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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	
AFW-2	In-State Liquid Biofuels Production	Adrian Polansky
AFW-3	Promotion of Agricultural Practices That Achieve GHG Benefits	Adrian Polansky, Steve Baccus
AFW-4	Manure Management and Waste Energy Utilization	
AFW-5	Forest and Rangeland Carbon Protection and Management	
AFW-6	Methane and Biogas Energy Programs	Charlie Sedlock

Bold type indicates sub-group leader.

Summary List of Pending Priority Policy Options for Analysis

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

GHG = greenhouse gas; MMtCO₂e = million metric tons of carbon dioxide equivalent; \$/tCO₂e = 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

The “Policy Description” is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text:

Increase the amount of biomass available from agriculture, forestry, and the municipal solid waste stream for generating electricity and displacing the use of fossil energy sources. Local electricity or steam production yields the greatest net energy payoff. 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. 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

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Goals:

- *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.
- *Forest Residues*—Increase the use of forest residues for electricity, steam, and heat generation to utilize 5% of available biomass by 2015, and 10% of available in-state forest residue by 2025.
- *Energy Crops*—Increase the production of energy crops to produce biomass feedstock for electricity, steam, and heat generation by increasing acreage devoted to energy crops to 10% of marginal agricultural land 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.]

- *Capture of Waste Heat*—By 2025, ensure that facilities using biomass for electricity, heat, and steam production are capturing and utilizing 10% of waste heat.

Timing: As described above.

Parties Involved: Agriculture landowners, forest owners and managers, utilities, and energy-using industries.

Other: The area of marginal agricultural land was provided by the Arkansas Natural Resources Conservation Service (NRCS) using a combination of the State Soil Geographic Databases (STASGO) and Gap Analysis Program (GAP)/Land Use Land Cover (LULC) data. Soils of capability Classes¹ III, IV, and V from STASGO were used as the primary criteria for marginal lands. Soil capability Classes VI, VII, and VIII are economically prohibitive, due to steepness of slope, depth to bedrock, or other limitation, so were excluded. The data set was overlaid and clipped using GAP/LULC data to produce marginal lands currently in forest, pasture, and crop. Acreage data for land use were generated through the 1997 National Resources Inventory (NRI). This acreage does not include federal agency managed lands or lands enrolled in federal conservation programs. The results of the above analysis indicate the following acres of marginal land by land use type:

- Agriculture: Crops—1,505,300 acres
- Herbaceous/Pasture/Forage—2,871,700 acres
- Forestland—7,233,000 acres

For the purposes of this analysis it was assumed that crop and pasture land would be potentially suitable for energy crops, resulting in a total of 4,377,000 acres.

¹ Soil capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and how they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible, but unlikely, major reclamation projects. Capability classes are designated by the numbers I through VIII. The numbers indicate progressively greater limitations and narrower choices for practical use. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

AFW-2. In-State Liquid Biofuels Production

Policy Description

The “Policy Description” is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text:

Increase production of ethanol and/or biodiesel fuel from agriculture and forestry feedstocks, as well as 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.

Integrate bioenergy feedstocks and biofuel production processes to serve multiple GHG-beneficial objectives. For example, manure methane energy derived from confined animal operations (CAO’s) can be used as an energy source to fuel a starch-based ethanol production (lowering the embedded GHGs of the ethanol); dried distillers grain from the ethanol production process can be used as feed to the livestock (thereby reducing transport related GHG for feed). Other integrated bioenergy production facilities are conceivable, where multiple agricultural or energy production systems are linked to provide large net GHG reductions.

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Goals: Achieve 10% use of renewable fuels with lower GHG emissions than petroleum-based fuels by 2012 and 25% by 2025.²

Timing: See Goals, above.

Parties Involved: Agricultural interests; forestry interests; food processing industries; primary and secondary forest products industries; auto industries; fuel industries; environmental/sustainability interests; relevant state regulatory authorities (MDEQ, MPSC), and the MDA, MDNR, MDLEG, and the MEDC.

² The goals of 10% by 2012 and 25% by 2025 are both included in the Michigan Renewable Fuels Commission final report. The goal of 25% by 2025 is included in the Midwestern Governors Association Energy Platform.

Other: Growth in the use of biomass fuels needs to be linked to the health of Michigan's agricultural, food processing, and forest products industries, and to sustainable agricultural and forest management practices.

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

Policy Description

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CCS default text:

The amount of carbon stored in the soil can be increased by the adoption of such practices 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. Improvements may also encompass newer machines with better fuel efficiency, larger planters and combines, and genetically modified seed. Provide incentives to farmers for using production processes that achieve net GHG benefits.

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 N₂O. Better nutrient utilization can lead to lower N₂O emissions from runoff.

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 is auto swath technology, which uses global positioning system (GPS)-based technology 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. Variable-rate fertilizing and liming are also becoming more popular among farmers

Improve the efficiency of water use through implementation of Best Management Practices (BMPs) and Generally Accepted Agricultural and Management Practices (GAAMP). Excess water can lead to nitrogen runoff, with subsequent emission to the atmosphere as N₂O. 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 result in lower energy use for water pumping. Encourage closed-loop irrigation systems when siting new construction.

In situations where perennial crop production can supplant annual crop production, gains in soil carbon are possible, which indirectly sequesters CO₂ from the atmosphere. Other net GHG benefits could be gained through lower use of nutrients and water.

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Goals:

- *Conservation tillage*—By 2020, manage 75% of annual cropland with continuous no-till or low-till production practices.
- *Agricultural land conversion*—By 2020, convert 333,000 acres of marginal agricultural land to higher-sequestration permanent cover (including grassland, rangeland, or orchard).
- *Conservation grazing*—By 2020, apply conservation grazing practices, including rotational grazing, to 50% of Iowa grazing lands.

Timing: As stated above.

Parties Involved: Landowners and forest managers.

Other: None identified.

AFW-4. Manure Management and Waste Energy Utilization

Policy Description

The “Policy Description” is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text:

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 improve methods for application to fields (for reduced nitrous oxide [N₂O] emissions). Rotational grazing where animals are moved from field to field on a regular basis reduces soil disturbance and maintains soil carbon levels. Application improvements include incorporation into soil instead of surface spraying or spreading. 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.

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

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Goals: Capture 20% of available methane from confined animal operations by 2020 for use in energy projects. The policy is designed to apply to hog farms and dairies in the state.

Timing: By 2010, 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: NC Farm Bureau, Department of Environment and Natural Resources. (DENR), NC Department of Agriculture and Consumer Services ((NCDA&CS), livestock producers

Other: Due to the levels of emissions and the cost effectiveness estimated for applying this option to livestock operations in NC, this policy is designed to address hog farms primarily and could also cover dairy producers.

AFW-5. Forest and Rangeland Carbon Protection and Management

Policy Description

The “Policy Description” is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text:

State actions for converting 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. Increased demand for corn-based ethanol and biodiesel feedstocks can act as an incentive for converting grassland to cropland. Work at the state level to influence national policy on converting 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.

Encourage forest management activities that promote forest productivity and increase the rate of CO₂ 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.

Reduce the rate at which agricultural lands, forest lands, and rangelands 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. A limiting factor for implementing this option is available state funding. Among the implementation options, brownfields development (developing former industrial areas that could be impacted by soil/groundwater pollution) can lower the pressure to develop other open space and agricultural lands.

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Goals: Achieve “no net loss” of forestland or an increase in forest carbon stocks through local land-use planning, conservation easements, technical and financial assistance to family forest landowners, education, revised tax policy, and other appropriate mechanisms.

Timing: Stabilize current statewide forest cover acres, and achieve no net loss in carbon stocks by 2015. Decrease conversion of forestland to non-forest uses/cover. Increase carbon stocks by 2025 through reforestation and by fully stocking forestlands (see AFW-5).

Parties Involved: None identified.

Other: None identified.

AFW-6. Methane and Biogas Energy Programs

Policy Description

The “Policy Description” is a part of the Straw Proposal. CCS will provide sample text for volunteer sub-groups to work from. This section should provide a **brief** summary of the proposed policy option.

CCS default text:

Use the renewable energy created at landfills by anaerobic digesters (methane) to make electric power, space heat, or liquefied natural gas. 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 twofold 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). Encourage 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, and they convert methane gas, which has a relatively high global warming potential, to CO₂.

A bioreactor landfill is essentially an 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 achieve rapid stabilization of the food, greenwaste, and paper-waste constituents. To optimize the rapid 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.

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Goals: Implement controls or waste management options at municipal solid waste landfills such that 50% of the methane emissions that would be generated under business as usual conditions are avoided by 2020. This can be done through development of additional landfill gas to energy (LFGTE) projects, flaring, reducing the amount of biodegradable waste being landfilled, or possibly other methods.

Timing: By 2012, implement controls or management strategies at 12 sites not currently using these technologies; by 2020, achieve full implementation of the policy (50% coverage of generated methane).

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

Other: This policy is meant to cover sites that would not be expected to trigger the Federal New Source Performance Standards/Emission Guidelines (NSPS/EG) for landfills (and would be required to capture and control methane).