Clean Energy From Texas Landfills

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

HIGHLIGHTS

- **Capturing landfill gas turns a potential nuisance into high value products**
- **Landfill gas is cheap and reliable**
- **Several Texas landfills are already capturing and using landfill gas to generate additional revenue**
- **Landfill gas is a small yet valuable resource available in many Texas communities**

SUMMARY

Landfill gas (LFG) recovery may be the ultimate in recycling. It taps one of society's least desirable items, garbage, and turns it into useful, high value energy products such as electricity and natural gas. Turning hazardous LFG into marketable energy enhances landfill safety. It also reduces odors and greenhouse gases while generating revenue. Every large Texas city should carefully evaluate its LFG potential. Why? Because what used to be known as "the dump" has become one of America's most cost-effective and reliable energy resources.

WHAT IS LANDFILL GAS?

Each Texan discards about a ton of trash per year. Consider that the average weight of an automobile is 3,500 pounds and that there are 2,000 pounds in a ton. That means that each year, every two Texans throw away more trash than a car weighs! Even with our best recycling efforts, most of the discarded trash is still buried

SOURCE: US DEPARTMENT OF ENERGY

LANDFILL GAS INTO ELECTRICITY *This small power plant located at a landfill produces low cost, reliable electricity.*

in municipal solid waste landfills, which are basically big piles of trash that are covered with dirt. Most trash is biomass, meaning it is derived from plants or animals. Examples of landfilled biomass include: food scraps, tree trimmings, dirty diapers, old newspapers, and discarded lumber.

When buried in the landfill, these materials break down and emit a mixture of methane and carbon dioxide along with a few other trace gases. The decomposition process will produce LFG for 30 years or more. Methane, which typically makes up half of all the gases emitted by a landfill, is the main component of natural gas and a valuable energy product. Therefore, LFG is considered a renewable form of natural gas. Although methane is a marketable commodity, methane is also a destructive "greenhouse gas" and landfill operators are required by federal law to control it. Twenty times more destructive to the Earth's atmosphere than carbon dioxide, methane currently accounts for about 12 percent of America's total greenhouse gas emissions.

Landfill operators are required to trap the methane and other gases. If the landfill volume is over one million tons, the methane produced can be captured, purified, and sold to gas utility supplies or used to generate electricity on the spot. Since the methane must be captured anyway, turning it into a commercial product can help defray the landfill's operating costs while reducing pollution.

TYPES OF PROJECTS

The simplest method of collecting and disposing of LFG is through the use of a flare. This technique was common 50 years ago for disposing of the explosive casing head gas that came along with the black gold from oil wells. But the oil industry eventually developed markets and infrastructure to sell the valuable natural gas rather than wasting it. In similar fashion, landfill operators are developing markets for LFG, which can be used for many applications.

Some of the applications for LFG are:

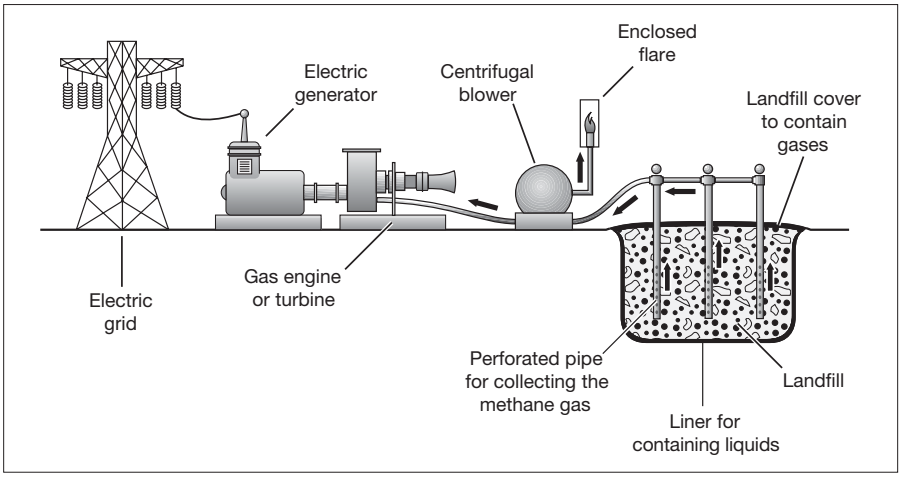
HEATING – burning gas for direct heating of homes and industry.

PIPELINE GAS – collected gases can be compressed, cleaned and separated into higher value products. LFG-derived methane can be sold as natural gas and transported to markets around Texas or in other states via natural gas pipelines.

ELECTRIC POWER GENERATION – LFG can fuel an internal combustion engine (e.g. truck engine) or small combustion turbine (e.g. jet engine) connected to a generator to produce electricity.

TEXAS POTENTIAL

About 22 million tons of trash are landfilled in Texas each year. That trash, in turn, creates approximately 70 billion cubic feet of methane. That quantity is equivalent to 1 percent of the natural gas produced in Texas each year and



SCHEMATIC DIAGRAM OF LFG-TO-ELECTRICITY PLANT *Major components include the collection system, engine and generator.*

equivalent to seven percent of the gas used by Texas' electric utility companies.

If the 70 largest landfills in Texas were fully developed for energy use, approximately 40 billion cubic feet of methane now drifting into the atmosphere or being wasted in flares would be utilized. It is estimated that nearly 200 megawatts (MW) of electricity could be generated from this LFG, providing the electric needs of more than 100,000 Texas homes.

Nationwide, more than 339 LFG utilization projects are in operation and perhaps 600 additional projects are feasible. In Texas, 11 LFG-to-energy projects were in service by the end of 2002. At least 55 more projects are possible.

AUSTIN'S LFG -TO-ELECTRICITY PLANT

Since 1996, Browning-Ferris Industries has been generating electricity from LFG at its Sunset Farms Landfill in Austin. This installation uses three 1,500 horsepower engines that are fueled by the methane-carbon dioxide mixture coming from the landfill. These engines, which are similar to large diesel engines, have relatively high initial costs – about $1,200 per kilowatt or about three times the cost per kilowatt of a large, natural gas-fueled power plant. But because they operate nearly continuously and use free, on-site fuel, they produce electricity at rates comparable to the cheapest conventional power plants.

Landfill gas powered units are highly reliable, producing full power for 90 to 95 percent of the year – a level higher even than fossil fuel and nuclear power plants. And due to their small size, LFG projects such as the one at Sunset Farms create "distributed" electricity, meaning that they connect directly into the local power grid, in contrast to giant conventional power plants that require high-voltage transmission lines with large metal towers to deliver power to customers.

CANDIDATE LANDFILLS FOR ENERGY RECOVERY

City	Gas Volume in million cubic feet (mmcf/d)	Electric Potential megawatts (MW)
Abilene	1.5	2.4
Altar	1.5	2.4
Alvarado	1.6	2.6
Arlington	1.7	2.8
Austin – A	1.8	2.8
Austin – B	1.4	2.2
Avalon	2.5	4.0
Beaumont	1.2	2.0
Clint	1.8	2.9
Columbus	4.4	7.1
Conroe – A	1.5	2.4
Conroe – B	2.0	3.2
Corpus Christi	1.3	2.1
Creedmore	2.5	4.0
El Paso	1.7	2.7
Farmers Branch	2.2	3.6
Ferris	2.3	3.6
Ft. Worth – A	1.5	2.3
Ft. Worth – B	1.6	2.6
Houston	5.4	8.7
Laredo	1.2	1.9
Longview	1.5	2.4
McKinney	1.3	2.0
Plano	2.9	4.7
Rosenberg	1.4	2.3
Sinton	1.6	2.6
Tyler	1.2	1.9
TOTAL	52.5	84.2

TABLE 1. CANDIDATE LANDFILLS FOR ENERGY RECOVERY *This list, compiled by the U.S. Environmental Protection Agency, identifies 27 of the more promising landfill sites in Texas. Additional sites in Texas may also be feasible.*

ORGANIZATIONS

CADDET
Center for Renewable Energy
1617 Cole Blvd.
Golden, CO 80401-3393
(303) 275-4373
www.caddet.org

Landfill Methane Outreach Program
US EPA
401 M St. SW
Washington, DC 20460
(202) 564-2666
www.epa.gov/lmop

National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO. 80401
(303) 275-3000
www.nrel.gov

Texas Renewable Energy Industries Association
P.O. Box 16469
Austin, TX 78761
(512) 345-5446
www.treia.org

RESOURCES

FREE TEXAS RENEWABLE ENERGY INFORMATION
For more information on how you can put Texas' abundant renewable energy resources to Use in your home or business, visit our website at **www.InfinitePower.org** or call us at 1-800-531-5441 ext 31796. Ask about our free Teacher Resource Guides and CD available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

Environmental Protection Agency site, a wealth of information on landfill gas energy. **http://www.epa.gov/lmop**

Solid Waste Association of North America
www.swana.org

Additional articles can be found at:
http://www.energyjustice.net/lfg/
http://www.beg.utexas.edu/esw/questions02.htm

BOOKS:

Methane Recovery from Lanfill Yearbook. 5th Edition, Eileen Berenyi, PH.D., Governmental Advisory Associates (available at 203-226-3238)

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