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Brief Description of Catalog Items
Forestry, Agriculture, and Waste Management Technical Work Group

(Note: This listing is incomplete and will be fleshed out during the Technical Work Group process. Technical Work Group members are encouraged to provide input to the Technical Work Group facilitators on existing policies and programs, where relevant. Recently enacted policies and programs in Alaska 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.)

FAW-1. FORESTRY—PRODUCTION OF ENERGY AND MATERIALS

1.1 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 4.1 Agricultural Biomass and 9.1 Waste Biomass.

Recent Actions in AK: Golden Valley Electric Association – Sustainable Natural Alternative Power (SNAP) Program. Provides a per-kWh incentive to small generators (< 25 kW) to generate electricity from renewable sources (including biomass). Program costs include $100 interconnection fee, $10 records fee, and a $3.65 per month meter fee. Amount of incentive depends on total kWh produced by all SNAP participants, but may not exceed $1.50/kWh.

The Renewable Energy Alaska Project is a coalition of urban and rural Alaska utilities, businesses, conservation groups, consumer groups, and Alaska Native organizations interested in developing Alaska's renewable energy resources. (http://www.alaskarenewableenergy.org/about/about_us.html)

1.2 In-State Liquid Biofuels Production

Increase production of ethanol and/or biodiesel fuel from 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. Note: This is related to 4.2 Agricultural Biofuels and 9.2 Waste Biofuels.

1.3 Improved Energy Capture from Wood Waste Combustion

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

1.4 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.

1.5 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.

FAW-2. FORESTRY—BIOMASS PROTECTION AND MANAGEMENT

2.1 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.

2.2 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.

2.3 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.

2.4 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 clearing and conversion of forest cover type to achieve higher sequestration levels, 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.

2.5 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.

2.6 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.

2.7 Silviculture Improvements

Adoption of water conservation, improved harvesting technology such as improved equipment, and other GHG-reducing agricultural practices that can be applied to silviculture. Maximize compliance to programs.

FAW-3. FORESTRY—WOOD PRODUCTS AND WASTE

3.1 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 option links to 1.1 and 1.3.

3.2 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.

3.3 Promotion of In-state Forestry Products

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

FAW-4. AGRICULTURE – PRODUCTION OF ENERGY AND MATERIALS

4.1 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 1.1 Forestry Biomass and 9.1 Waste Biomass.

Recent Actions in AK: Golden Valley Electric Association – Sustainable Natural Alternative Power (SNAP) Program. Provides a per-kWh incentive to small generators (< 25 kW) to generate electricity from renewable sources (including biomass). Program costs include $100 interconnection fee, $10 records fee, and a $3.65 per month meter fee. Amount of incentive depends on total kWh produced by all SNAP participants, but may not exceed $1.50/kWh.

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(http://www.alaskarenewableenergy.org/about/about_us.html)

4.2 In-state Liquid Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agriculture feedstocks 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. Note: This is related to 1.2 Forestry Biofuels and 9.2 Waste Biofuels.

4.3 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.

4.4 Improving Energy Capture from Biomass Heat

Reduce emissions and increase heat efficiency from heat sources such as bio feedstocks. Continue to advance the biomass heating industry.

4.5 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.

4.6 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.

FAW-5. AGRICULTURE—LIVESTOCK

5.1.1 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.

5.1.2 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.)

5.1.3 Manure Management—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.

5.1.4 Manure Management—Utilize Biofilters to Control CAFO Emissions

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

5.1.5 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.

5.2 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.

5.3 Technology Improvements to Increase Water Conservation

Encourage closed loop systems when siting new construction.

FAW-6. AGRICULTURE—CROP PRODUCTION

6.1 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.

6.2 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.

6.3 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 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 counterpart in Option 8.1.

6.4 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.

6.5 Drainage Management

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

FAW-7. AGRICULTURE—LAND-USE CHANGE

7.1 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.

7.2 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.

FAW-8. AGRICULTURE—FARMING PRACTICES

8.1 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.

8.2 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). Improve the energy efficiency and production volumes for greenhouse agricultural production in Alaska.

8.3 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.

8.4 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.

FAW-9. WASTE MANAGEMENT—WASTE MANAGEMENT STRATEGIES

9.1 Expanded Use of Municipal Solid Waste (MSW) 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 Forestry Biomass and 4.1 Agricultural Biomass.

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The Fairbanks North Star Borough (FNSB) is soliciting proposals for optimizing the Municipal Solid Waste (MSW) stream. The FNSB is seeking a long-term partnership to implement a method for economical disposal of the community's municipal solid waste while returning energy savings to the Borough; with a particular emphasis on waste reduction, recycling and waste to energy options.

9.2 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 fuel. See 1.2 above. This is related to 1.2 Forestry Biofuels and 4.2 Agricultural Biofuels.

9.3 Advanced Waste Reduction and Recycling

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.

Recent Actions in AK: The four largest communities in Alaska are embarking on new recycling programs. In Anchorage, the Municipality has dedicated a fund for recycling and is planning to build on private efforts by expansion of drop-off sites, school district recycling and public outreach. The Municipal collection utility, which serves approximately 20% of Anchorage residences, has implemented a Pay As You Throw (PAYT) and curbside recycling program beginning in October 2008. The residential waste hauler, Alaska Waste, is offering curbside recycling service to a third of Anchorage and Eagle River residences.

The Fairbanks North Star Borough (FNSB) is soliciting proposals for optimizing the Municipal Solid Waste (MSW) stream. The FNSB is seeking a long-term partnership to implement a method for economical disposal of the community's municipal solid waste while returning energy savings to the Borough; with a particular emphasis on waste reduction, recycling and waste to energy options.

The City and Borough of Juneau has just completed an evaluation by a consultant for a long range solid waste management strategy and analysis. Alaska's capital city is targeting the implementation of a curbside recycling program in 2009.

In the Matanuska-Susitna Valley, Valley Community for Recycling Solutions is securing funds and moving forward for the construction and operation of a Community Recycling Center. The site is located adjacent to the Matanuska-Susitna Borough's Central Landfill.

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 AK: In 2007 the Anchorage Regional Landfill completed a system for re-introducing leachate into an active cell. This structure gives the Municipality a tool for managing landfill gas production.

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. Reduce the use of plastic shopping and refuse bags.

Recent Actions in AK: The Municipality of Anchorage refuse collection utility has implemented a Pay As You Throw (PAYT) and curbside recycling program beginning in October 2008. The PAYT system promotes waste reduction through lower rates for smaller refuse containers. The utility is discontinuing flat-rate refuse collection service.

Alaskans for Litter Prevention and Recycling (ALPAR) has an in-store plastic bag recycling, reuse and conservation toolkit available on their website www.alparalaska.com.

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.

Recent Actions in AK: The Fairbanks North Star Borough (FNSB) is soliciting proposals for optimizing the Municipal Solid Waste (MSW) stream. The FNSB is seeking a long-term partnership to implement a method for economical disposal of the community's municipal solid waste while returning energy savings to the Borough; with a particular emphasis on waste reduction, recycling and waste to energy options.

9.9 Decrease Emissions from Waste Collections

In addition to vehicle and alternative fuel being addressed by the Transportation and Land Use Technical Working Group, waste collectors can decrease emissions with existing equipment. Driver training for fuel saving techniques, reducing idling, optimizing routes and utilizing transfer stations are all strategies for decreasing emissions.

9.10 Management strategies for Class III landfills

Develop GHG mitigation strategies at landfills serving small communities.

FAW-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.

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., seafood industry and 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).

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.

10.4 Mixed MSW Composting

Composting of a combined MSW waste stream can rapidly decompose the organic fraction of the waste stream and reduce the production of methane and other anaerobic byproducts. The process does produce CO_2.

Recent Actions in AK: In Haines, Haines Sanitation has constructed an in-vessel composting system which reduces provides rapid aerobic decomposition of the organic portion of the waste stream.

FAW-11. WASTE MANAGEMENT—WASTEWATER MANAGEMENT ACTIVITIES

11.1 Wastewater Treatment Plant 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.

11.2 Energy Efficiency Improvements

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 (WWTPs).
- Conduct benchmarking of energy use per million gallons treated in Alaska 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.

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 incentive to research the production of bio-oils from algae, seafood industry residues, or other microorganisms grown in wastewater effluents (which would reduce carbon, nitrogen, and phosphorus). This option would likely be developed under 4.2.

11.6 Utilization of Biosolids as a Fertilizer Substitute

Promote the use of residual biosolids from wastewater treatment plants on farms in order to replace fossil-derived fertilizers.