greenhouse gases. The amount of carbon stored in soil can be increased by the adoption of specific agricultural practices including no-till or strip-till farming, crop rotation, and planting of perennial vegetation. Reducing tillage decreases the loss of soil carbon and promotes formation of stable aggregates that protects soil carbon. Crop rotation and cover crops can increase the amount of plant material added to the soil that forms soil carbon. Increasing soil C through soil C sequestration improves agricultural soil quality, fertility and productivity; reduces soil erosion and nutrient runoff; improves soil water retention and drought resistance; reduces nutrient leaching, and improves surface and groundwater quality; and can help reduce fuel use and inputs. Soil C sequestration thus boosts agricultural productivity while reducing atmospheric GHG concentrations.

In addition to soil C, nitrous oxide emissions can be reduced by improved N management. Improved N management include soil testing to reduce the amount of N fertilizer applied to the crop, improved timing and placement of N fertilizer, and the use of legumes for biological N fixation. Many of these practices increase N efficiency and thus increased profitability to the producer.

Restoration of perennial vegetation on marginal or degraded soils also increases the carbon stored in soils. Permanent vegetation or semi-permanent vegetation like grasses, trees, forbs, shrubs or other perennial crops can still be used for agriculture production but has the secondary benefit of building carbon stocks in the soil. Examples include planting cool and warm season grasses for forage, managed and harvested timber stands, orchards, vineyards or riparian area restoration.

Policy Design

Goal(s): *Conservation tillage*—By 2020, increase the number of acres in conservation tillage to 50% statewide and no-tillage to 25% of the acres

Timing: As stated above.

Parties Involved: Landowners, state and federal agencies, universities, extension service, county conservation districts, commodity and agriculture advocacy organizations, and non-profit agriculture education organizations.

Other: None identified

AFW-4. Manure Management and Waste Energy Utilization

Policy Description

Agriculture is the only way to feed the world. In production Agriculture, there continues to be difficulties even without the supposed Climate scare and a continuous burden placed on all of those associated with food production. With that in mind, the following must be done through financial backing from sources which include all consumers.

Suggest implementation of manure management practices that reduce GHG emissions associated with manure handling and storage.

Such ways would include composting, methane digesters, using additives to chemically reduce odor and methane.

Many practices are already in place and have been done through State and Federal regulations.

Current and future regulations should be designed with the intention to not restrain the current food supply that not only feeds the United States, but the world.

Policy Design

Goal(s): Capture 20% of available methane from confined animal operations by 2020 for use in energy projects whether for private or sold to utilities. The policy recommendation is designed to assist all operations where capturing gasses is a reasonable option to the operation. For example: hog farms, feed yard's, dairies, others.

Timing: By 2015, implement projects to capture 5% of available methane energy at hog farms and dairies. By 2020, implement projects to capture 20% of methane energy.

Parties Involved: None identified

Other: None identified

AFW-5. Forest and Rangeland Carbon Protection and Management

Policy Description

It has been estimated that 20-40% of targeted emission reductions can be met by agricultural soil carbon sequestration and a reduction in other greenhouse gases.

Specific rangeland management practices can also have the net effect of storing additional carbon in the soil. By maintaining good stands of native rangeland and allowing recovery of areas that have poor vegetative cover, greater root mass will develop increasing carbon stocks in soils and sequester that carbon permanently. Some of the principles that are applied to increase carbon are appropriate stocking rates, good distribution of livestock across grazing areas and adequate recovery time for grazed vegetation. Management practices like rotational grazing, variable and multiple water sources, frequent relocation of supplements and drought contingency plans can all enhance the ability of grasses to sequester additional carbon. Optimally grazed lands often have greater soil carbon than on un-grazed or over-grazed lands As for croplands, C storage in grazing lands can be improved by a variety of measures that promote productivity. For instance, alleviating nutrient deficiencies by fertilizer or organic amendments increases plant productivity and, hence, soil C storage Introducing grass species with higher productivity, or C allocation to deeper roots, has been shown to increase soil C.

Policy Design

Goal(s): *Improved range management*—By 2020, increase the number of acres with improved grazing practices by 15% on Kansas grazing lands.

Timing: As stated above.

Parties Involved: Landowners, state and federal agencies, universities, extension service, county conservation districts, commodity and agriculture advocacy organizations, and non-profit agriculture education organizations.

Other: None identified.

AFW-6. Methane and Biogas Energy Programs

Policy Description

The purpose of this proposal is the reduction of GHGs in Kansas related to landfill operations and more specifically landfills without gas collection and control systems (GCCS). Reductions in GHGs occur from landfill gas collection, landfill gas destruction, landfill gas utilization which is to off-set fossil based fuels and the oxidation of methane in cover soil systems. This proposal encourages and promotes controls or waste management options at municipal solid waste landfills such that GHGs from landfills that do not currently utilize a gas collection and control system (GCCS) would be reduced.

Policy Design

Landfills that currently have a GCCS in place, such as new source performance standard (NSPS) landfills, shall continue current LFG collection and control activities. GHG emissions reductions can be achieved by increased grants or incentives to develop projects that utilize landfill gas such as renewable portfolio standards (RPS), carbon offset market mechanisms, renewable electricity credits (RECs), and promotion of new technologies such as LFG oxidizing soil caps. By adopting policies that encourage and incentivise LFG use, Kansas will dramatically decrease GHG emissions through reduced GHG emissions and offset other GHG producers such as coal fired electric plants. **Highlighted text presents implementation mechanisms. TWG should suggest numeric goal (i.e. control 40% of CH_4 emissions by 2025).**

Goal(s): Policy recommendation still needs quantifiable goal.

Timing: Evaluate implementation of the policy by comparing GHG emissions in 2020 to the baseline year.

Parties Involved: Municipal governments, landfill operators, landfill gas to energy project developers.

Other: This policy is intended for sites that would not be expected to trigger the Federal New Source Performance Standards or Emission Guidelines (NSPS/EG) for landfills.