



July 2016

Green Power from Landfill Gas

Improving the environment while sustainably fueling the economy

What is Landfill Gas?

Landfill gas (LFG) is a natural byproduct of the decomposition of organic material within landfills. LFG is composed of roughly 50 percent methane and 50 percent carbon dioxide (CO₂). Methane is a potent greenhouse gas that traps radiation in the atmosphere and has a global warming potential 25 times greater than CO₂.¹ In 2014, municipal solid waste (MSW) landfills were the third largest human-made source of methane in the United States, accounting for about 18 percent of total methane emissions.² Many cost-effective options exist to capture and use LFG to generate energy and reduce methane emissions.

EPA's Interest in LFG Energy

Much has been done to facilitate development of LFG energy projects through EPA's Landfill Methane Outreach Program (LMOP). EPA is interested in supporting LFG energy projects for many reasons, because these projects:

- Destroy methane and offset the use of non-renewable fossil fuels.
- Help reduce local air pollution.
- Create jobs, revenues and cost savings.

As of April 2016, there are 650 currently operational LFG energy projects in the United States. These beneficial use projects recover LFG from 600 MSW landfills, about one-quarter of the 2,400 operating or recently closed sites in the United States. However, there are more opportunities to use LFG to benefit the environment and the economy. EPA estimates that as many as 400 additional landfills could cost-effectively have their methane turned into an energy resource, with the potential to generate enough electricity to power nearly 437,000 homes each year.

LFG Energy Projects Offer Many Benefits

Energy Benefits. Since the mid-1970s, LFG has been captured and used to provide a renewable energy resource in the form of electricity and fuel to citizens, communities and industry. In 2015, 650 operational LFG energy projects in 49 states/territories supplied approximately:

- 16 billion kilowatt hours of electricity, and
- 99 billion cubic feet of LFG to end users.

These LFG energy projects produced enough energy in 2015 to power nearly 1.3 million homes and heat more than 724,000 homes.

Environmental Benefits. Producing energy from LFG benefits the environment directly by reducing greenhouse gas emissions and indirectly by avoiding the use of fossil fuels. Annual emission reductions by operational LFG energy projects are approximately equivalent to the following:

- Carbon sequestered by about 109 million acres of U.S. forests in one year, or
- CO₂ emissions from about 309 million barrels of oil consumed, or
- CO₂ emissions from more than 14.9 billion gallons of gasoline consumed.

Economic Benefits. LFG energy projects also have a substantial impact on economic growth and produce cost savings. A typical 3-megawatt LFG electricity project is estimated to add more than \$5 million in expenditures for the purchase of equipment and services during the year of construction.

¹ U.S. EPA. Overview of Greenhouse Gases. epa.gov/climatechange/ghgemissions/gases/ch4.html.

² U.S. EPA. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014. April 2016. epa.gov/climatechange/ghgemissions/usinventoryreport.html.

LMOP is a voluntary assistance and partnership program that promotes the use of LFG as a renewable energy resource. By preventing emissions of methane, a potent greenhouse gas, through the development of LFG energy projects, LMOP helps businesses, states and communities protect the environment and build a sustainable energy future. For more information about LMOP, see epa.gov/lmop.

LFG Energy Is Truly Green

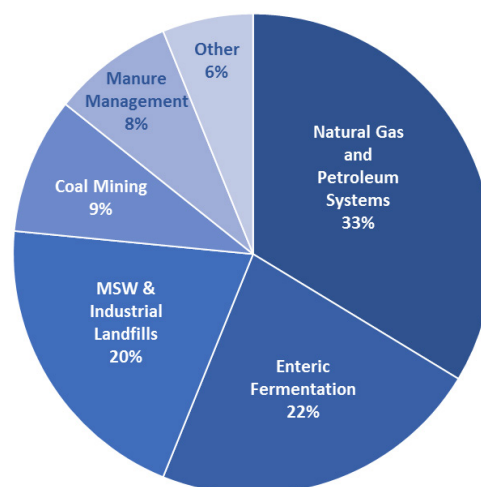
In 2014, methane accounted for about 10.6 percent of all U.S. greenhouse gases emissions from human activities.

LFG energy projects mitigate global climate change by preventing methane from escaping into the atmosphere. Instead, LFG is captured and used as a reliable, renewable energy resource.

Properties of Methane

Chemical Formula	CH ₄
Lifetime in Atmosphere	12 years
Global Warming Potential (100-year)	25

U.S. 2014 Methane Emissions, By Source



epa.gov/climatechange/ghgemissions/usinventoryreport.html

LFG and Green Pricing Programs

Green pricing programs offer premium rates for power provided from renewable energy resources. Many states require utilities to offer green pricing to customers, and utilities are increasingly offering green pricing options even without a legal requirement. At least 30 green pricing programs include LFG.³ States may also adopt renewable portfolio standards (RPS) that specify the minimum amount of customer load to be supplied from eligible renewable energy sources. At least 37 states accept LFG energy in their RPS and renewable energy resource procurement goals.⁴

LFG is a good fit for green power programs for several reasons:

- LFG is recognized by energy certification programs as a renewable energy resource.⁵
- LFG can serve as a “baseload renewable”, providing online availability exceeding 90 percent.
- Most states have landfills that can support LFG energy projects.
- Energy produced from LFG is one of the more cost-competitive forms of renewable energy.
- Several financial incentives exist, e.g., federal tax credits and state grants.

LFG End User Success Stories

LFG energy projects provide significant cost savings and long-term, sustainable energy to end users. Examples include:

- **Coca-Cola’s Atlanta Syrup Branch** facility gets nearly all of its energy in the form of electricity, steam and chilled water from green power generated at a nearby landfill, providing Coca-Cola with real energy savings. The project generates 48 million kilowatt-hours of green power per year.
- The **U.S. Navy** has saved approximately \$1.3 million annually in utility costs at the Marine Corps Logistics Base in Albany, Georgia, since its first LFG cogeneration plant started up in 2011. This facility is made up of one dual-fuel engine generator, a heat recovery steam generator and two dual-fuel boilers.
- In 2012, **Gundersen Health System’s** Onalaska Campus became the first energy-independent medical campus in the country by using LFG piped from the local landfill in La Crosse County, Wisconsin to power a generator. The electricity is sold to a local utility while the recovered waste heat supplies 100 percent of campus heat energy needs. Gundersen saves \$100,000 annually in space heating and hot water costs.
- The **U.S. Department of Justice** obtains 80 percent of the electricity used by Federal Bureau of Prisons’ Allenwood Correctional Complex from the combustion of LFG at the nearby landfill in Lycoming County, Pennsylvania.



³ U.S. DOE, Energy Efficiency & Renewable Energy. The Green Power Network.
apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=0

⁴ Database of State Incentives for Renewables & Efficiency (DSIRE).
www.dsireusa.org.

⁵ Green-e certification program for green power products (www.green-e.org) and U.S. EPA Green Power Partnership (www.epa.gov/greenpower).