

Capturing and Converting Landfill Gas

Landfill gas—from an environmental problem to an energy solution

New federal regulations will require that large municipal waste landfills control harmful emissions. But in a cooperative effort, DOE and EPA are developing and demonstrating technology to profitably capture gas generated by rotting garbage in landfills to generate electricity, heat, and steam, and as a fuel source for vehicles, at the same time reducing the threat to the environment.

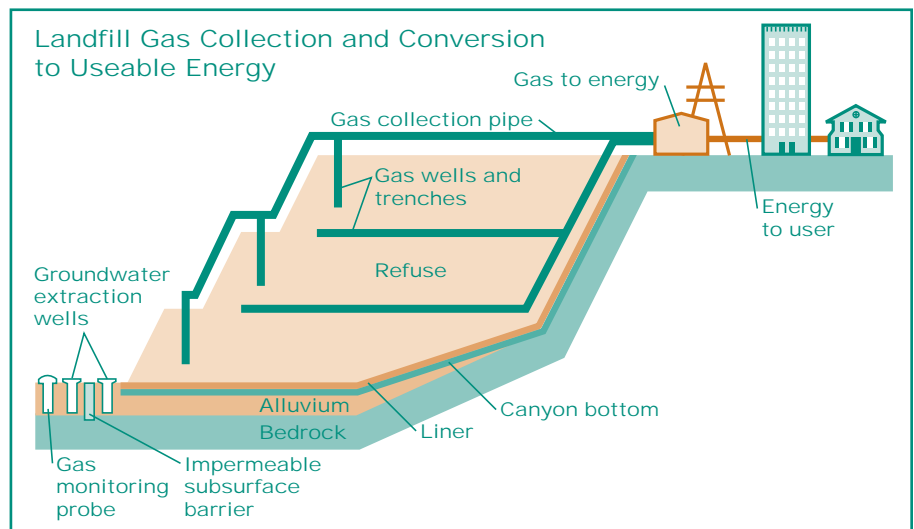
Beneath every landfill in the United States lies a potentially hazardous environmental problem. Landfill gases (LFG), if not collected, can pose serious odor, safety, and environmental hazards. Methane, the most dominant gas in a landfill, is a particularly potent “greenhouse” gas, having roughly 21 times the global warming effects of carbon dioxide. Methane is also highly explosive and has been responsible for 40 landfill fires and explosions that resulted in 10 deaths. LFG emissions contribute to local smog and can cause unpleasant odors and trigger complaints from neighbors.

In 1991, the U.S. Environmental Protection Agency (EPA) designated municipal solid waste landfill emissions as a pollutant because the volatile organic compounds in landfill gas interact with nitrous oxides to form ozone, a primary cause of smog. EPA officials have proposed regulations requiring the gases to be collected. The agency estimates that 500 to 700 landfills across the country will be affected by its pending regulations. But instead of just flaring the gas, landfill operators can burn it in gas engines or turbines to generate electricity or heat. If the local market for the power is good, revenues can help pay or even totally offset collection costs.

Yet LFG can and is being captured and converted to energy to produce electricity, heat, or steam. At the same time, it is generating significant revenues for larger communities across America, and reducing electrical demand for local utilities. Currently the technology is not economical for most smaller landfills, but DOE research and demonstrations will increase the number of sites that can support energy recovery.

The technology for recovering landfill gas is already on-line in a number of communities. The U.S. Department of Energy (DOE), through President Clinton’s Global Climate Change Action Plan, is charged with expanding research, development, and demonstration (RD&D) of technologies that will make it more practical and economical to recover and use methane. DOE will:

- In cooperation with the landfill industry and EPA, develop a practical guide to assist public and private landfill owners in the design, construction, implementation, and operation of successful LFG recovery and utilization programs.



Capturing and Converting Landfill Gas—continued

- Develop and demonstrate efficient and economical processes for increasing the recovery of energy from landfills, thereby decreasing U.S. dependence on nonrenewable energy resources.
- Create joint cooperative RD&D projects between federal, state, industry, and other stakeholders to remove technical impediments and other barriers to implementing enhanced LFG recovery and utilization programs.
- Cooperate with EPA and the LFG industry on an outreach program.

Landfill gas, with minimal cleaning, can be used directly in boilers to create steam for industrial uses. This reduces dependency on fuel oil, which is a standard fuel for boilers. Direct use of LFG does not require large capital investment for equipment such as generators, and is probably the most cost-effective application of landfill gas. Improved or emerging technologies such as fuel cells may require more gas cleaning.

In Raleigh, North Carolina, a boiler fueled by landfill gas generates steam at an average rate of 24,000 pounds per hour to meet the needs of a pharmaceutical plant. The energy conversion system uses gas collected from the city-owned landfill. The private developers, Natural Power, Inc., and Raleigh Landfill Gas Corporation, invested \$1.6 million in the project. The developers' annual gross revenue from steam sales ranges from \$450,000 to \$500,000, of which the city of Raleigh receives annual royalties of \$65,000 to \$75,000.

The project won the 1993 North Carolina Governor's Energy Achievement Award and also won an Energy Innovation Award from DOE.

DOE sees recovering and using methane from landfills as a "win-win" solution to an environmental problem. DOE participates in cost-shared demonstrations of landfill gas with various stakeholders with the goal of overcoming technical barriers to commercialization. Under the new federal regulations many landfill owners and operators will have to collect and control LFG. It will become worthwhile for them to look for a customer for this energy rather than just flaring the gas. Secondly, in the case of landfills that are now closed, it may still be worth the investment because of long-term postclosure monitoring and controls required through regulations. If owners and operators can find a customer for the gas, they can offset part, and quite possibly a good percentage, of their costs.

At this point there are approximately 700 landfills across the United States that are large enough to be potentially good sites for economically converting LFG to energy. The objective of DOE's program is to provide improved technology that will expand the economic recovery of LFG from additional smaller landfills.

Through President Clinton's Global Climate Change Action Plan, RD&D is expected to begin in 1995 and extend into the year 2000. DOE estimates that the technology, combined with the right economics and environmental settings, can help people use LFG for their commercial and environmental benefit rather than as a liability.

For additional information, call 1-800-363-3731.



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