

Landfill Gas-to-Energy in the United States

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Abstract. Over 200 landfill gas-to-energy (LFG-E) facilities are currently operating in the United States (US). With the exception of a few research and development projects, essentially all LFG-E facilities are commercial (for profit) facilities. The LFG-E industry in the US has grown by about 11-14% per year over the past five years. There are over 130 LFG-to-electricity facilities, over 40 medium BTU (50% methane) LFG sales projects, over 10 leachate/condensate evaporation projects, and about 10 LFG-to-natural gas projects. The cumulative capacity of the LFG-E-to-electricity projects is about 600 megawatts (MWe). The sale of medium and high BTU LFG is equivalent to over 150 MWe.

Technologies to utilize landfill gas to generate electricity or to displace fossil fuel have been proven in field service over the past 20 years. A competitive market has been created by landfill owners desiring to utilize their landfill gas and by several LFG-E developers. A review of existing projects by State and by year shows that when energy prices are sufficient, landfill gas projects are quickly developed. Low wholesale electricity and fossil fuel pricing are the primary impediment to developing additional LFG-E facilities.

This paper presents a summary of an extensive survey of the LFG-E industry that was completed in early 1997 in conjunction with the Solid Waste Association of North America (SWANA) and the US Environmental Protection Agency (EPA)⁴. A brief survey was conducted in late 1998 to provide more up-to-date information for the ANACON conference.

Introduction. Landfill gas (LFG) is produced by the natural biological decomposition of organics in landfills. Between 20% and 50% of the organics in modern landfills are converted to methane and carbon dioxide over a period of about 30 years. Extensive networks of wells and trenches spaced 150 to 300 feet apart over the entire surface of the landfill are used to collect the gas.

Collecting and utilizing LFG benefits the environment by significantly reducing methane emissions (a significant greenhouse gas) and reducing odors. Without LFG utilization, LFG collection is an environmental control expense. Landfill gas-to-energy (LFG-E) projects provide economic incentives to fully collect and utilize LFG for energy sales revenues. Several technologies have been adapted or developed over the past 20 years to cost effectively utilize LFG.

The cumulative and projected growth of the LFG-E industry is shown in Figure 1. As of the end of 1996, there were over 140 electrical generation facilities with an installed electrical generating capacity of over 520 MWe. Also at this time, landfill gas sales displacing fossil fuels were equivalent to over 140 MWe of power generation. LFG-E projects that are no longer operational have been excluded from Figure 1.

Operational Facilities. Figure 2 shows the number of operational LFG-E facilities on a state by state basis as reported in the 1997 SWANA/EPA survey⁴. Facilities in construction and advanced planning in late 1996 are shown in parentheses. The development of LFG-E facilities correlates with States that have, or have had, favorable energy rates vs. state population and the resultant waste generation.