

Fact Sheet: Sequestering Greenhouse Gases from Landfills, Animal Waste, Sewage, and Other Sources Via Biomethane Production

Introduction/Summary

- Biogas is a mixture of methane and other gases produced from the decomposition of organic materials. It is produced naturally in landfills, and from the processing of animal waste, sewage, crop waste, and cellulosic and non-cellulosic crops.
- Biomethane is a pipeline-quality natural gas-substitute produced by purifying biogas.
- Landfills, animal waste “lagoons,” and sewage processing plants are major sources of biogas, a major component of which is methane.
- Methane is a significant greenhouse gas -- estimated to be 21 times as intense a greenhouse gas as carbon dioxide.
- This biogas can be captured and “flared,” which reduces the methane to carbon dioxide. But, in doing so, its energy value is wasted.
- An energy-wise and greenhouse gas-wise alternative is to capture the biogas from these renewable waste sources, convert that biogas to biomethane, and use the biomethane to displace petroleum or other fossil fuels in transportation or other energy applications.
- A 1998 U.S. Department of Energy study¹ concluded that a feasible biomethane potential from these sources would be 10 billion gasoline-gallon-equivalent per year.
- If all this biomethane were used in vehicles, it is estimated that this would reduce greenhouse gases by **500 million metric tons of CO₂ per year** – or removing the emissions equivalent to **90 million light-duty gasoline vehicles off the road**.
- This is a form of methane sequestration, with energy savings as a bonus.

Opportunities

- The study cited above concluded that, in the U.S., it is feasible to capture and use over a third of the biogas potential from landfills, animal waste and sewage or about 1.25 quadrillion Btu.
 - This is equivalent to 6 percent of all the natural gas used in the U.S.
 - If all of this were used in transportation, it would displace 10 *billion* gasoline-gallon-equivalent per year.
- The study estimated that, if all of the feasible U.S. biogas production were used as transportation fuel in place of petroleum, greenhouse gas production would be reduced by the equivalent of 580 million tons of CO₂ *per year*.
- Producing biomethane from cellulosic and non-cellulosic crops would increase the production potential substantially.

¹ Biogas For Transportation Use: A 1998 Perspective,” July 9, 1998, QSS Group Inc.

Sources: Landfills, Animal Waste, Sewage, and Biomass

- Landfills generate a substantial amount of biogas through anaerobic (oxygen-free) degradation of waste.
- According to the U.S. EPA, there were 380 landfill gas electrification projects in place at the end of 2006.
- EPA estimates that there are 600-700 additional landfill gas-to-energy projects that could be constructed nationwide.
- Biomethane is now being produced at the Bowerman Landfill in Irvine, California to help run the Orange County transit fleet
- Farmers and other operators of animal facilities can install anaerobic digester systems to convert their animal waste to usable biomethane -- with valuable, sanitary fertilizer as a byproduct.
- Sewage too can be converted to biomethane via anaerobic digesters.
- In Malmo, Sweden, the city runs part of its fleet of transit buses on biomethane produced at its local sewage treatment plant.
- Other recoverable biomass – including crop waste, wood chips, plants (such as switch grass) grown especially for energy production and other organic matter – also can be a major feedstock for the production of biomethane.

Environmental Benefits

- Biomethane/natural gas is one of the cleanest fuels on the market today.
- If not addressed, methane leaking from landfills, animal “lagoons” and other waste sites pose significant greenhouse gas problems since methane is estimated to be 21 times as intense a greenhouse gas as carbon dioxide.
- Displacing fossil fuels such as oil with biomethane has huge greenhouse benefits since:
 - During combustion, biomethane is converted to carbon dioxide (a 20 times greenhouse gas savings)
 - The fossil fuel that would otherwise be used is displaced (100% savings)
 - The biomethane that is burned in place of the fossil fuel produces less greenhouse gas when burned (20 percent less than gasoline, for example)
- When combusted, biomethane also produces substantially less NO_x, PM and other urban pollutants than gasoline, diesel and other fossil fuels.
- Processing animal waste in lieu of streaming it into open animal lagoons significantly reduces groundwater contamination and community “odor-pollution.”

Economic/Energy Security Benefits

Increasing the production of biogas and biomethane would:

- Substantially increase the supply of domestically produced, renewable non-fossil fuel energy.
- Lead to the development and deployment of new technologies.
- Create jobs here at home as the industry grows.
- Convert a waste problem for dairy, hog and poultry farmers into a valuable supplementary revenue source.
- Provide a valuable supplemental revenue source to municipalities while reducing the amount of sewage solids that currently needs to be processed.

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