

**Methane to electricity: Evaluation of technology alternatives
for El Trebol Landfill (Guatemala City)**

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Guatemala City's El Trebol landfill emits significant quantities of methane, a potent greenhouse gas, and other noxious gases. The El Trebol landfill consists of an existing large, open, and unmanaged landfill that does not meet current sanitary landfill design standards and a new managed landfill that is under development. Guatemala City, with the cooperation of USAID/PROARCA and with assistance from the USDOE's National Energy Technology Laboratory (NETL) seeks to develop new, cost-effective power generation technologies and environmental control technologies that achieve reductions in emissions of greenhouse gases and solid and liquid wastes. It is the intent of Guatemala City to work with private developers in utilizing the landfill gases generated at the El Trebol Landfill to promote this activity.

Guatemala City, through the assistance of NETL, has completed the pre-feasibility analysis for the commercial development of electrical generation using landfill gases at the El Trebol landfill. The project proposes to finance, design, build, install, and operate a power generating plant using landfill gases from the El Trebol Landfill. The completed pre-feasibility study showed that 9.2 MW of power could be generated economically using simple-cycle gas turbines. Emphasis was placed on offering clean power generating technologies since it is the predominant aim of the municipality to improve the environmental operation of the landfill. This will have the impact of reducing total carbon dioxide and other emissions to the atmosphere. Use of power plant rejected heat is also considered for a combined heat power project to improve financing and/or achieve lower emissions.

This paper provides a technical and financial analysis of various power generation technologies for electricity generation from landfill gas at the El Trebol landfill. Three representative types of power generation equipment, fuel cell power units, combustion turbines, and spark ignition engines, were preliminarily assessed in feasibility studies. Information on the technical performance and economics of these project generation options is provided. Environmental credits from the offset carbon dioxide emissions is also considered in the project financing analysis.

Preliminary methane gas flows have been developed from data collected in previous years, and serve as the basis for the electrical production evaluations that are required. In addition, generation plans are defined that show increasing amounts of power generation based on successful operation of early units to minimize investment risk and quickly achieve financial viability.