



**REPORT OF THE PUMP TEST AND PRE-FEASIBILITY STUDY
FOR LANDFILL GAS RECOVERY AND UTILIZATION
AT THE PIRANA LANDFILL
AHMEDABAD, INDIA**

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EXECUTIVE SUMMARY

This Preliminary-Feasibility Study Report addresses the potential implementation of a landfill gas (LFG) collection, control and utilization project at the Pirana Landfill located in Ahmedabad, India. The U.S. EPA's Landfill Methane Outreach Program (LMOP) has commissioned this report for the City of Ahmedabad.

For this evaluation, three alternative projects were examined which involved the installation of a landfill gas collection system to extract LFG, including two LFG-to-energy (LFGE) projects and one flaring only project. Option 1 consists of a project to combust LFG in a power plant using internal combustion engine generators. Option 2 consists of a project to deliver LFG via pipeline to a nearby industrial facility where it would be combusted in replace of conventional fossil fuels. Both Options 1 and 2 would include flaring any unused LFG. Option 3 is a non-utilization project scenario in which all collected LFG would be flared. Revenues for the project would be generated from the sale of credits for the reduction of greenhouse gas emissions and (in the case of the power plant or direct use projects) from energy sales (exporting power to the grid or selling LFG to end users). The emission reductions are created by the combustion of methane, which makes up approximately 50 percent of LFG. Methane has a global warming potential about 21 times that of carbon dioxide (CO₂).

As part of this investigation, a pump test was conducted at the Pirana Landfill. This test has provided additional information regarding the available LFG volume and quality at the landfill, along with other physical information such as extent of soil cover and leachate levels within the waste mass. The results of the test indicated that the initial LFG recovery projections prepared via mathematical modeling do not require an adjustment.

The following is a summary of the relevant project information:

- The Pirana Landfill has been used historically as a disposal site for the City of Ahmedabad, India. The site is owned and operated by the Ahmedabad Municipal Corporation (AMC), began receiving waste in 1980, and is projected to close in 2008. At site closure the two main disposal areas with waste depths suitable for project development (Areas 1 and 3) will contain approximately 4.6 million tonnes of municipal solid waste (MSW).
- Annual waste disposal estimates provided by AMC are based on historical records of total waste disposed by the City for 1985 through 1996, and scalehouse records of disposal at the landfill after 1996. The reported total amount of waste disposed since 1996 exceeds the estimated capacity of Areas 1 and 3. Disposal Areas 1 and 3 cover about 10 and 4.5 hectares (ha), respectively, and averaged about 22 meters (m) deep as of mid-2007. The Project Team developed two alternative disposal histories to reflect two possible solutions to the discrepancies between the AMC information and the estimated disposal volumes. Disposal Scenario 1 assumes that disposal began in Area 1 in mid-2000 and uses the post-2000 annual disposal estimates provided by AMC. Disposal Scenario 2 uses the 1985 start date for Area 1 provided by AMC but adjusts the annual tonnages downward based on available capacity.

- Soil cover is not applied at the landfill except during the months of March through May when large quantities of silt are cleared from the City's drainage ditches.
- The landfill does not have an existing active landfill gas collection and control system or passive gas vents.
- The two disposal scenarios result in the following alternative gas recovery projections:
 - Recovery Scenario 1: Projected gas recovery in 2009 after the completion of the gas collection and control system is estimated to be approximately 1,754 cubic meters per hour (m³/hr) or 1,032 cubic feet per minute (cfm) under a mid-range estimate. The LFG recovery rate is expected to decrease to 1,719 m³/hr (1,012 cfm) in 2010, and decline rapidly thereafter, reaching 906 m³/hr (533 cfm) in 2015 and 571 m³/hr (336 cfm) in 2020.
 - Recovery Scenario 2: Projected gas recovery in 2009 after the completion of the gas collection and control system is estimated to be approximately 1,126 cubic meters per hour (m³/hr) or 663 cubic feet per minute (cfm) under a mid-range estimate. The LFG recovery rate is expected to increase to 1,135 m³/hr (668 cfm) in 2010, and decline rapidly thereafter, reaching 643 m³/hr (379 cfm) in 2015 and 429 m³/hr (252 cfm) in 2020.
- Power plant sizing:
 - Assuming Recovery Scenario 1 and start-up of a power plant in January 2009, sufficient gas is estimated to be available to support a 1.27 MW power plant (consisting of two I.C. engines). Due to declining gas recovery, only one 633 kW engine can be supported after 2016.
 - Assuming Recovery Scenario 2 and start-up of a power plant in January 2009, sufficient gas is estimated to be available to support a 1.08 MW power plant (consisting of two I.C. engines). Due to declining gas recovery, only one 540 kW engine can be supported after 2014.
- Direct use project sizing:
 - Assuming Recovery Scenario 1 and start-up of a LFG treatment and pipeline delivery project in January 2009, sufficient gas is estimated to be available to support an 850 m³/hr facility. Lower rates of LFG delivery can be supported after 2015 due to declining gas recovery.
 - Assuming Recovery Scenario 2 and start-up of a LFG treatment and pipeline delivery project in January 2009, sufficient gas is estimated to be available to support a 600 m³/hr facility. Lower rates of LFG delivery can be supported after 2015 due to declining gas recovery.

- Flaring only project:
 - Assuming Recovery Scenario 1 and start-up of a flaring only project in January 2009, sufficient gas is estimated to be available to combust a maximum of approximately 31.3 million Btus per hour (mmBtus/hr) in 2009.
 - Assuming Recovery Scenario 2 and start-up of a flaring only project in January 2009, sufficient gas is estimated to be available to combust a maximum of approximately 20.1 mmBtus/hr in 2009.
- Projection of methane emissions reduction under Recovery Scenario 1:
 - A project to capture and combust LFG generated at the landfill would generate direct CO₂ equivalent (CO₂e) emission reductions totaling approximately 907,715 tonnes for the period 2009 through 2022, through reduction of landfill methane emissions.
 - A direct use LFGE project at the landfill would result in an estimated additional 63,820 tonnes of indirect CO₂e emission reductions for the period 2009 through 2022 by the displacement of conventional fuel use.
- Projection of methane emissions reduction under Recovery Scenario 2:
 - A project to capture and combust LFG generated at the landfill would generate direct CO₂ equivalent (CO₂e) emission reductions totaling approximately 631,179 tonnes for the period 2009 through 2022, through reduction of landfill methane emissions.
 - A direct use LFGE project at the landfill would result in an estimated additional 45,980 tonnes of indirect CO₂e emission reductions for the period 2009 through 2022 by the displacement of conventional fuel use.

The project economics were analyzed for the 2008 - 2022 period under different scenarios, including: Recovery Scenario (1 or 2); 2008 equity investment percentage (25 or 100 percent); project type (power generation with flaring of excess gas, direct use with flaring of excess gas, or flaring of all collected gas); project duration;¹ and emission reduction pricing (\$8 or \$10/tonne of CO₂e). A power sales price of \$0.058/kWh was assumed for the electricity generation LFGE project; this price is estimated based on the most recent data on wholesale tariff rates. A LFG sales price of \$3.00/mmBtu was assumed for the direct use LFGE project; this price is estimated based on the most recent available data on natural gas prices. Emission reduction sales prices of \$8 and \$10 per tonne of CO₂-equivalent methane reduced by the project were used in the economic analysis of the LFGE and the flaring only projects; these emission reduction sales prices are based on recent trends in emission reduction pricing.

¹ Project duration is 2008 – 2022 under the power plant or direct use scenarios regardless of duration of receipt of revenues from emission reductions. For the flaring only project, project duration is from 2008 until revenues from emission reductions end (2012 or 2018).

If Recovery Scenario 1 is applied, the results of the analysis indicate that the economic feasibility of a direct use LFGE project appears favorable enough to likely attract developers/investors under all scenarios evaluated for emission reduction price, duration of emission reduction revenues, and project financing. The electric generation LFG project appeared economically feasible under most emission reduction and financing scenarios analyzed, and the flaring only project appeared financially feasible only under the most favorable emission reduction and financing scenarios.

If Recovery Scenario 2 is applied, the results of the analysis indicate that the economic feasibility of a direct use LFGE project appears favorable enough to likely attract developers/investors under most scenarios evaluated for emission reduction price, duration of emission reduction revenues, and project financing. The electric generation and flaring only LFG projects did not appear to be economically feasible under any emission reduction and financing scenarios analyzed.

A summary of economic indicators for each of the three projects is presented in Tables ES-1 through ES-6 below.

**TABLE ES-1: SUMMARY OF ECONOMIC EVALUATION
POWER PLANT PROJECT UNDER LFG RECOVERY SCENARIO 1**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	- \$684	7.6%
2009 - 2012	10	100	- \$230	11.8%
2009 - 2012	8	25	- \$276	--*
2009 - 2012	10	25	\$179	33.2%
2009 - 2018	8	100	\$76	14.6%
2009 - 2018	10	100	\$737	19.6%
2009 - 2018	8	25	\$484	30.4%
2009 - 2018	10	25	\$1,146	50.8%

*IRR was a negative value that could not be calculated.

**TABLE ES-2: SUMMARY OF ECONOMIC EVALUATION
DIRECT USE PROJECT UNDER LFG RECOVERY SCENARIO 1**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	\$340	19.0%
2009 - 2012	10	100	\$799	26.4%
2009 - 2012	8	25	\$600	65.9%
2009 - 2012	10	25	\$1,051	98.9%
2009 - 2018	8	100	\$1,343	28.6%
2009 - 2018	10	100	\$2,060	36.2%
2009 - 2018	8	25	\$1,594	76.9%
2009 - 2018	10	25	\$2,311	105.9%

**TABLE ES-3: SUMMARY OF ECONOMIC EVALUATION
FLARING ONLY PROJECT UNDER LFG RECOVERY SCENARIO 1**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	- \$625	- 4.0%
2009 - 2012	10	100	- \$205	8.3%
2009 - 2012	8	25	- \$514	--*
2009 - 2012	10	25	- \$94	2.6%
2009 - 2018	8	100	- \$174	10.8%
2009 - 2018	10	100	\$431	21.4%
2009 - 2018	8	25	\$35	20.4%
2009 - 2018	10	25	\$639	67.3%

*IRR was a large negative value which cannot be calculated.

**TABLE ES-4: SUMMARY OF ECONOMIC EVALUATION
POWER PLANT PROJECT UNDER LFG RECOVERY SCENARIO 2**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	-\$1,344	-0.2%
2009 - 2012	10	100	-\$1,038	2.6%
2009 - 2012	8	25	- \$969	--*
2009 - 2012	10	25	- \$663	--*
2009 - 2018	8	100	- \$829	6.7%
2009 - 2018	10	100	- \$376	10.7%
2009 - 2018	8	25	- \$454	-8.9%
2009 - 2018	10	25	- \$2	13.9%

*IRR was a negative value that could not be calculated.

**TABLE ES-5: SUMMARY OF ECONOMIC EVALUATION
DIRECT USE PROJECT UNDER LFG RECOVERY SCENARIO 2**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	-\$532	5.4%
2009 - 2012	10	100	\$234	10.1%
2009 - 2012	8	25	-\$296	--*
2009 - 2012	10	25	\$3	7.1%
2009 - 2018	8	100	-\$18	13.8%
2009 - 2018	10	100	\$427	19.4%
2009 - 2018	8	25	\$218	25.3%
2009 - 2018	10	25	\$663	47.1%

*IRR was a negative value that could not be calculated.

**TABLE ES-6: SUMMARY OF ECONOMIC EVALUATION
FLARING ONLY PROJECT UNDER LFG RECOVERY SCENARIO 2**

Period Emission Reduction Revenues are Received¹	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2009 - 2012	8	100	-\$1,086	-21.2%
2009 - 2012	10	100	- \$809	-11.0%
2009 - 2012	8	25	- \$981	--*
2009 - 2012	10	25	- \$703	--*
2009 - 2018	8	100	-\$838	-3.4%
2009 - 2018	10	100	-\$430	5.8%
2009 - 2018	8	25	-\$641	--*
2009 - 2018	10	25	-\$233	--*

*IRR was a large negative value which cannot be calculated.

SECTION 1.0 INTRODUCTION

EPA's Landfill Methane Outreach Program (LMOP) is pleased to present this Preliminary-Feasibility Study Report for the implementation of a LFG collection, control and utilization project at the Pirana Landfill in Ahmedabad, India. This pre-feasibility study has been prepared by SCS Engineers (SCS) and LMOP (Project Team) as part of the EPA's Methane-to-Markets Program, an international initiative to help partner countries reduce global methane emissions. The Pirana Landfill was identified as a candidate for a LFG capture and utilization project for a number of reasons, including:

- Landfill size (volume) and depth of fill.
- The use of LFG as a fuel for a project at the landfill would result in a net reduction of carbon emissions directly from the combustion of methane, and perhaps also indirectly from the displacement of other carbon fuels.

1.1 OBJECTIVES AND APPROACH

The objectives of this evaluation are as follows:

- Assess the technical and economic feasibility of the development of an LFG control and utilization project at the landfill.
- To quantify the potential greenhouse gas (GHG) emission reduction from implementing a project.
- To provide the City of Ahmedabad with a tool to assist potential project developers in making informed decisions regarding additional investigations or moving forward with a project at the landfill.

The approach taken for this study is as follows:

- Reviewing site conditions and available background information, including waste quantities and composition, landfill type and configuration, and meteorological data.
- Performing a field investigation (pump test) of LFG extraction rates at the landfill by installing three extraction wells and monitoring probes, conducting the pump test, and evaluating the results. The pump test was conducted from late July through August 2007.
- Estimating the LFG recovery potential from the landfill using computer modeling based on available information, site observations, pump test results, and engineering experience at similar landfills.
- Quantifying the potential for on-site electricity generation using LFG as a fuel, or for selling LFG to off-site industrial facilities.

- Estimating the required elements for the gas collection and utilization system (number and depth of wells, piping sizes and lengths, flare capacities, etc.) for the purpose of evaluating the capital and operational costs required for implementing gas collection and flaring at the landfill.
- Estimating the capital and operational costs of implementing an energy recovery project.
- Evaluating the project economics by quantifying capital and operational costs and sources of revenues, and calculating the net present value and internal rate of return.

1.2 LANDFILL GAS UTILIZATION BACKGROUND

Landfills produce LFG as organic materials decompose under anaerobic (without oxygen) conditions. LFG is composed of approximately equal parts methane and carbon dioxide, with trace concentrations of volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and other constituents. Both of the two primary constituents of LFG (methane and carbon dioxide) are considered to be greenhouse gases (GHG) which contribute to global warming, although the Intergovernmental Panel on Climate Change (IPCC) does not consider the carbon dioxide specifically present in raw LFG to be a GHG (it is considered to be “biogenic”, and therefore a natural part of the carbon cycle).

Methane present in raw LFG is, however, considered to be a GHG. In fact, methane is a much more potent GHG than carbon dioxide, with a global warming potential of approximately 21 times that of CO₂. Therefore, the capture and combustion of methane (transforming it to carbon dioxide and water) in an LFG flare, an engine generator or other device, results in a substantial net reduction of GHG emissions. Additional benefits beyond GHG emission reductions include the potential for improvement in local air quality through the destruction of HAPs and VOCs through LFG combustion.

LFG can leave a landfill by two natural pathways: by migration into the adjacent subsurface and by venting through the landfill cover system. In both cases, without capture and control the LFG (and methane) will ultimately reach the atmosphere. The volume and rate of methane emission from a landfill is a function of the total quantity of organic material buried in the landfill and its age and moisture content, compaction techniques, temperature, and waste type and particle size. While the methane emission rate will decrease after a landfill is closed (as the organic fraction is depleted), a landfill will typically continue to emit methane for many (20 or more) years after its closure.

A common means for controlling LFG emissions is to install an LFG collection and control system. LFG control systems are typically equipped with a combustion (or other treatment) device designed to destroy methane, VOCs, and HAPs prior to their emission to the atmosphere.

Good quality LFG (high methane content with low oxygen and nitrogen levels) can be utilized as a fuel to offset the use of conventional fossil fuels or other fuel types. The heating value typically ranges from 400 to 600 Btus (British thermal units) per standard cubic foot (scf), which is approximately one half the heating value of natural gas. Existing and potential uses of LFG generally fall into one of the following categories: electrical generation, direct use for

heating/boiler fuel (medium-Btu), upgrade to high Btu gas, and other uses such as vehicle fuel. This study focuses on evaluation of a potential electrical generation project and a direct use project.

1.3 PROJECT LIMITATIONS

During this evaluation, the Project Team relied upon information provided and various assumptions in completing the LFG recovery modeling and economic evaluation. Judgments and analysis are based upon this information and the Project Team's experience with LFG collection and utilization systems. Specific limitations include:

- LFG production estimates are based on a desktop analysis and visual observation of the landfill and its operations.
- Because the landfill does not currently have an LFG recovery system, the economic analysis uses typical capital and operating cost data for similar systems rather than project specific information.
- The LFG recovery projections have been prepared in accordance with the care and skill generally exercised by reputable LFG professionals, under similar circumstances, in this or similar localities. No other warranty, express or implied, is made as to the professional opinions presented herein. Changes in the landfill property use and conditions (for example, variations in rainfall, water levels, landfill operations, final cover systems, or other factors) may affect future gas recovery at the landfill. LMOP does not guarantee the quantity or quality of available LFG.
- Although a pump test helps reduce the uncertainties of predicting LFG recovery, it also has limitations. First, the pump test is conducted on only a limited area of the landfill and the results are assumed to apply to the entire site. Secondly, pump tests can only indicate the quantity of LFG during the period of the field test and don't provide any indication of future gas resources.
- This modeling work has been conducted exclusively for the use of the City of Ahmedabad for this Pre-Feasibility Study. No other party, known or unknown to LMOP or SCS Engineers is intended as a beneficiary of this report or the information it contains. Third parties use this report at their own risk. LMOP and SCS Engineers assume no responsibility for the accuracy of information obtained from, or provided by, third-party sources.

SECTION 2.0

PROJECT BACKGROUND INFORMATION

2.1 LANDFILL BACKGROUND

The Pirana Landfill is located in Ahmedabad, India, a city located in the western region of India with a population of approximately five million people. The climate in the region is tropical, with moderate rainfall. Annual average temperature is 27.5 degrees C (81.5 degrees F), and annual average precipitation is 820 millimeters (32 inches).²

Landfill Physical Characteristics

The following information on the physical characteristics of the Pirana Landfill was provided by the Ahmedabad Municipal Corporation (AMC):

- The existing landfill property covers approximately 84 hectares (ha), of which 65 ha has been used for disposal since 1980.
- A majority of the disposal area contains only shallow waste deposits, with depths ranging up to about 7 meters (m).
- The following two areas of the landfill currently have waste depths averaging approximately 22 m:
 - Area 1 reportedly covers 30 ha and received approximately 6.6 million tonnes of waste from 1985 – 2001.
 - Area 3 reportedly covers 25 ha and received approximately 2.7 million tonnes of waste from 2003 - 2006.
- Disposal is projected to remain in Area 3 until 2008 when a new planned landfill is constructed and the existing landfill is scheduled to close.

This report addresses only Areas 1 and 3, which are the portions of the landfill with adequate depth to generate significant LFG quantities and to install extraction wells. Areas 1 and 3 receive no soil cover except during the months of March through May when large quantities of silt are deposited in select areas on the landfill surface (see Figure 2-1 below). The source of the silt is the city's drainage ditches and canals, which are cleared in the Spring in anticipation of the summer monsoon rains. Most of the existing landfill surface is gently sloping. Waste is compacted using bulldozers. In place waste density in Area 3 is estimated to be approximately 0.9 tonnes per cubic meter, based on the estimated waste composition (which includes 30 percent silt), waste depths, and degree of waste compaction. In-place waste density in Area 1 will be greater depending on the extent of waste decay (which leaves silt as the predominant remaining waste type); apparent density based on current landfill volume is estimated to be approximately 1.2 tonnes per cubic meter.

² Source: www.worldclimate.com



Figure 2-1. Pirana Landfill

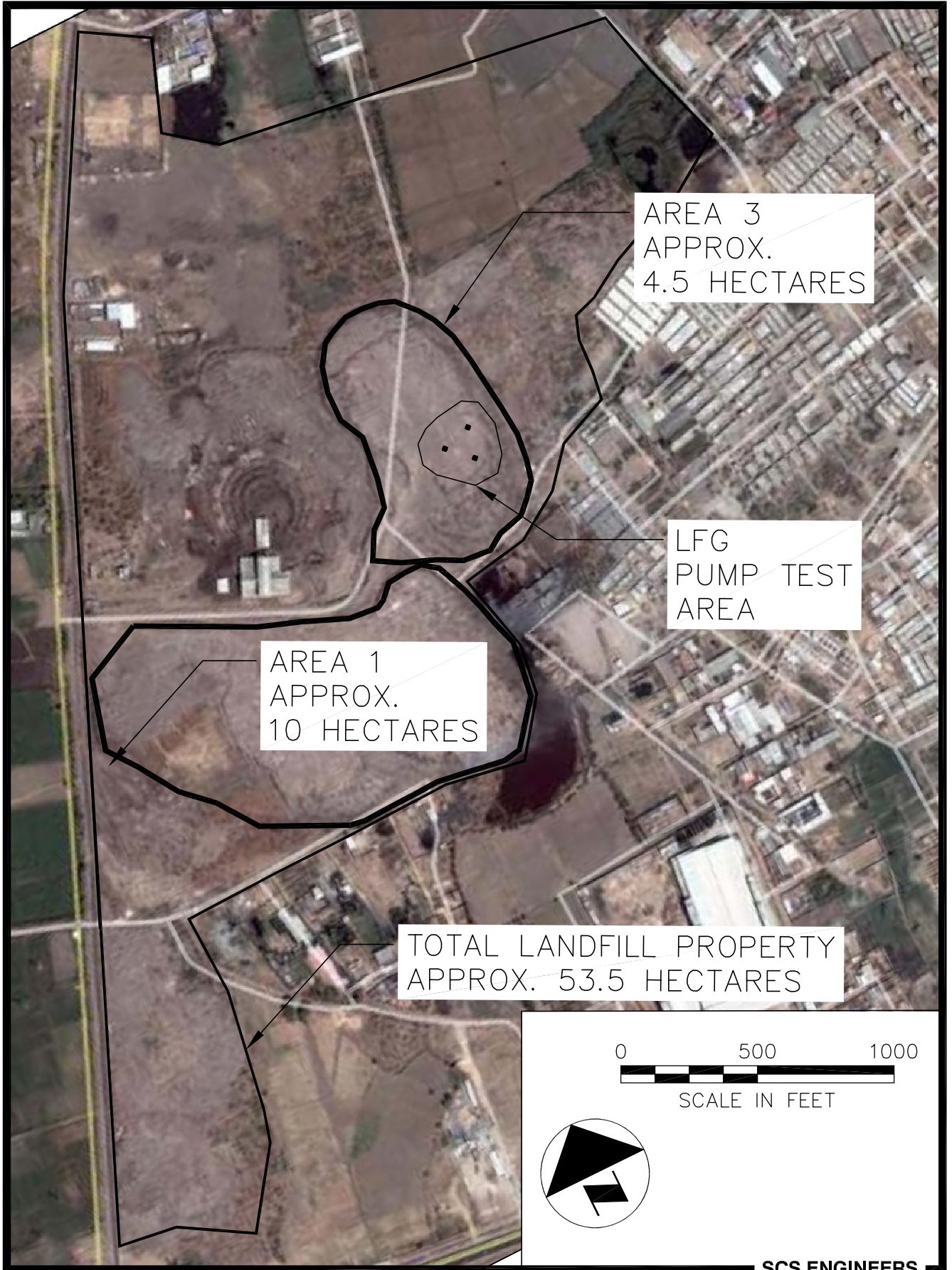
2.2 WASTE DISPOSAL RATES

Data and assumptions used to develop the waste disposal estimates for Areas 1 and 3 are provided in this section. In the process of confirming the disposal estimates provided by AMC, SCS used a scaled aerial photograph and site observations to develop the following estimates regarding waste disposal areas (see Figure 2-2):

- Area 1 covers approximately 10 ha.
- Area 3 covers approximately 4.5 ha.
- The total landfill property is approximately 53.5 ha.

Assuming a mid-2007 average landfill depth of 22.5 m, the estimated total volume of Area 1 is 2.25 million cubic meters (m^3) and the volume of Area 3 is 1.01 million m^3 . These estimated volumes are much less than the reported amounts of waste disposed in each of the areas. Using the SCS waste volume estimates and the estimated in place waste densities described above, total waste in place is estimated to be 3,611,250 tonnes (2,700,000 tonnes in Area 1 and 911,250 tonnes in Area 3). SCS has re-examined the aerial photographs and is confident that the revised Area 1 and 3 volume estimates are reasonably accurate. This suggests that AMC's estimates of the amounts of waste disposed in Areas 1 and 3 are too high. The conflict can be resolved either by assuming lower annual disposal rates at the landfill during the years disposal occurred in Areas 1 and 3, or by assuming that disposal occurred in Areas 1 and 3 for fewer years than reported.

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PIRANA LANDFILL - LANDFILL PROPERTY OVERLAY

Adjustments to Historical Annual Disposal Estimates

AMC's estimates of historical annual disposal rates at the Pirana Landfill are based on historical records of total waste disposed by the City of Ahmedabad for the period of 1985 through 2006. Actual disposal rates at the landfill are uncertain prior to activation of the truck scale in 1996, and significant amounts of wastes generated by the City reportedly were disposed at other sites prior to 1998. In addition, during the site visit the scale did not appear to be actively used to record incoming truck weights; however, site personnel at the landfill believe that the reported disposal rates for 1999 through 2006 accurately reflect disposal at the site.

After discussions with AMC Solid Waste Director (P.U. Asnani, personnel communication) the Project Team applied the following discounts to the annual disposal estimates provided by AMC to account for disposal at other landfills and for inflated disposal estimates prior to scale activation:

- A 25 percent discount to reported tonnages was applied to account for disposal at other landfills from 1985 through 1990 and from 1994 through 1998.
- Another 25 percent discount to reported tonnages was applied to disposal estimates for 1985 – 1995 to account for potential over-reporting of tonnages prior to scale activation.

These adjustments result in a revised total of 5.7 million tonnes disposed from 1985 through 2002 in Area 1. This revision to the reported disposal estimates in Area 1 is not adequate to reduce the total to match the volume based estimate of about 2.7 million tonnes. AMC's estimated total amount of waste disposed in Area 3 in 2003 through 2006 is unaffected by these adjustments (remains at 2.7 million tonnes). AMC projected disposal in 2007 and 2008 is estimated to add another 1.74 million tonnes to Area 3.

Disposal Scenario 1 – Adjust the Timing of Historical Disposal in Areas 1 and 3

One solution to the inconsistency between waste volumes and reported tonnages disposed is to assume that there is greater uncertainty in the locations where disposal was occurring historically than in estimates of the annual tonnages or the volume of waste in place in Areas 1 and 3. The volume-based estimate of waste in place in Areas 1 and 3 as of mid-2007 (3,611,250 tonnes) is equal to the amount of waste disposed since mid- 2000, using the historical annual disposal rates (only the pre-1999 figures were adjusted). Disposal prior to mid-2000 is assumed to have occurred in the shallower portions of the landfill outside of Areas 1 and 3. Under this revised disposal scenario (Scenario 1), Area 1 received all wastes disposed at the site from mid-2000 through 2001. In 2002 AMC reports that Area 2 was filled. Starting in 2003, disposal shifted back to Area 1, which still had significant remaining capacity. Disposal may have started in Area 3 in 2003 and continued there since that date, as AMC reports, but not exclusively, because the estimated amount of waste in place (911,250 tonnes) represents little more than one full year's total at current disposal rates. Disposal likely occurred in Area 1 during most of the period since 2002, including in 2007 (observed during site visit in mid-2007).

Disposal Scenario 2 – Adjust the Annual Historical Disposal Rates in Areas 1 and 3

A second solution to the inconsistency between waste volumes and reported tonnages disposed is to assume lower annual disposal rates occurred during the historical period of disposal in Areas 1 and 3. Under Disposal Scenario 2, Area 1 received waste received 2.7 million tonnes from 1985 through 2001 and Area 3 received 911, 250 tonnes from 2003 through 2007. This scenario is consistent with the reported timing of historic waste disposal in Areas 1 and 3 but conflicts with the reported annual disposal rates. Disposal Scenario 2 creates more conservative estimates of LFG generation than Scenario 1 because it assumes the same volume of waste was disposed over a much longer time period, creating an older average waste age and lower LFG generation rates.

Future Disposal Estimates

AMC projects five percent annual growth in disposal through the end of 2008, including 850,400 tonnes in 2007 and 892,920 tonnes in 2008. Based on the configuration of Areas 1 and 3 (location of side slopes), future disposal is expected to occur on the existing (10 and 4.5 ha) waste footprints. SCS estimated the remaining capacity in Areas 1 and 3 assuming that waste depths could increase to a maximum of 30 m. As of mid-2007, the remaining capacity was only about 980,000 tonnes (675,000 tonnes in Area 1 and 305,000 tonnes in Area 3). SCS therefore estimates that Areas 1 and 3 have sufficient capacity to receive waste through July 2008, resulting in a total of about 554,000 tonnes for 2008.

Revised Waste Disposal Estimates

Table 2-1 summarizes the revised estimates of historical and future waste disposal through closure in 2008 for Areas 1 and 3 under historical Disposal Scenario 1, which is consistent with the estimated volumes of waste in place, and which is based on the assumption that disposal in these areas did not begin until 2000. As shown in Table 2-1, the total cumulative waste disposal in Areas 1 and 3 at closure is estimated to be 4,590,000 tonnes.

**TABLE 2-1. WASTE DISPOSAL RATES
UNDER DISPOSAL SCENARIO 1
AREAS 1 AND 3
PIRANA LANDFILL, INDIA**

Year	Waste Disposed (Mg/year)	Cumulative Waste Disposed (Mg)
2000	193,130	193,130
2001	279,140	472,270
2002	0	472,270
2003	545,550	1,017,820
2004	630,070	1,647,890
2005	728,300	2,376,190
2006	809,860	3,186,050
2007	850,400	4,036,450
2008	553,550	4,590,000

Table 2-2 summarizes the estimates of historical and future waste disposal through closure in 2008 under Disposal Scenario 2, which is consistent with the estimated volumes of waste in place and reported years of disposal.

**TABLE 2-2. WASTE DISPOSAL RATES
UNDER DISPOSAL SCENARIO 2
AREAS 1 AND 3
PIRANA LANDFILL, INDIA**

Year	Waste Disposed (Mg/year)	Cumulative Waste Disposed (Mg)
1985	98,850	98,850
1986	126,690	225,540
1987	135,850	361,390
1988	134,080	495,470
1989	128,810	624,280
1990	172,460	796,740
1991	216,420	1,013,160
1992	204,490	1,217,650
1993	215,230	1,432,880
1994	159,720	1,592,600
1995	121,580	1,714,180
1996	150,580	1,864,760
1997	164,810	2,029,570
1998	171,900	2,201,470
1999	179,790	2,381,260
2000	186,690	2,567,950
2001	132,050	2,700,000
2002	0	2,700,000
2003	183,190	2,883,190
2004	211,570	3,094,760
2005	244,550	3,339,310
2006	271,940	3,611,250
2007	425,200	4,036,450
2008	553,550	4,590,000

2.3 WASTE COMPOSITION

Waste composition is an important consideration in evaluating an LFG recovery project, in particular the organic content, moisture content, and “degradability” of the various waste fractions. For example, landfills with a high amount of food wastes, which are highly degradable,

will tend to produce LFG sooner but over a shorter length of time. The effect of waste composition on LFG production is discussed further in Section 4.

Data on the composition of wastes disposed at the Pirana Landfill was not available. Waste composition data from the Gorai Landfill in Mumbai reported by TCE Consulting Engineers in a Methane to Markets workshop presentation in Mumbai on March 6, 2006 was used for this study. General observations of waste composition during the pump test appears consistent with the waste composition data provided in Table 2-3, which shows that food waste and construction and demolition waste (including earth fill) make up over 65 percent of wastes disposed.

TABLE 2-3. WASTE COMPOSITION DATA

Component	Fraction of Waste Stream (%)
Food Waste	35.7
Garden Waste	6.3
Wood Waste	0.0
Paper and Cardboard	11.8
Plastics	5.0
Rubber, Leather	2.5
Textiles	7.5
Other Organics	0.0
Metals	0.8
Glass and ceramics	0.4
Construction and demolition waste (including sand and earth fill)	30.0
TOTAL	100.0

2.4 OTHER SITE CHARACTERISTICS

No LFG collection system or venting wells exist at the Pirana Landfill. Leachate collection does not occur at the site. Waste pickers are present in the active disposal areas.

SECTION 3.0 LANDFILL GAS PUMP TEST PROGRAM

3.1 PUMP TEST BACKGROUND INFORMATION

A pump test program was conducted at the Pirana Landfill. The objectives of the pump test were:

- To measure vacuum (pressure) and flow relationships while actively extracting LFG from the landfill.
- To measure sustainable methane levels of the extracted LFG during the pump test.
- To measure vacuum (pressure) in probes to estimate the lateral vacuum influence of the active pump test.
- To measure oxygen levels of the extracted biogas during the pump test to check for air infiltration through the landfill surface during the pump test.
- Utilize the results of the pump test to refine the projections of LFG recovery.

The pump test generally consisted of the following physical elements and equipment:

- A total of three vertical extraction wells constructed with PVC piping (referred to as Wells 1, 2, and 3). All three wells were installed in Area 3 of the landfill. Well depths were 14 m. Well construction consisted of a 6-inch (0.15 m) diameter PVC well casing and the annulus was backfilled with gravel, bentonite clay, and soil. Figure 3-1 presents a typical detail of construction for the extraction wells. Well construction logs are provided in Appendix A.
- A total of 18 gas and pressure monitoring probes. Six probes were installed for each extraction well. The probes were installed in shallow (1.5 m depth) and deep (4 m depth) pairs in line at distances of about 5, 15, and 25 meters from each extraction well. Figure 3-2 presents a typical detail of construction for the monitoring probes.
- An electrically-powered mechanical blower, to exert a vacuum on the extraction wells and withdraw LFG from the wells. The blower was powered on-site by a portable diesel powered electrical generator and was run continuously during the pump test.
- Interconnection of the three extraction wells and the blower with 2-inch and 4-inch diameter flexible piping. Flow control valves were installed at each extraction well and at the blower inlet to allow adjustment of vacuum and flow both system-wide and at individual wells. Figure 3-3 is a drawing showing the layout of the pump test system.

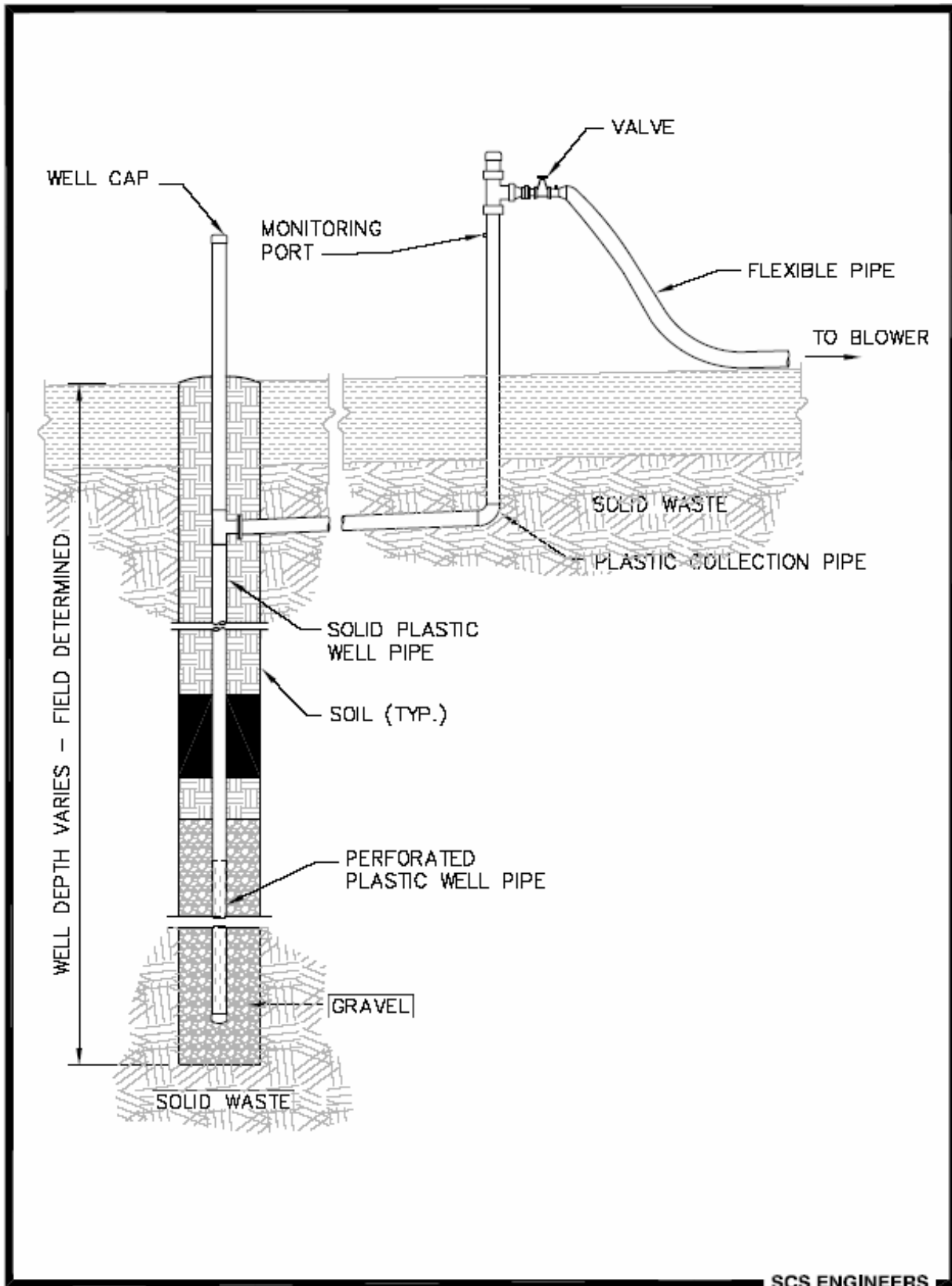


Figure 3-1. Typical LFG Extraction Well and Well-head Diagram

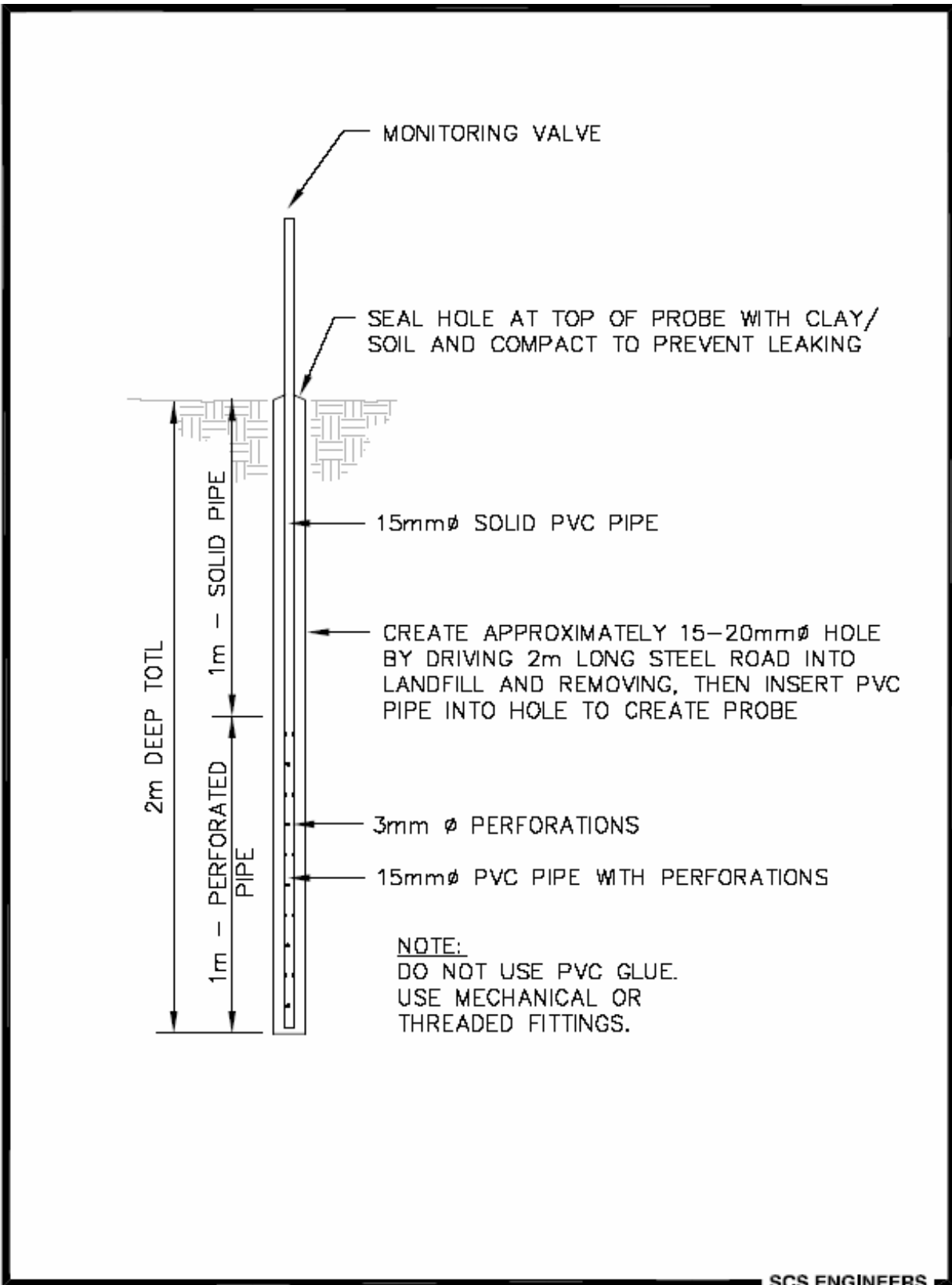
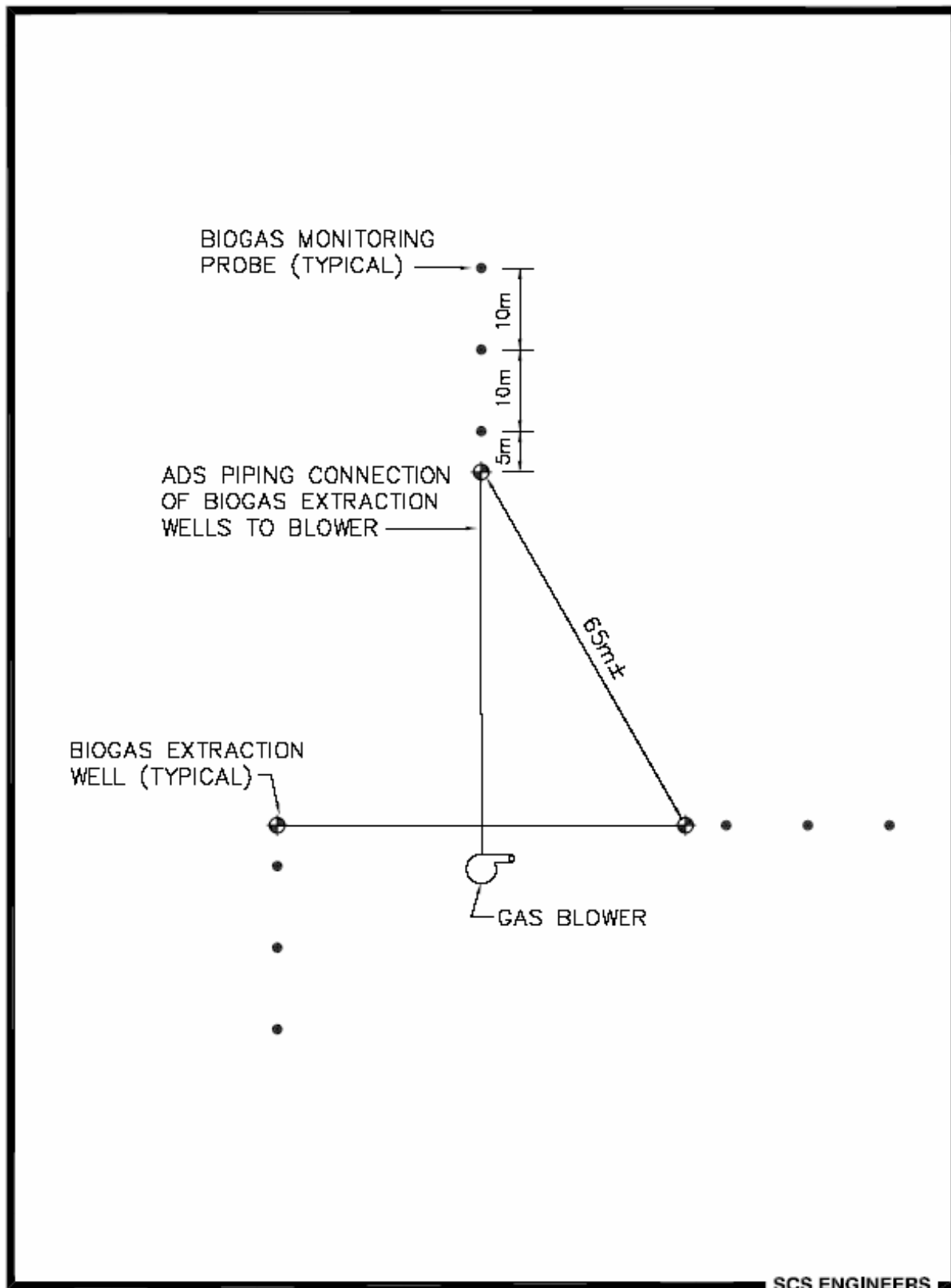


Figure 3-2. Monitoring Probe Diagram



SCS ENGINEERS

Figure 3-3. Pump Test Layout

- Gas testing, and flow and pressure monitoring equipment. Gas quality (methane, oxygen) and static pressure measurements were taken using a Landtec GEM 500 Infrared Gas Analyzer (GEM 500). Gas velocity measurements were taken using an TSI VelociCheck thermal anemometer.

The Project Team contracted with Anandjiwala Technical Consultancy for the drilling and construction of the three extraction wells and the installation of the 18 monitoring probes. SCS Engineers and Anandjiwala Technical Consultancy performed the installation of the blower, motor, generator, and interconnecting piping, and provided construction oversight.

SCS personnel were on site for a portion of the drilling and well installation activities and observed the following:

- The drilling method used water to flush out the cuttings. This made even qualitative observation of the waste cuttings difficult. The plastic portion of the cuttings were clearly observed, however fine organic and inorganic cuttings were not observable.
- After installation of the extraction wells was completed, each extraction well was dewatered. The dewatering process appeared to remove the water injected into the boring during drilling. After dewatering, leachate did not appear to infiltrate either of the three extraction wells.

Anandjiwala Technical Consultancy performed monitoring of the wells and probes and recorded the data. Figures 3-4 and 3-5 below show photographs of the drill rig during probe installation and an extraction well, blower, and collection piping used during the pump test.



Figure 3-4. Pump Test Extraction Well and Drill Rig



Figure 3-5. Pump Test Blower and Collection Piping

3.2 PUMP TEST ACTIVITIES AND RESULTS

Test Program: Passive Conditions

On July 24, 2007, Anandjiwala Technical Consultancy performed gas quality monitoring to document system conditions under static (i.e., passive) conditions for comparison with data to be taken under active conditions. Table 3-1 presents a summary of the average static conditions at each monitoring point. In general, gas quality measured at the wells under static conditions was observed to be very good (i.e., high methane levels, with low oxygen). Additional pump test monitoring results are provided in Appendix B.

Test Program: Active Conditions

On the morning of August 1, 2007, the blower was turned on and active extraction conditions were established. During active gas pumping, wells, probes, and the header piping leading to the blower were monitored several times daily for the following parameters:

- Wells and header: methane, oxygen, static pressure, temperature, and gas flow velocity;
- Probes: methane, oxygen, and static pressure.

TABLE 3-1: PUMP TEST PROGRAM - STATIC CONDITIONS

Location	Methane (%)	Oxygen (%)
Well 1	72.0	1.1
Probe 1A-deep	19.0	16.0
Probe 1A-shallow	45.5	7.6
Probe 1B-deep	75.3	0.7
Probe 1B-shallow	65.3	0.7
Probe 1C-deep	70.4	0.7
Probe 1C-shallow	76.4	0.5
Well 2	66.9	3.2
Probe 2A-deep	74.1	0.6
Probe 2A-shallow	53.6	5.9
Probe 2B-deep	55.3	0.7
Probe 2B-shallow	73.3	0.3
Probe 2C-deep	71.5	0.5
Probe 2C-shallow	73.2	0.5
Well 3	72.0	0.7
Probe 3A-deep	70.7	0.8
Probe 3A-shallow	43.9	6.3
Probe 3B-deep	73.1	0.6
Probe 3B-shallow	66.3	0.8
Probe 3C-deep	72.8	0.5
Probe 3C-shallow	70.9	0.6

Appendix B provides a complete data set showing the monitoring data taken during this valid period for the three wells, 18 probes, and the header pipe leading to the blower. To estimate flow for each extraction well and cumulative flow with the header pipe leading to the blower, gas velocity was measured at a straight pipe section of appropriate length.

Extraction Well Data

Tables 3-2 through 3-4 summarize the monitoring results for Wells 1 through 3, respectively, and show the average of the measured values and calculated flows for each of the days that monitoring occurred (18 of the 20 days of active system operation).

TABLE 3-2. SUMMARY OF WELL 1 MONITORING RESULTS

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]	Temperature [°F]	Velocity [fpm]	LFG Flow [acfm]	Methane Flow [acfm]	LFG Flow @50% CH4 [scfm]
1-Aug-07	14.8	17.1	-10.6	97.0	130.3	20.9	3.1	5.6
3-Aug-07	63.5	2.7	-7.9	97.8	44.0	8.6	5.4	9.8
4-Aug-07	67.2	1.6	-7.4	97.8	79.8	7.0	4.6	8.3
5-Aug-07	65.0	2.3	-10.8	95.0	36.5	3.2	2.1	3.8
6-Aug-07	63.5	2.7	-10.8	98.0	82.0	7.2	4.4	8.1
7-Aug-07	55.0	4.9	-11.4	94.3	111.8	9.8	5.1	9.4
9-Aug-07	47.5	7.2	-10.4	90.3	37.3	3.3	1.5	2.8
10-Aug-07	54.3	5.2	-9.1	92.4	103.8	9.1	4.8	8.8
11-Aug-07	53.9	4.9	-10.7	89.3	66.8	5.8	3.2	5.9
12-Aug-07	51.4	6.6	-10.5	92.0	47.0	4.1	2.1	3.9
13-Aug-07	50.0	6.6	-11.2	91.0	56.5	4.9	2.4	4.4
14-Aug-07	53.2	4.3	-10.4	90.0	204.0	17.8	9.5	17.5
15-Aug-07	53.8	5.1	-10.7	95.0	71.0	6.2	3.3	6.1
16-Aug-07	48.8	20.5	-10.5	97.3	87.3	7.6	3.7	6.7
17-Aug-07	52.8	3.8	-18.6	98.0	422.5	36.9	19.4	34.6
18-Aug-07	56.0	4.0	-10.7	91.5	333.3	29.1	16.3	30.0
19-Aug-07	59.2	2.4	-14.4	96.0	369.5	32.2	19.3	34.9
20-Aug-07	59.5	1.9	-10.6	99.5	225.0	19.6	11.7	21.1
Averages	53.8	5.8	-10.9	94.6	139.3	13.0	6.8	12.3
Aug. 17-19 Average (Maximum)	56.1	3.4	-14.6	95.2	375.1	32.7	18.4	33.1

The results of the extraction well monitoring indicate the following:

- Well 1 had very low gas quality (low methane and very high oxygen) on August 1 but had fairly high methane levels for the remainder of the pump test (ranging from 47 to 68 percent methane), despite high oxygen levels above 5 percent on August 9, 10, 12, 13, and 16. Applied vacuum remained fairly steady (ranging from -7.4 to -11.4 inches w.c.) until August 17, when vacuum was increased to -18.6 inches w.c. During August 18-20 applied vacuum remained between -10.6 and -14.4 inches w.c.. LFG flows fluctuated significantly prior to August 17 despite the fairly steady applied vacuum, and then increased to the highest levels observed (21 to 35 scfm adjusted to 50% methane) during August 17-20.
- Well 2 had methane levels above 60 percent on August 3 and 4, but gas quality remained at more moderate levels for the remainder of the pump test. Methane ranged from 31 to 53 percent, and oxygen levels were high (between 4.3 and 12.5 percent, with 12 days above 5 percent). Applied vacuum fluctuated between -4.7 and -11.9 inches w.c. during the first five days of the pump test, but remained fairly steady (ranging from -9.2 to -11.3 inches w.c.) until August 17, when vacuum was increased to -18.3 inches w.c.. During

August 18-20 applied vacuum remained between -10.5 and -14.2 inches w.c.. LFG flows reached 20 scfm (adjusted to 50% methane) on August 1, but remained low afterwards (ranging from 0.5 to 11.2 scfm adjusted to 50% methane) until the increased vacuum was applied on August 17, when flows reached their highest levels (33 scfm at 50% methane). LFG recovery declined during August 18-20 as vacuum was decreased, but remained above 13 scfm (at 50% methane).

- Well 3 had very high gas quality throughout the pump test, and averaged 68 percent methane and less than one percent oxygen. Applied vacuum before August 17 remained fairly steady (ranging from -7.2 to -10.9 inches w.c.). On August 17 vacuum was increased to -18.2 inches w.c.. From August 18-20 applied vacuum remained between -10.5 and -14.3 inches w.c. LFG flows reached 23 and 19 scfm (adjusted to 50% methane) on August 1 and 2, respectively, but remained low afterwards (ranging from 1.6 to 11.1 scfm adjusted to 50% methane) until the increased vacuum was applied on August 17, when flows reached their highest levels (61 scfm at 50% methane). LFG recovery declined during August 18-20 as vacuum was decreased, but remained above 14 scfm (at 50% methane).

TABLE 3-3. SUMMARY OF WELL 2 MONITORING RESULTS

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]	Temperature [°F]	Velocity [fpm]	LFG Flow [acfm]	Methane Flow [acfm]	LFG Flow @50% CH4 [scfm]
1-Aug-07	44.0	8.1	-10.4	97.7	149.3	23.9	10.8	19.6
3-Aug-07	61.8	1.8	-5.2	97.5	28.5	5.6	3.3	6.1
4-Aug-07	63.0	2.2	-4.7	105.0	5.0	0.4	0.3	0.5
5-Aug-07	45.5	7.6	-11.9	92.0	68.0	5.9	2.8	5.1
6-Aug-07	52.8	5.0	-5.3	98.3	52.8	4.6	2.4	4.5
7-Aug-07	51.3	5.5	-10.6	97.5	33.5	2.9	1.5	2.7
9-Aug-07	52.1	5.3	-11.3	89.0	68.5	6.0	3.1	5.7
10-Aug-07	38.6	10.3	-9.2	90.4	98.2	8.6	3.9	7.3
11-Aug-07	31.1	12.5	-10.7	88.8	132.8	11.6	3.6	6.7
12-Aug-07	34.8	11.1	-10.9	93.0	72.0	6.3	2.2	4.0
13-Aug-07	37.9	10.3	-11.3	90.8	87.5	7.6	2.7	5.0
14-Aug-07	40.8	8.8	-10.4	93.0	177.7	15.5	6.1	11.2
15-Aug-07	46.0	7.6	-10.4	97.0	73.0	6.4	2.9	5.3
16-Aug-07	42.5	7.2	-10.9	97.3	116.8	10.2	4.0	7.3
17-Aug-07	50.6	4.7	-18.3	97.5	415.0	36.2	18.6	33.1
18-Aug-07	44.1	7.2	-10.8	91.8	307.5	26.8	11.7	21.5
19-Aug-07	53.5	4.5	-14.2	95.0	174.0	15.2	8.0	14.5
20-Aug-07	52.6	4.3	-10.5	99.5	159.0	13.9	7.3	13.2
Averages	46.8	6.9	-10.4	95.0	123.3	11.5	5.3	9.6
Aug. 17-19 Average (Maximum)	49.1	5.4	-14.4	94.8	298.8	26.1	12.8	23.1

TABLE 3-4. SUMMARY OF WELL 3 MONITORING RESULTS

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]	Temperature [°F]	Velocity [fpm]	LFG Flow [acfm]	Methane Flow [acfm]	LFG Flow @50% CH4 [scfm]
1-Aug-07	66.3	1.6	-10.4	94.0	122.3	19.0	12.6	23.0
3-Aug-07	69.2	0.7	-7.3	97.0	76.5	15.0	10.3	18.9
4-Aug-07	69.5	0.6	-7.2	100.0	14.5	1.3	0.9	1.6
5-Aug-07	69.1	0.6	-10.4	96.0	35.0	3.1	2.1	3.8
6-Aug-07	67.7	0.9	-10.7	98.5	84.3	7.4	4.9	9.0
7-Aug-07	67.6	0.8	-10.7	97.0	44.8	3.9	2.6	4.8
9-Aug-07	70.4	0.3	-10.8	91.0	57.3	5.0	3.5	6.5
10-Aug-07	63.4	2.2	-11.2	92.0	121.8	10.6	7.0	12.7
11-Aug-07	68.6	0.4	-10.9	92.0	58.8	5.1	3.3	6.1
12-Aug-07	70.3	0.7	-10.5	98.0	47.0	4.1	2.9	5.2
13-Aug-07	70.0	0.4	-10.7	92.0	77.0	6.7	4.7	8.7
14-Aug-07	70.4	0.3	-10.2	94.3	105.3	9.2	6.5	11.8
15-Aug-07	72.0	0.2	-10.1	97.0	75.0	6.5	4.7	8.6
16-Aug-07	65.5	0.7	-10.5	99.5	208.8	18.2	11.8	21.3
17-Aug-07	67.5	0.3	-26.0	99.0	590.0	51.5	34.8	60.5
18-Aug-07	68.0	0.2	-10.8	92.0	303.8	26.5	18.0	33.1
19-Aug-07	68.0	0.1	-14.3	95.8	301.0	26.3	18.2	32.8
20-Aug-07	68.8	0.6	-10.5	98.5	131.5	11.5	7.9	14.3
Averages	67.8	0.6	-11.3	95.8	136.4	12.8	8.7	15.7
Aug. 17-19 Average (Maximum)	68.1	0.2	-17.0	95.6	398.3	34.8	23.7	42.1

Overall, Well 3 was the most productive in terms of methane and LFG flows during the pump test. Methane and LFG flow reached maximum levels recorded in any well in Well 3 on the morning of August 19 (79 scfm at 50% methane), when applied vacuum was -26 inches w.c. Measured LFG recovery during the pump test exceeded 40 scfm (at 50% methane) a total of eight times, including whenever well vacuum was at least -26 inches w.c. (occurred a total of five times on July 17 and 19 – twice in Wells 1 and 3, once in Well 2). These data indicate the following:

- LFG recovery appears to be maximized at high vacuum levels (-26 inches w.c.).
- LFG recovery was not maximized during most of the pump test.
- Steady-state conditions did not appear to be reached during the pump test.

The average of measurements taken during August 17-19 (shown in Tables 3-2 through 3-4) is considered representative of maximum LFG recovery rates. During this period, average LFG recovery at 50 percent methane was 33 scfm in Well 1, 23 scfm in Well 2, and 42 scfm in Well 3. Because steady state conditions were not likely achieved, it is not clear that these recovery rates would be sustainable over a longer period.

Monitoring Probe Data--

As mentioned previously, a total of 18 monitoring probes (three shallow and three deep probes per well) were installed. The objective of the probes is to measure gas quality and static pressures at varying distances from each extraction well in order to estimate the radius or volume of influence of each well. This was performed under static conditions on July 24 and during wellfield operation on August 1 through 20.

The probe monitoring data is provided in Appendix B. The most direct indication that a monitoring probe is within the influence of an extraction well is negative static pressure (vacuum) at the probe. Another indication is a significant decline in methane content accompanied by an increase in the concentrations of oxygen and balance gases. Five Well 1 probes and two Well 3 probes had monitoring data showing negative static pressure or methane levels below 20 percent. The Well 2 probes showed no indication of extraction well influence. Increases in applied vacuum at the wells during August 17-19 did not produce increased evidence of extraction well influence in any of the probes.

The monitoring results showing extraction well influence are summarized in Tables 3-5 through 3-11. The probes appear to indicate that the Well 1 radius of influence (ROI) reached at least 25m and the Well 3 ROI reached at least 5m.

**TABLE 3-5. SUMMARY OF MONITORING RESULTS
FOR PROBE 1A - DEEP (5m from Well 1)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	19.0	16.0	--	0.0
1-Aug-07	15.9	18.3	0.0	-10.6
3-Aug-07	16.1	22.8	0.0	-7.9
4-Aug-07	69.1	0.8	2.4	-7.4
5-Aug-07	58.2	3.0	0.0	-10.8
6-Aug-07	58.0	4.1	1.4	-10.8
7-Aug-07	18.2	16.2	-0.1	-11.4
9-Aug-07	26.3	13.9	-0.1	-10.4
10-Aug-07	18.2	16.2	-0.1	-9.1
11-Aug-07	26.3	13.9	-0.1	-10.7
13-Aug-07	22.6	14.2	0.0	-11.2
14-Aug-07	42.6	8.9	1.1	-10.4
16-Aug-07	49.8	5.4	2.3	-10.5
17-Aug-07	54.0	27.7	3.4	-18.6
18-Aug-07	54.1	4.6	2.4	-10.7
19-Aug-07	15.0	16.4	0.0	-14.4
20-Aug-07	54.2	4.8	1.9	-10.6

**TABLE 3-6. SUMMARY OF MONITORING RESULTS
FOR PROBE 1A - SHALLOW (5m from Well 1)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	45.5	7.6	--	0.0
1-Aug-07	54.6	2.8	1.8	-10.6
3-Aug-07	59.0	0.5	1.8	-7.9
4-Aug-07	40.9	17.7	0.0	-7.4
5-Aug-07	21.3	15.8	-0.1	-10.8
6-Aug-07	18.5	15.8	0.1	-10.8
7-Aug-07	9.6	17.9	-0.1	-11.4
9-Aug-07	10.5	18.1	0.0	-10.4
10-Aug-07	9.6	18.3	0.0	-9.1
11-Aug-07	27.4	12.7	0.7	-10.7
13-Aug-07	9.5	17.9	0.5	-11.2
14-Aug-07	11.4	17.5	0.0	-10.4
16-Aug-07	8.2	18.0	0.0	-10.5
17-Aug-07	8.3	18.3	0.0	-18.6
18-Aug-07	10.8	17.8	0.0	-10.7
19-Aug-07	54.5	4.3	2.6	-14.4
20-Aug-07	17.1	15.7	0.0	-10.6

**TABLE 3-7. SUMMARY OF MONITORING RESULTS
FOR PROBE 1B - DEEP (15m from Well 1)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	75.3	0.7	--	0.0
1-Aug-07	4.9	18.3	0.0	-10.6
3-Aug-07	5.0	18.5	0.0	-7.9
4-Aug-07	70.9	0.7	3.3	-7.4
5-Aug-07	3.9	19.5	0.0	-10.8
6-Aug-07	4.0	17.3	0.0	-10.8
7-Aug-07	4.3	18.7	-0.1	-11.4
9-Aug-07	4.6	19.2	-0.4	-10.4
10-Aug-07	4.4	3.6	-2.2	-9.1
11-Aug-07	4.6	18.9	0.0	-10.7
13-Aug-07	4.1	18.7	0.0	-11.2
14-Aug-07	4.7	19.1	0.0	-10.4
16-Aug-07	4.6	18.5	0.0	-10.5
17-Aug-07	4.2	18.5	0.0	-18.6
18-Aug-07	4.4	18.4	0.0	-10.7
19-Aug-07	4.5	18.0	0.0	-14.4
20-Aug-07	5.3	18.6	0.0	-10.6

**TABLE 3-8. SUMMARY OF MONITORING RESULTS
FOR PROBE 1B - SHALLOW (15m from Well 1)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	65.3	0.7	--	0.0
1-Aug-07	72.9	0.5	3.5	-10.6
3-Aug-07	73.0	0.4	3.2	-7.9
4-Aug-07	4.1	18.3	0.0	-7.4
5-Aug-07	71.0	0.4	3.2	-10.8
6-Aug-07	71.5	0.6	3.1	-10.8
7-Aug-07	70.9	0.6	3.4	-11.4
9-Aug-07	73.8	0.4	1.4	-10.4
10-Aug-07	73.6	0.4	2.8	-9.1
11-Aug-07	71.9	0.4	4.2	-10.7
13-Aug-07	71.7	0.5	4.3	-11.2
14-Aug-07	72.5	5.4	2.7	-10.4
16-Aug-07	68.3	0.4	3.0	-10.5
17-Aug-07	71.5	0.3	4.0	-18.6
18-Aug-07	71.6	0.3	4.0	-10.7
19-Aug-07	69.3	0.3	4.1	-14.4
20-Aug-07	67.4	0.5	3.4	-10.6

**TABLE 3-9. SUMMARY OF MONITORING RESULTS
FOR PROBE 1C - DEEP (25m from Well 1)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	70.4	0.7	--	0.0
1-Aug-07	4.6	19.0	0.0	-10.6
3-Aug-07	5.0	17.6	0.0	-7.9
4-Aug-07	4.6	17.4	0.0	-7.4
5-Aug-07	3.8	19.4	0.0	-10.8
6-Aug-07	3.9	17.2	0.0	-10.8
7-Aug-07	3.7	18.8	0.0	-11.4
9-Aug-07	5.2	19.0	0.0	-10.4
10-Aug-07	3.8	19.0	0.0	-9.1
11-Aug-07	3.8	18.7	0.0	-10.7
13-Aug-07	3.5	19.8	0.0	-11.2
14-Aug-07	4.2	19.7	0.0	-10.4
16-Aug-07	4.0	18.8	0.0	-10.5
17-Aug-07	3.8	18.5	0.0	-18.6
18-Aug-07	4.0	18.9	0.0	-10.7
19-Aug-07	3.5	19.0	0.0	-14.4
20-Aug-07	4.1	18.9	0.0	-10.6

**TABLE 3-10. SUMMARY OF MONITORING RESULTS
FOR PROBE 3A - DEEP (5m from Well 3)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	70.7	0.8	--	0.0
1-Aug-07	8.0	18.6	0.0	-10.4
3-Aug-07	7.8	17.9	0.0	-7.3
4-Aug-07	9.7	17.6	0.0	-7.2
5-Aug-07	69.3	0.3	0.7	-10.4
6-Aug-07	7.0	18.1	0.0	-10.7
7-Aug-07	8.0	17.9	0.0	-10.7
9-Aug-07	29.7	12.1	1.6	-10.8
10-Aug-07	53.0	3.3	4.6	-11.2
11-Aug-07	48.3	3.1	-2.4	-10.9
13-Aug-07	46.3	7.2	-4.1	-10.5
14-Aug-07	37.0	10.2	-6.6	-10.7
16-Aug-07	41.1	8.2	0.7	-10.2
17-Aug-07	13.8	16.8	-0.1	-10.1
18-Aug-07	32.0	11.1	-5.3	-10.5
19-Aug-07	23.7	12.7	1.1	-26.0
20-Aug-07	9.5	17.1	-6.2	-10.8

**TABLE 3-11. SUMMARY OF MONITORING RESULTS
FOR PROBE 3A - SHALLOW (5m from Well 3)**

Date	Methane (%)	Oxygen (%)	Static Pressure (in. w.c.)	Applied Vacuum at Adjacent Well (in. w.c.)
24-Jul-07	43.9	6.3	--	0.0
1-Aug-07	65.9	0.9	0.8	-10.4
3-Aug-07	68.9	0.8	0.7	-7.3
4-Aug-07	67.7	0.7	0.5	-7.2
5-Aug-07	10.8	18.3	0.0	-10.4
6-Aug-07	67.7	0.6	0.6	-10.7
7-Aug-07	66.9	0.6	0.9	-10.7
9-Aug-07	69.4	0.3	1.7	-10.8
10-Aug-07	69.2	0.2	1.3	-11.2
11-Aug-07	67.7	3.8	1.2	-10.9
13-Aug-07	69.7	0.3	1.4	-10.5
14-Aug-07	69.9	0.1	1.1	-10.7
16-Aug-07	67.8	0.3	1.0	-10.2
17-Aug-07	68.2	0.1	0.8	-10.1
18-Aug-07	66.4	0.2	0.9	-10.5
19-Aug-07	66.7	0.0	0.9	-26.0
20-Aug-07	65.5	0.5	0.7	-10.8

Header Data--

LFG flow velocity, methane, oxygen, static pressure, and temperature was measured along a straight section of header piping leading to the inlet to the gas blower to calculate gas flows. A summary of the monitoring results for the header is provided below in Table 3-11. The complete set of header monitoring data for the August 1 – 20 period is provided in Appendix B.

TABLE 3-12. SUMMARY OF HEADER MONITORING RESULTS

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]	Temp. [°F]	Velocity [fpm]	LFG Flow [acfm]	LFG Flow @ 50% Methane (scfm)
1-Aug-07	19.1	16.1	-12.7	94.0	143	12.5	4.4
3-Aug-07	21.7	15.5	-27.7	96.0	259	22.6	7.9
4-Aug-07	27.7	12.9	-26.2	94.0	224	19.5	9.2
5-Aug-07	33.8	11.5	-26.8	80.5	555	48.4	28.8
6-Aug-07	31.7	11.6	-26.2	94.5	325	28.4	16.1
7-Aug-07	26.8	12.8	-26.1	94.0	303	26.4	12.6
9-Aug-07	29.1	12.9	-26.4	91.3	391	34.1	14.7
10-Aug-07	27.4	13.5	-26.6	87.5	498	43.4	21.4
11-Aug-07	28.8	12.7	-26.6	87.8	308	26.9	14.6
12-Aug-07	24.0	14.5	-26.6	83.0	74	6.5	2.8
13-Aug-07	24.2	13.6	-30.1	89.8	234	20.4	8.1
14-Aug-07	33.6	11.0	-12.3	89.5	221	19.3	11.7
15-Aug-07	35.4	10.5	-11.4	93.5	300	26.2	17.5
16-Aug-07	31.2	11.4	-16.8	98.3	177	15.4	7.4
17-Aug-07	31.4	13.2	-18.6	100.0	122	10.6	6.6
18-Aug-07	35.2	10.2	-13.6	90.3	419	36.5	23.5
19-Aug-07	41.8	7.7	-14.1	97.3	245	21.3	15.9
20-Aug-07	44.1	5.8	-18.1	99.3	299	26.1	20.5
Averages	30.7	12.1	-21.5	92.2	283	24.7	13.5

The header data show relatively poor LFG quality, with low methane concentrations and high oxygen levels (averaging 30.7% methane and 12.1% oxygen), although gas quality generally improved during the pump test. LFG flows adjusted to 50 percent methane started out very low, but steadily increased during the first few days of system operation day, reaching near maximum levels (28.8 scfm) on August 5. LFG flows declined for two days and then reached maximum levels (29.2 scfm) on August 9. LFG flows declined rapidly thereafter, reached a low of 2.8 scfm on August 12, and remained below 20 scfm until August 18 (23.5 scfm), and August 20 (20.5 scfm).

As shown in Table 3-11, LFG flows averaged 24.7 cfm at 30.7 percent methane (converts to 13.5 scfm at 50% methane) during the pump test, which was significantly less than average flows at

each of the three extraction wells. The extremely low flow readings at the header, combined with low methane and high oxygen levels, indicate problems with air intrusion or with the flow or methane measurements. Flow measurements at the wells may be more representative of achievable recovery rates at the landfill.

3.3 INTERPRETATION OF PUMP TEST RESULTS

The Project Team evaluated the results of the pump test to determine if they can be used for the projection of LFG recovery rates at the landfill (see Section 4.0). The general procedure by which the pump test data are utilized for this purpose is as follows:

1. Evaluate the monitoring data to determine if it indicates a steady state flow rate and radius of extraction well influence. There were several issues with the flow data that contribute to an uncertain estimates of a steady-state flow rate and radius of influence include the following: 1) the monitoring data does not provide evidence of the achievement of steady state conditions and provided limited evidence of extraction well influence (ROI) except at Well 1; 2) flow rates measured at the header leading to the blower are significantly less than the sum of the average LFG flow at each of the wells; 3) flow rates measured at the wells were at maximum levels during the August 17 – 19 monitoring events when applied vacuum also was at maximum levels; 4) data from the period of maximum well flows may represent temporary maximum recovery rates, which are not sustainable; 5) a reliance on flow data from wells rather than at the blower/flare station adds uncertainty to the flow rate estimates.
2. Estimate the maximum steady-state flow rate achievable in the pump test area. Total LFG recovery from the three wells averaged 37.7 scfm (at 50% methane). Assuming 75 percent of the August 17 – 19 average well recovery rate represents maximum steady state flows, the pump test indicated a maximum steady-state flow rate of 73.8 scfm (at 50% methane).
3. Estimate the ROI of the extraction wells. The monitoring data indicates that the ROI of Well 1 extended at least to the outermost probes (Probe 1C) located 25 meters from the well, and likely beyond.

General industry guidelines suggest that the ROI of an extraction well is a function of the well depth, and that extraction wells typically have a ROI between 1.25 and 3 times its depth, depending on well construction, refuse permeability, and other factors. The probe data from Well 1 suggest that the ROI was at least 25 meters, which is 1.79 times the well depth of 14 meters.

Based on these considerations and the results of the pump test, the Project Team estimates the average ROI of Well 1 under the conditions established during the pump test to be approximately 2 times the well depth of 14 meters, or 28 meters. Although the probe data for Wells 2 and 3 did not provide any clear indication of an ROI, the Project Team assumes that Wells 2 and 3 (which also are 14 m deep) have an ROI of 28 m.

4. Estimate the volume of refuse within the ROI of the extraction wells. Using the estimated ROI values for each well, the volume of refuse within the influence of the three wells during the pump test was calculated using an estimated average refuse depth of 22.5 meters; this volume is estimated to be approximately 166,253 cubic meters.
5. Estimate the unit recovery rate representing conditions achieved during the pump test (in cubic feet of LFG per year per pound of waste). Based on information provided by the City of Ahmedabad, the in-place refuse density at the landfill is estimated to be approximately 900 kg per cubic meter (approximately 1,517 lbs/yd³). This density can be applied to the volume of waste estimated to be within the influence of the pump test (166,253 m³), which results in 149,628 tonnes. The pump test average flow rate from the wells (37.7 scfm or 64 m³/hour) converts to 560,529 cubic meters per year, which results in a unit recovery rate of approximately 3.75 cubic meters per tonne per year. The estimated maximum steady-state flow rate (73.8 scfm or 125 m³/hour) converts to 1,097,969 cubic meters per year, which results in a unit recovery rate of approximately 7.34 cubic meters per tonne per year.
6. Extrapolate the unit recovery rate achieved during the pump test to the estimated total amount of refuse in the landfill. The estimate for total waste disposed in Areas 1 and 3 as of July 2007 is 3,611,250 tonnes. Extrapolating the low and high estimates of pump test unit recovery rates (3.75 and 7.34 m³/Mg-year) to the total estimated amount of waste deposited (3,611,250 tonnes), the project team estimates that the average gas capture at the entire landfill in 2007 (if a comprehensive gas collection system were in place) would range between 1,544 and 3,025 m³/hour (909 – 1,780 scfm). This estimate for the potential recovery rate was used for comparison against the LFG recovery projections developed in Section 4.

SECTION 4.0 LANDFILL GAS RECOVERY PROJECTIONS

4.1 INTRODUCTION

For projecting LFG recovery rates from the Pirana Landfill, the Project Team utilized the results of the pump test (see Section 3) to refine the mathematical modeling parameters. Specifically, the projected range of 1,544 to 3,025 m³/hour (909 – 1,780 scfm) for the landfill was used to evaluate the model and make adjustments as needed. The specific modeling approach is discussed below.

4.2 LANDFILL GAS MATHEMATICAL MODELING

Landfill gas is generated by the anaerobic decomposition of solid waste within a landfill. It is typically composed of between 40 to 60 percent methane, with the remainder primarily being carbon dioxide. The rate at which LFG is generated is largely a function of the type of waste buried and the moisture content and age of the waste. As is widely accepted throughout the industry, the LFG generation rate generally can be described by a first-order decay equation.

To estimate LFG generation and potential recovery rates for the landfill, the Project Team utilized the SCS International LFG model that employs a first-order decay equation identical to the algorithm in the U.S. EPA's landfill gas emissions model (LandGEM). The international LFG model is described in detail below.

SCS International LFG Model

The Project Team has developed a first-order decay model for estimating the LFG generation rate of landfills. The model, essentially a modified version of the EPA's LandGEM, was developed based on actual LFG collection/recovery data from over 160 landfills across the U.S., and adjusted to account for conditions at disposal sites in India.

When calibrating the model, the Project Team identified trends in the LFG collection data that were used to develop the model. Specifically, it was apparent that different values for the ultimate methane recovery potential [Lo] and the decay rate constant [k] were appropriate depending upon the amount of precipitation a landfill receives.

The SCS International LFG Model also is used to estimate LFG recovery by applying an estimate of collection system efficiency. Collection efficiency is defined as the fraction of generated LFG that is or will be collected, and reflects the extent that LFG collection system provides coverage of the landfill as well as the efficiency of system operation. Many factors can affect collection system efficiency, including: well spacing and depth, depth of well perforations, presence of a flexible membrane liner (FML) or low-permeability cover system, landfill type and depth, condition of LFG collection system, and other design and operational issues.

The Project Team used the model to estimate the projected LFG recovery rates for the landfill through 2035 using the following criteria and assumptions:

- **Refuse Disposal Rates** – The annual filling rates used in the model are provided in Tables 2-1 (Disposal Scenario 1) and 2-2 (Disposal Scenario 2). As described in Section 2-1, the landfill is projected to stop receiving waste in mid-2008 after receiving a total of 4.59 million tonnes. As was noted in Section 2, large inconsistencies in available information on the volume of waste in place at the landfill and the timing of historic waste disposal suggest significant uncertainty in the estimated historical disposal rates. Two sets of LFG recovery projections were developed which reflect the two waste disposal scenarios.
- **Methane Content of LFG** – Because the methane content of LFG fluctuates over time, it is standard industry practice to normalize the methane content to 50 percent for the purposes of LFG modeling.
- **Methane Rate Constant [k]** - The decay rate constant is a function of refuse moisture content, nutrient availability, pH, and temperature. For the Ahmedabad evaluation, three different k values were used based on the degradability of the waste components (see discussion of model inputs below).
- **Methane Generation Potential [Lo]** - The methane generation potential is the total amount of methane that a unit mass of refuse will produce given enough time. The Lo is a function of the organic content of the waste. For the Pirana Landfill, The Project Team started with a default Lo value of 100 cubic meters per tonne (3,204 ft³/ton) for generation from U.S. landfills (AP-42 or U.S. inventory value). This value was then adjusted based on the ratios of the organic content of U.S. waste and waste at the landfill (see discussion of model inputs below).
- **Methane Correction Factor [MCF]** – At unmanaged disposal sites such as Pirana, aerobic conditions will exist in a significant portion of the waste mass. To account for the portion of disposed waste which does not attain anaerobic conditions and produce LFG, the Intergovernmental Panel on Climate Change (IPCC) recommends that unmanaged sites greater than 5 meters in depth apply a methane correction factor (MCF) of 0.8 to account for the estimated amount of aerobic decay.³ The MCF was applied to the Lo as discussed below.
- **Collection System Efficiency.** Varies. The model estimates both LFG generation and the projected rate of LFG recovery using the estimated collection system efficiency. Collection efficiency is based on engineering judgment, and considers many factors including: whether the landfill is closed or active, extent and type of soil cover and liners, the type of well construction and gas system construction, the level of operation that is provided, the likelihood that system components such as pipes and wells may be damaged by landfill operations and/or settlement, how quickly damaged pipes and wells (and other equipment, such as blowers, etc.) are likely to be repaired, leachate levels in wells, and other factors. This value falls within the range of 0 percent (for no gas collection system) to an estimated maximum of 85 percent (for a comprehensive collection system over a closed landfill with excellent construction and operation).

³ MCF is 0.4 for unmanaged sites less than 5 meters deep.

Modifications to the estimated collection efficiency can be made to account for expected collection system expansions or if other changes to the LFG system or landfill are anticipated (e.g., landfill closure or partial capping, increasing flows due to the presence of additional fill material). Active landfills generally tend to have lower collection efficiencies than closed landfills due to the lack of final cover and the interferences caused by active filling operations or by waste pickers. Another potential issue that can limit system efficiency is concern over security of equipment (wells, piping, etc.), particularly at landfills that allow public access.

Pirana is at present an active site with limited soil cover and a significant population of waste pickers. There is no security fencing around the site to prevent unauthorized access. In order to prevent loss or damage to equipment, wells need to be installed only in closed areas with adequate fencing or walls to prevent unauthorized access. Since the landfill is projected to be closed before wells are installed in 2009, it is assumed that waste pickers will no longer be present at the site and security fencing will be constructed prior to gas collection system construction.

Given the above considerations, the Project Team has employed three collection efficiency scenarios in order to develop a range of estimates of predicted recovery with the proposed collection system. All three scenarios assume system start-up on January 1, 2009. Wellfield installation is assumed to be 80 percent complete in January 2009, with the remaining 20 percent completed by the end of the year (averaging 90 percent in 2009). The scenarios also assume that leachate management activities, including pumping out leachate accumulated in extraction wells, will be employed to limit the impact on LFG collection rates if leachate is encountered. Estimates of collection system efficiency vary under each of the three scenarios according to the expected level of skill and effort employed to operate and maintain the system.

The three scenarios result in low, mid-range, and high projections and are as follows:

1. The low recovery scenario assumes that a moderate level of skill and effort is employed in the operation and maintenance of the collection system (e.g., including wellfield monitoring and adjustment about once or twice per month). Collection efficiency is assumed to be 30 percent in 2009 and reach a maximum of 35 percent starting in 2010. The Project Team considers the low recovery estimates to be conservative and should be employed only if a large margin of safety is needed.
2. The mid-range recovery scenario assumes that a moderately high level of skill and effort is employed in the operation and maintenance of the collection system (e.g., including weekly wellfield monitoring and adjustment). Collection efficiency is assumed to be 45 percent in 2009 and 50 percent in 2010 and afterwards. The Project Team considers the mid-range recovery scenario to be its best estimates of likely recovery and recommends its use in the economic evaluation.
3. The high recovery scenario assumes that highest possible level of skill and effort is employed in the operation and maintenance of the collection system (e.g.,

including wellfield monitoring and adjustment several times per week). Collection efficiency is assumed to be 55 percent in 2009 and 60 percent in 2010 and afterwards. The Project Team considers the high recovery estimates to be ambitious and attainable only if the maintenance of an optimal LFG recovery system is considered to be a top priority.

Note that, in addition to the potential variability in collection efficiency and the level of operation and maintenance, mathematical modeling of LFG is inherently uncertain. The Project Team considered (and tried to account for) this modeling uncertainty in selecting the values for the high and low recovery scenarios when estimating LFG recovery.

Model Inputs--

For estimating the model parameters decay rate (k) and methane generation capacity (Lo) for the landfill, the Project Team took into consideration the estimated composition of waste buried in the Pirana Landfill. The Project Team compared the estimated composition of waste disposed in the landfill with U.S. EPA's waste characterization data for U.S. landfills. These data are presented in Table 4-1.

TABLE 4-1: COMPARISON OF WASTE COMPOSITION (%)

COMPONENTS	PIRANA LANDFILL ¹	TYPICAL U.S. ²	DEGRADABILITY CATEGORY	DECAY RATE (k)
Food	35.7	13.4	Fast	0.22
Green Waste ³	3.15	3.2	Fast	0.22
Other Organic	0.0	0.9	Fast	0.22
Green Waste ³	3.15	3.2	Medium	0.044
Paper	11.8	23.8	Medium	0.044
Textiles	7.5	4.4	Medium	0.044
Wood	0.0	8.5	Slow	0.011
Rubber, Leather	2.5	2.8	Slow	0.011
Plastics, Metals, Glass	6.2	24.3	Inert	0.0
Other Inorganic	30.0	15.5	Inert	0.0

Notes to Table 4-1:

1. No waste site-specific composition data was available for the Pirana Landfill. Pirana waste composition was estimated based on data for the Gorai Landfill in Mumbai.
2. U.S. data reflect 2001 MSW disposal data (source: USEPA, October 2003. Municipal Solid Waste in the United States: 2001 Facts and Figures - Table 3), with construction and demolition waste added (source: Cascadia Consulting Group, Inc., Statewide Waste Characterization Study – December 2004).
3. Assumes 50 percent of green waste disposed is highly degradable and 50 percent is moderately degradable.

One particularly important difference between the two sets of data is that the waste stream at the Pirana Landfill contains significantly more food wastes (which are highly degradable) than

typical U.S. wastes. Because food waste is so readily degraded, it produces LFG sooner, but over a shorter length of time. Therefore, a graph of LFG generation from wastes that are high in food waste, green waste, and other similar readily-degraded wastes will show a steeper slope in the LFG generation rate (reaching peak flows more rapidly), but a lower sustainable long term yield than the generation rate from waste with slower-degrading components. In the model, this effect is reflected in the parameter k.

Furthermore, the waste stream at the Pirana Landfill contains both a higher organic fraction than U.S. wastes and a higher level of moisture, primarily due to the food waste. The higher organic content will tend to increase the potential for methane generation per ton of waste. Conversely, however, the increased moisture content (which is inert) will tend to decrease the potential for methane generation per ton of waste. In the model, these effects are reflected in the parameter L_0 .

The specific approach for developing each parameter is discussed below.

Methane Decay Rate Constant--The k value reflects the fraction of refuse which decays in a given year and produces methane. An alternative approach to estimating a single k value for the entire landfill is to assign k values to different portions of the waste stream, based on their relative decay rates. Laboratory studies have suggested that fast-decaying organic refuse such as food waste typically decays at 5 times the rate of medium decay rate materials, such as wet paper, and 20 times the rate of slowly decaying components of the waste stream, such as textiles.⁴ Because landfill moisture content significantly affects decay rates, the values of the decay rates for the fast, medium, and slow decaying waste fractions will vary with moisture as well. However, the relative rates of decay are expected to remain constant, despite varying landfill moisture.

The primary benefit of evaluating decay rates for different waste components is that it provides a tool for comparing average U.S. k values to k values at specific landfills which may have significantly differing waste compositions. The procedure assumes that fast, medium, and slow decaying waste components will each have fixed k values for a given moisture regime in a landfill. Using average annual precipitation as a surrogate for landfill moisture conditions, fast, medium, and slow waste component k values can be developed for landfills with a given precipitation value, if a single overall k value is known for the entire landfill and can be used to calibrate the three k values.

The Project Team employs a set of default k values when preparing LFG recovery projections for U.S. landfills for USEPA LMOP. The k values vary with average annual precipitation as follows: 0.02/year for sites experiencing less than 20 inches of precipitation per year; 0.04/year for sites experiencing 20-39 inches of precipitation per year; and 0.065 for sites experiencing 40 or more inches of precipitation per year.

⁴ Ehrig, Hans-Jürgen, "Prediction of Gas Production from Laboratory-Scale Tests." Landfilling Waste: LFG Edited by T.H. Christenson, R. Cossu and R. Stegmann, E & FN Spon, London: 1996.

Ahmedabad receives 620 millimeters (32 inches) of rainfall annually. Given the appropriate k value for an average landfill in the U.S. experiencing 32 inches per year of rainfall (0.04/year), the procedure of developing k values for the Pirana Landfill is as follows:

1. Prepare a single-k LFG model run using the Pirana disposal data and the k value that would be appropriate for an average site in the U.S. experiencing 32 inches per year of precipitation (0.04/year).
2. Using the percentages of fast, medium, and slow-decaying waste components in the average U.S. waste stream and the Pirana disposal data, prepare a multi-phased LFG model (summing the results of the fast, medium, and slow refuse decay calculations). Keeping the fast to medium to slow ratios constant, adjust the fast-decaying waste k value so that the resulting LFG recovery projection matches as closely as possible the results of the single k model run using the U.S. default k value. The resulting k values are to be used in a 3-k model run for Pirana Landfill using the Pirana waste composition percentages.

The values for the three methane generation rate constants (k) initially used for modeling of LFG recovery at the Pirana Landfill, prior to adjustments for the results of the pump test, are as follows:

- Fast-decaying organic waste: 0.22 per year;
- Medium-decaying organic waste: 0.044 per year; and
- Slowly-decaying organic waste: 0.011 per year.

Methane Generation Potential--The Lo values for the Pirana Landfill were estimated by modifying the estimated Lo value for U.S. landfills based on the organic content of the waste (dry weight basis). Separate Lo values were developed for the three organic waste categories using the ratio of the dry organic waste percentages to average U.S. waste, and the estimated MCF. Table 4-2 summarizes the calculation of the Lo value.

The values for the potential methane generation capacity (Lo) for the Pirana Landfill were estimated to be as follows:

- Fast-decaying organic waste: 60 m³/Mg.
- Medium-decaying organic waste: 162 m³/Mg.
- Slowly-decaying organic waste: 175 m³/Mg.

TABLE 4-2. CALCULATION OF THE L_o VALUES

	U.S. LANDFILLS	PIRANA LANDFILL	RATIO: PIRANA / U.S.
Organic % (dry weight basis)	Total waste: 43.5%	Fast Organics: 32.4% Medium Organics: 87.9% Slow Organics: 95.0%	Fast Organics: 0.75 Medium Organics: 2.02 Slow Organics: 2.18
MCF	1	0.8	0.8
Lo values	Total waste: 100 m ³ /Mg	Fast Organics: 60 m ³ /Mg Medium Organics: 162 m ³ /Mg Slow Organics: 175 m ³ /Mg	Fast Organics: 0.60 Medium Organics: 1.62 Slow Organics: 1.75

4.3 LANDFILL GAS MODELING RESULTS

The Project Team estimated both the LFG generation rate at the landfill and the expected LFG recovery rate (which accounts for the collection efficiency factor described above) for each disposal scenario. As mentioned previously, the model results were compared with the results of the pump test to evaluate whether modifications to the model assumptions were required. The recovery projections and the comparison to the pump test results are described below.

LFG Generation

Using the assumptions outlined above, the Project Team estimates that the LFG generation rate for Areas 1 and 3 of the landfill in 2007 is 3,204 m³/hour (1,780 cfm) under Disposal Scenario 1 and 1,758 m³/hour (1,035 cfm) under Disposal Scenario 2. These estimates can be compared with the two LFG recovery estimates from the pump test: 1,544 m³/hour (909 scfm), which reflects the average recovery rate (measured at the wells); and 3,025 m³/hour (1,780 scfm), which represents the estimated maximum sustainable recovery rate at the wells.

The lower LFG recovery estimate from the pump test is 50 percent of the model estimate of LFG generation under Scenario 1 and 88 percent of the model estimate of LFG generation under Scenario 2. The higher LFG recovery estimate from the pump test is equal to 100 percent of the model estimate of LFG generation under Scenario 1 and 172 percent of the model estimate of LFG generation under Scenario 2. The pump test recovery rate estimates are derived by extrapolating measured LFG flows from the waste under the influence of the pump test to the entire landfill and reflect the maximum achievable collection efficiency. EPA estimates that the maximum achievable collection efficiency with a comprehensive system is 85 percent; thus the Scenario 1 LFG model indicates that the maximum recovery potential in 2007 is 2,570 m³/hour and the Scenario 2 LFG model indicates that the maximum recovery potential in 2007 is 1,494 m³/hour. The lower pump test recovery rate estimate is 40 percent below the Scenario 1 model based estimate of the 2007 recovery potential and three percent above the Scenario 2 model-

based estimate of the 2007 recovery potential. The higher pump test recovery rate estimate is 18 percent higher than the Scenario 1 model-based estimate of the 2007 recovery potential and 102 percent above the Scenario 2 model-based estimate of the 2007 recovery potential. The Scenario 1 model estimate appears to be supported by the upper estimate from the pump test results and the Scenario 2 model estimate appears to be supported by the lower estimate from the pump test results.

The Project Team's opinion is that the pump test results provide support to the LFG generation estimates developed via mathematical modeling. The Project Team did not adjust the LFG model assumptions according to the pump test results.

The Scenario 1 model projects that LFG generation will reach a maximum of 3,898 m³/hour (2,294 cfm) in 2009. LFG generation is projected to decline thereafter, reaching 3,437 m³/hour (2,023 cfm) in 2010, 1,812 m³/hour (1,066 cfm) in 2015, and 1,143 m³/hour (673 cfm) in 2020.

The Scenario 2 model projects that LFG generation will reach a maximum of 2,502 m³/hour (1,473 cfm) in 2009. LFG generation is projected to decline thereafter, reaching 2,270 m³/hour (1,336 cfm) in 2010, 1,286 m³/hour (757 cfm) in 2015, and 858 m³/hour (505 cfm) in 2020.

Scenario 1 LFG Recovery Estimates

The Project Team assumes that LFG recovery at the landfill will begin in January 2009. Under Scenario 1 and the mid-range collection efficiency assumptions, LFG recovery is projected to be 1,754 m³/hour (1,032 cfm) in 2009 and decline thereafter due to declining LFG generation. LFG recovery is projected to be 1,719 m³/hour (1,012 cfm) in 2010, 906 m³/hour (533 cfm) in 2015, and 571 m³/hour (336 cfm) in 2020.

Assuming that 100 percent of the amount of LFG recovered is available for use for electrical generation (i.e., not accounting for available engine capacities or parasitic loads), the model projects that a 1.5 MW power plant could be supported from 2009 through 2015 and a 1.0 MW power plant could be supported from 2009 through 2019. Table 4-3 presents a summary of the following estimates from the Scenario 1 model: projected LFG generation rates; LFG recovery rates under the mid-range collection efficiency assumptions; and corresponding maximum power plant sizes that could be supported by the projected amounts of LFG for 2009-2023.

TABLE 4-3. SUMMARY OF SCENARIO 1 LFG MODELING RESULTS UNDER THE MID-RANGE RECOVERY ASSUMPTIONS - PIRANA LANDFILL

Year	LFG Generation (m³/hour)	Estimated Collection Efficiency (%)	Projected LFG Recovery (m³/hour)	Projected LFG Recovery (cfm)	Projected Maximum Project Capacity (MW)
2009	3,898	45%	1,754	1,032	2.9
2010	3,437	50%	1,719	1,012	2.8
2011	2,977	50%	1,489	876	2.5
2012	2,599	50%	1,300	765	2.2
2013	2,287	50%	1,143	673	1.9
2014	2,028	50%	1,014	597	1.7
2015	1,812	50%	906	533	1.5
2016	1,631	50%	815	480	1.3
2017	1,478	50%	739	435	1.2
2018	1,349	50%	674	397	1.1
2019	1,238	50%	619	364	1.0
2020	1,143	50%	571	336	0.9
2021	1,060	50%	530	312	0.9
2022	988	50%	494	291	0.8
2023	925	50%	462	272	0.8

Scenario 2 LFG Recovery Estimates

Under Disposal Scenario 2 and the mid-range collection efficiency assumptions, LFG recovery is projected to be 1,126 m³/hour (663 cfm) in 2009, 1,135 m³/hour (668 cfm) in 2010, and decline thereafter due to declining LFG generation. LFG recovery is projected to be 643 m³/hour (379 cfm) in 2015 and 429 m³/hour (252 cfm) in 2020.

Assuming that 100 percent of the amount of LFG recovered is available for use for electrical generation (i.e., not accounting for available engine capacities or parasitic loads), the model projects that a 1.0 MW power plant could be supported from 2009 through 2015 and a 0.75 MW power plant could be supported from 2009 through 2019. Table 4-3 presents a summary of the following estimates from the Scenario 2 model: projected LFG generation rates; LFG recovery rates under the mid-range collection efficiency assumptions; and corresponding maximum power plant sizes that could be supported by the projected amounts of LFG for 2009-2023.

TABLE 4-4. SUMMARY OF SCENARIO 2 LFG MODELING RESULTS UNDER THE MID-RANGE RECOVERY ASSUMPTIONS - PIRANA LANDFILL

Year	LFG Generation (m ³ /hour)	Estimated Collection Efficiency (%)	Projected LFG Recovery (m ³ /hour)	Projected LFG Recovery (cfm)	Projected Maximum Project Capacity (MW)
2009	2,502	45%	1,126	663	1.9
2010	2,270	50%	1,135	668	1.9
2011	1,996	50%	998	587	1.7
2012	1,768	50%	884	520	1.5
2013	1,579	50%	789	465	1.3
2014	1,420	50%	710	418	1.2
2015	1,286	50%	643	379	1.1
2016	1,173	50%	586	345	1.0
2017	1,076	50%	538	317	0.9
2018	993	50%	496	292	0.8
2019	921	50%	460	271	0.8
2020	858	50%	429	252	0.7
2021	802	50%	401	236	0.7
2022	753	50%	377	222	0.6
2023	709	50%	355	209	0.6

Tables C-1 through C-4 in Appendix C provide detailed results of the LFG modeling for Scenarios 1 and 2, including the following:

- Estimated annual disposal rates and waste in place values.
- Projected LFG generation through 2035 (in m³/hour, cfm, and mmBtu/hour).
- The k values used for the fast, medium, and slowly decaying organic waste fractions.
- The Lo values used for the fast, medium, and slowly decaying organic waste fractions.
- Annual collection efficiency estimates under the low-range, mid-range, and high-range recovery assumptions.
- Predicted LFG recovery under each of the three sets of collection efficiency assumptions (in m³/hour, cfm, and mmBtu/hour).
- The maximum electrical power plant size (in kW) that can be supported by the predicted LFG recovery rates.
- Estimated emission reductions based on the predicted LFG recovery rates (including emissions reduction from LFG combustion only, not including avoided emissions from electricity generation or fuel displacement).

The projected LFG generation and recovery rates for Scenarios 1 and 2 under the low-range, mid-range, and high-range collection efficiency assumptions are also shown graphically in Figures C-1 and C-2 of Appendix C.

SECTION 5.0 LANDFILL GAS COLLECTION AND UTILIZATION SYSTEM

5.1 INTRODUCTION

This section addresses the expected components of a full-scale LFG collection and utilization system and analyzes the options for utilization of the LFG. Based on the evaluation of the potential for LFG recovery at the Pirana Landfill in Section 4, the quantity of recoverable LFG appears to be sufficient for developing a small-scale LFGE project to utilize LFG as a fuel source. Three options were identified to utilize the LFG:

1. Electrical generation
2. Direct use in an off-site industrial facility; and
3. Flaring only - destruction of the methane to reduce greenhouse gas (GHG) emissions.

Electricity could be generated on-site utilizing LFG to meet on-site electricity needs and the excess sold to the local grid at market rates. In addition, if a nearby industry requires electricity, LFG could be piped to this facility to generate electricity, heat, and/or steam for a cogeneration application. This could provide significant cost savings from avoided electricity purchases for on-site energy needs and revenues from the sale of unused electricity to the local power grid. This is also known as auto-generation or “inside the fence” electric generation. The sale of LFG for direct use at a nearby industrial facility with natural gas needs can generate significant revenues while requiring less initial investment costs when compared to an electricity generation LFGE project. A nearby industrial facility could also generate electricity utilizing LFG. Finally, an electricity generation project, a direct use project, and a flaring only project all can generate revenues through the sale of GHG emission reduction credits to global carbon markets, which helps to pay for the development and implementation of the LFG collection system.

In order to ensure the combustion of all collected LFG, and to maximize the amount of GHG emission reductions achieved, any LFG not combusted in the LFGE facility will be burned in a flare. Additional GHG emission reductions can be realized from an LFGE project to the extent that fuel sources normally employed for electricity generation are displaced by the use of methane in the LFGE facility.

5.2 LFG COLLECTION AND CONTROL SYSTEM

The landfill does not currently have a landfill gas collection system. Therefore, the installation of an active LFG collection and control system including new wells and an enclosed flare is assumed for the cost analysis in this report. Also included is an analysis of the costs of an on-site LFG-to-electricity facility and the costs for a gas treatment skid (filter, compressor, de-hydration unit) and pipeline for delivery of LFG to a nearby end-user.

The LFG collection and utilization system requirements will vary depending on estimates of maximum LFG recovery. As noted in Section 4, alternative LFG generation and recovery estimates have been developed under Disposal Scenarios 1 and 2. The alternative LFG recovery

scenarios create different capacity requirements for the flare, LFG-to-electricity facility, and direct use project that are discussed in this section, and different cost estimates which are discussed in the following section. The uncertainty regarding historical disposal estimates is assumed to be resolved prior to project implementation, at which time the LFG recovery scenario which best describes project requirements and costs will be selected.

To maximize LFG recovery rates, a comprehensive collection system should be installed at the landfill. The project feasibility analysis assumes that construction of the collection and flaring system and LFGE facility, including about 80 percent of the extraction wells and associated lateral piping, would be completed in 2008 to allow system start-up to occur in January 2009, with the remaining wells and laterals installed throughout 2009.

Collection and Control System Components

The Project Team has the following general recommendations for the LFG collection system:

- Installation of 52 vertical extraction wells, or about 1.4 wells per acre. Once available, operational data can be used to evaluate the well spacing by assessing flow rates from individual wells and the range of vacuum influence exerted by the wells.

The pump test data estimated that the ROI of the extraction wells is approximately 28 meters. The Project Team used this site-specific ROI for developing the estimated number and depth of wells required. Well depths and estimated ROIs were adjusted to account for estimated future refuse depths (up to 30 m).

For budgetary purposes, the Project Team assumes that each extraction well would be fitted with a wellhead with a flow control valve and gas monitoring ports.

- Installation of approximately 10,500 meters of HDPE piping to connect the extraction wells with the flare station and LFG control plant. This piping includes main gas header piping designed to accommodate greater gas flow rates, and smaller lateral gas piping designed to connect the main header piping to the extraction wells.

For budgetary purposes, the Project Team assumes that the header piping will be 150 to 300 mm in diameter, and the lateral piping will be 100 mm in diameter.

- Installation of a condensate management system. Condensate, which forms in the LFG piping network as the warm gas cools, can cause significant operational problems if not managed properly. The LFG collection system must be designed to accommodate the formation of condensate. The Project Team presumes that this will be accomplished with condensate traps, sumps, and drainage piping.
- Installation of a blower and flaring station. The Project Team has assumed that the flaring system will be an enclosed-type flare so that exhaust components can be tested and quantified, if applicable, for registration of emission reductions (exhaust testing is not possible on candlestick-type open flares).

Under Recovery Scenario 1, the Project Team has assumed that the system construction would include installing approximately 1,870 cubic meters per hour (1,100 cfm) of gas flaring capacity and blower equipment. This capacity is sufficient to handle the maximum projected LFG recovery rate under Scenario 1 (which will occur in 2010). Under Recovery Scenario 2, the Project Team has assumed that the system construction would include installing approximately 1,190 cubic meters per hour (700 cfm) of gas flaring capacity and blower equipment. This capacity is sufficient to handle the maximum projected LFG recovery rate under Scenario 2 (which will occur in 2010).

- Installation of an LFG utilization plant under the electricity generation LFGE project option. Under Scenario 1, the Project Team has assumed that the initial system construction would occur in 2008 and include installing two reciprocating engine generators each with a gross capacity of 633 kW, for a total capacity of 1.27 MW. The facility would begin operation in January 2009 and require approximately 766 m³/hour (450 cfm) of LFG to operate at full capacity. The Project Team has assumed that some pre-treatment of the LFG will be required to remove moisture.

Based on the Scenario 1 LFG recovery projections provided in Section 4, a 1.27 MW project can be supported for 8 years (through 2016). After 2016, one of the engines will need to be sold or moved to another project. The LFG recovery projections indicate that a 0.63 MW project can be supported until 2025.

Under Scenario 2, the Project Team has assumed that the initial system construction would occur in 2008 and include installing two reciprocating engine generators each with a gross capacity of 540 kW, for a total capacity of 1.08 MW. The facility would begin operation in January 2009 and require approximately 766 m³/hour (450 cfm) of LFG to operate at full capacity.

Based on the Scenario 2 LFG recovery projections provided in Section 4, a 1.08 MW project can be supported for 6 years (through 2014). After 2014, one of the engines will need to be sold or moved to another project. The LFG recovery projections indicate that a 0.54 MW project can be supported until 2024.

Combustion gas turbines also have been used successfully for LFG-fired electric power generation. However, combustion turbines require a high-pressure fuel supply and typically two stages of gas compression, which results in a higher net heat rate (turbines do, however, generally have lower emission of combustion products [primarily NO_x]). Based on these factors, the Project Team feels that reciprocating engines may be more appropriate for the Pirana LFGE project than turbines.

- Installation of a gas filter, compressor, de-hydration unit, and pipeline for delivering LFG to potential end-users under the direct use project option. Under Scenario 1, the project design flow rate is estimated to be approximately 850 m³/hour (500 cfm) based on the estimated 2009 through 2015 LFG recovery rates. The amount of LFG available for delivery to end-user facilities under Scenario 1 is projected to decline below 850 m³/hour after 2015 due to declining recovery potential. Under Scenario 2, the project design flow rate is estimated to be approximately 600 m³/hour (350 cfm) based on the estimated 2009

through 2015 LFG recovery rates. The amount of LFG available for delivery to end-user facilities under Scenario 2 is projected to decline below 600 m³/hour after 2015 due to declining recovery potential.

As noted above, all gas collection and flaring system components except for approximately 20 percent of the wells (14 wells) and associated lateral piping are assumed to be installed in 2008. The remaining wells and laterals are to be constructed in 2009.

Figure 5-1 shows the conceptual layout of the proposed system.

Collection System Maintenance

In order to maintain a high level of efficiency for the LFG collection system, and thus maximize LFG recovery rates and emission reductions, implementing a regular program of operation and maintenance of the gas collection system equipment will be necessary.

Following system start-up, operational data should be reviewed with respect to the system design criteria, and adjustments and repairs made as appropriate. Adjustments to the wellfield layout that are indicated by operating data may include the following:

- Wells that are unproductive or are damaged will need to be repaired or replaced.
- Areas of the landfill where monitoring data indicate a surplus of LFG may yield higher recovery rates if additional wells are installed.
- Ongoing monitoring of leachate levels in wells will indicate whether or not additional leachate pumps are required.



Figure 5-1. Collection System Conceptual Layout

DRAWING NO. OF	SCALE	DATE	CADD FILE	SCS ENGINEERS STEPHEN DOWD AND SCHMIDT CONSULTING ENGINEERS, INC. 2300 READING ROAD, SUITE 600, CINCINNATI, OHIO 45202 PH. (513) 421-3353 FAX NO. (513) 421-3847	CLIENT:	SHEET TITLE	REV	DATE	DESCRIPTION	CC BY
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**SECTION 6.0
EVALUATION OF PROJECT COSTS**

For purposes of evaluating the project economics, the Project Team estimated the capital costs for development of an LFG recovery system and utilization project at the landfill. The Project Team also estimated the expected costs for operation and maintenance of the LFG collection system.

6.1 LANDFILL GAS COLLECTION AND FLARING SYSTEM COSTS

Budgetary Construction Cost Estimate

The Project Team estimates the budgetary cost (in 2008 U.S. dollars prior to inflation) for the LFG collection and flaring system construction to be \$2,201,500 under Scenario 1 and \$2,086,500 under Scenario 2. These are costs associated with the proposed gas collection system described previously, including: gas extraction wells, header and lateral piping, condensate management, and installation of a blower and enclosed flaring station.

Tables 6-1 and 6-2 present a summary of the cost items under Scenarios 1 and 2. A more detailed outline of these costs and their associated quantities is presented in Appendix D.

**TABLE 6-1: BUDGETARY COSTS FOR
LFG COLLECTION AND CONTROL SYSTEM – SCENARIO 1**

ITEM	TOTAL ESTIMATED COST (U.S. \$)
Mobilization and project management	\$120,000
Vertical extraction wells and wellheads (52 wells, 20 m average depth)	\$301,000
Leachate pumping equipment (assumed required for 50% of the wells)	\$130,000
Main gas header collection piping (assume about 5,920 m of HDPE ranging from 150-300 mm diameter and header valves (assume 4)	\$630,500
Lateral piping (assume about 4,600 m of 100 mm diameter)	\$179,000
Condensate management	\$60,000
Blower and flaring equipment (enclosed flare) ⁽¹⁾	\$300,000
Security fencing around landfill	\$150,000
Engineering/contingency, and up-front (pre-operational) costs ⁽²⁾	\$331,000
TOTAL ESTIMATED COST	\$2,201,500

**TABLE 6-2: BUDGETARY COSTS FOR
LFG COLLECTION AND CONTROL SYSTEM – SCENARIO 2**

ITEM	TOTAL ESTIMATED COST (U.S. \$)
Mobilization and project management	\$110,000
Vertical extraction wells and wellheads (52 wells, 20 m average depth)	\$301,000
Leachate pumping equipment (assumed required for 50% of the wells)	\$130,000
Main gas header collection piping (assume about 5,920 m of HDPE ranging from 100-250 mm diameter and header valves (assume 4)	\$565,500
Lateral piping (assume about 4,600 m of 100 mm diameter)	\$179,000
Condensate management	\$60,000
Blower and flaring equipment (enclosed flare) ⁽¹⁾	\$275,000
Security fencing around landfill	\$150,000
Engineering/contingency, and up-front (pre-operational) costs ⁽²⁾	\$316,000
TOTAL ESTIMATED COST	\$2,086,500

Notes to Tables 6-1 and 6-2:

1. Blower and flaring equipment includes: blower and flare, construction and site work, LFG measurement and recording equipment, flare start-up costs, and emissions testing.
2. Pre-operational costs cover up-front costs required for obtaining revenues from emission reductions, including: preparation of a Monitoring Plan and PDD, registration, validation, and legal fees.

Budgetary Estimate for Annual System Operation and Maintenance

The Project Team estimates the budgetary cost for annual operation and maintenance of the gas collection system to be approximately 7 percent of the construction costs (excluding security fence construction), or about \$85,000 (U.S. dollars prior to inflation adjustments). These costs include those associated with operation and maintenance of the existing collection system such as labor, testing equipment and parts, routine maintenance and system repairs, and limited replacement of existing wells and piping.

Other annual costs include those associated with the process of obtaining emission reductions, including registration fees, and monitoring and verification of the emission reductions. These costs are estimated to be \$30,000 (U.S.) prior to inflation adjustments.

6.2 ELECTRICAL GENERATION PROJECT COSTS

The Project Team estimated the capital and annualized costs for implementing an LFG-fueled IC engine power plant. These costs are presented below.

Budgetary Estimate of Power Plant Cost

The Project Team estimates that the capital cost for implementing an LFG-fueled 1.27 MW (gross) IC engine power plant under Scenario 1 to be approximately \$2,008,600 (U.S.). This cost is additional to the LFG collection and flaring system. The capital cost for a 1.08 MW IC engine power plant under Scenario 2 is approximately \$1,782,000. Tables 6-3 and 6-4 present a summary of the initial cost items for Scenarios 1 and 2, respectively. A more detailed outline of the initial costs and their associated quantities is presented in Appendix D.

TABLE 6-3: BUDGETARY COSTS FOR 1.27 MW IC ENGINE POWER PLANT

ITEM	TOTAL ESTIMATED COST (\$)
Mobilization and project management	\$120,000
Plant construction/sitework (incl. piping)	\$80,000
LFG measuring and recording equipment	\$35,000
LFG pre-treatment and engine-generator for 1266 kW LFG-fueled power plant *	\$1,266,000
Plant substation (switchgear, main breaker, step-up transformer)	\$200,000
Electrical Interconnection	\$100,000
Source Test	\$25,000
Engineering/Contingency (~10% of other costs)	\$182,600
TOTAL ESTIMATED COST	\$2,008,600

TABLE 6-4: BUDGETARY COSTS FOR 1.08 MW IC ENGINE POWER PLANT

ITEM	TOTAL ESTIMATED COST (\$)
Mobilization and project management	\$100,000
Plant construction/sitework (incl. piping)	\$80,000
LFG measuring and recording equipment	\$35,000
LFG pre-treatment and engine-generator for 1080 kW LFG-fueled power plant *	\$1,080,000
Plant substation (switchgear, main breaker, step-up transformer)	\$200,000
Electrical Interconnection	\$100,000
Source Test	\$25,000
Engineering/Contingency (~10% of other costs)	\$162,000
TOTAL ESTIMATED COST	\$1,782,000

*Notes to Tables 6-3 and 6-4: Plant costs assume containerized engine generators with no other building for this equipment

Budgetary Estimate for Annual Operation and Maintenance

The Project Team estimates the budgetary cost for annual operation and maintenance of the power plant to be approximately 2 cents per kilowatt-hour of electricity output (prior to inflation adjustments), or about \$204,000 per year for Scenario 1 (based on a 1.27 MW plant capacity) and \$174,000 per year for Scenario 2 (based on a 1.08 MW plant capacity). These costs include those associated with operation and maintenance of the power plant such as labor, testing equipment and parts, routine maintenance and repairs, and minor equipment replacement. Based on the Scenario 1 LFG modeling results, the Project Team estimates that the plant capacity will need to be reduced to a 633 kW facility from 2017 through the end of the 15-year project period in 2022. The Scenario 2 LFG modeling results indicate that the plant capacity will need to be reduced in 2015 from 1.08 MW to 0.54 MW.

Other annual costs such as wellfield operation and maintenance and project monitoring and emission reduction verification are included in the collection and flaring system annual operation and maintenance costs (see above).

6.3 DIRECT USE PROJECT COSTS

EPA LMOP evaluated the projected capital and annualized costs for implementing a direct use project to deliver LFG to industrial end-users. Several potential end-users were identified within approximately one kilometer from the landfill; these facilities include a cement plant, and other industries (steel, plastic, chemical, textile). The direct use project costs are presented below.

Budgetary Estimate of Direct Use Facility Cost and Ongoing Costs

Using LMOP's LFGCost tool and adding mobilization costs and 25 percent for engineering costs and a contingency cost to account for conditions in India, EPA LMOP estimates that the initial cost for implementing a direct use project to deliver LFG to potential end-user facilities to be approximately \$440,000 (U.S.) under Scenario 1 and \$390,000 under Scenario 2. This cost is additional to the LFG collection and flaring system and does not include any costs that might be required for modifications to the existing equipment at the end users' facilities.⁵

Tables 6-5 and 6-6 present summaries of the initial cost items under Scenario 1 and 2, respectively.

⁵ The LFGcost v1.4 Model produces costs estimates with an uncertainty of +/- 30 to 50 percent.

TABLE 6-5: BUDGETARY COSTS FOR DIRECT USE PROJECT – SCENARIO 1

ITEM	TOTAL ESTIMATED COST (\$)
Mobilization	\$50,000
Skid-mounted Filter, Compressor, and Dehydration Unit	\$135,000
1 km (0.62-mile) Pipeline to Convey Gas to Project Sites	\$165,000
Engineering/Contingency (~25% of other costs)	\$90,000
TOTAL ESTIMATED COST	\$440,000

TABLE 6-6: BUDGETARY COSTS FOR DIRECT USE PROJECT – SCENARIO 2

ITEM	TOTAL ESTIMATED COST (\$)
Mobilization	\$50,000
Skid-mounted Filter, Compressor, and Dehydration Unit	\$95,000
1 km (0.62-mile) Pipeline to Convey Gas to Project Sites	\$165,000
Engineering/Contingency (~25% of other costs)	\$80,000
TOTAL ESTIMATED COST	\$390,000

Annual operating and maintenance costs include pipeline and compressor station maintenance, and electricity costs for running the compressor station. For the first year of operation under Scenario 1 (2009), these costs are estimated using the LFGCost model to be approximately \$34,000 and \$36,000, respectively, for a total of \$70,000. Under Scenario 2, the 2009 operating and maintenance costs are estimated to be approximately \$23,000 and \$25,000, respectively, for a total of \$48,000.

SECTION 7.0 ECONOMIC EVALUATION

The economics of implementing Option 1, an LFGE electric generation project; Option 2, an LFGE direct use project; and Option 3, an LFG recovery and methane destruction (flaring only) project, were evaluated using the projected capital and annualized costs outlined in Section 6, and anticipated revenues described below.

Option 1 would produce significant environmental benefits from the capture and combustion of LFG and the displacement of fossil fuel normally consumed for the generation of electricity. For purposes of evaluating Option 1, the Project Team assumed that the revenue streams include those associated with the sale and/or offset of electricity as well as revenues associated with GHG emissions reductions (i.e., the purchase of emissions reductions generated by the project).

Option 2 would produce significant environmental benefits from the capture and combustion of LFG and the displacement of natural gas normally consumed in an industrial process. For purposes of evaluating Option 2, the Project Team assumed that the revenue streams include those associated with the sale LFG and/or offset of natural gas as well as revenues associated with GHG emissions reductions (i.e., the purchase of emissions reductions generated by the project).

Option 3 would produce significant environmental benefits from the capture and combustion of LFG, and potential revenues from methane emissions reduction. Because emission reductions are typically the only source of revenues from a flaring only project, prices received for the emission reductions will largely determine economic feasibility. A flaring only project will typically produce lower revenues than an LFGE project, but may be more economically feasible due to much lower capital investment costs.

A summary of the economic evaluation and assumptions is presented below. More detailed analysis of the economics is presented in Appendix E.

7.1 SUMMARY OF ASSUMPTIONS

The following general assumptions were used in evaluating the project economics:

- Two recovery scenarios (as outlined in Section 4) were considered, each with different project costs (as outlined in Section 6).
- Two financing options were considered, one with no financing of capital expenditures (i.e., 100% initial application of capital expenditures), and one with financing of 75 percent of initial capital expenditures (25% equity investment).⁶

⁶ These percentages were chosen to reflect the typical range in the level of financing. Actual levels of financing will vary, and result in different estimates of financial feasibility, but the percentages chosen for this study should cover the likely range of effects produced by varying levels of project financing.

- Two scenarios for the pricing of emission reductions were considered, with sales prices of \$8 and \$10 per tonne of CO₂-equivalent (CO₂e) emission reductions. Two scenarios for the period over which these prices are received were evaluated – one which assumes revenues from 2009 through 2012, and a second which assumes revenues from 2009 through 2018.
- The economic evaluation of both LFGE projects covered a 15-year period (2008 – 2022). The economic evaluation of the flaring only project considered shorter time periods based on the reasoning that the project would not be likely to continue when there was no longer any source of revenue from emission reductions. The time periods considered for the flaring only project were therefore 2008 through 2012 (5 years) and 2008 through 2018 (11 years).
- An interest rate of 14 percent is used for the NPV analysis.
- An interest rate of 10 percent is used for the loan financing.
- Initial investment for the LFG collection and flaring system and power plant (for electricity generation) or LFG treatment facility and pipeline (for direct use) is assumed to occur in 2008. Completion of the wellfield will occur in 2009. Loan payback period is assumed to be 10 years for the LFGE project, four years for the five-year flaring only project, and 10 years for the 11-year flaring only project.
- For purposes of this analysis, payment of approximately 20 percent of the emission reduction revenue to the landfill owner for use of LFG was considered (represented by a rate of \$0.67/MMBtu under the \$8 per tonne emission reduction price scenario and \$0.84/MMBtu under the \$10 per tonne emission reduction price scenario). This is based on international experience that payment to the landfill owner for LFG typically ranges between 10 and 30 percent of the emission reduction revenue. If the landfill owner were to self develop the project (which is not typical) this value could be assumed to be zero.
- Future operation and maintenance and system expansion expenditures escalate at an annual rate of 3 percent.
- Under the power plant project option, the following assumptions apply:
 - Under recovery Scenario 1, the power plant will consist of two 633 kW IC engines that will be operational from 2009 through 2016 and one 633 kW IC engine that will be operational from 2017 through 2022.
 - Under recovery Scenario 2, the power plant will consist of two 540 kW IC engines that will be operational from 2009 through 2014 and one 540 kW IC engine that will be operational from 2015 through 2022.
 - A 7 percent reduction in electricity output by the plant was assumed to account for parasitic load, and a plant capacity factor of 90 percent was assumed to account for routine and non-routine plant downtime. Landfill gas collected during plant downtime will be routed to the flare for combustion.

- All electricity generated by the project is assumed to be sold off-site at a rate of \$0.058 per kWhr. This price is estimated based on the most recent data on wholesale tariff rates set by the Gujarat State Electricity Corporation Limited.⁷
- Under the direct use project option, the following assumptions apply:
 - One or more direct use projects will be implemented that will be operational from 2009 through the end of the project period (2022). A total of 1 km (0.6 miles) of pipeline is assumed to be built to deliver the LFG to potential end-user facilities.
 - A facility capacity factor of 90% is used to account for facility downtime for problems with project equipment, weather related interruptions of the local utilities, and shut-downs at the energy consumer end of the system due to maintenance/repair and/or daily or seasonal fluctuations in demand.
 - Revenues from emission reductions for landfill gas combusted off site will be retained by the project developer.
 - Excess landfill gas not sold or delivered to an end-user will be combusted in the on-site flaring equipment.
 - Landfill gas is sold to the end-user at a rate of \$3.00 per MMBtu, which is 50 percent of the estimated current average market price for natural gas in Ahmedabad.⁸
- The gas collection system and flare will be operational from January 2009 through the end of the project period (2012, 2018, or 2022). The flare will be used to combust excess gas under either LFGE project option. Under the flaring only project option, no capital or operating costs are incurred for any LFGE facilities, and no revenues from electricity of LFG sales are received.

7.2 PROJECT EXPENDITURES

The following project expenditures were considered under the power plant option:

- Initial capital investment for LFG collection system, flare, and power plant occurs in 2008 (see Section 6).

⁷ Gujarat Electricity Regulatory Commission Ahmedabad "Tariff Order of GSECL Petition No. 896/2006" Ahmedabad, March 31, 2007.

⁸ "Dabhol: Deora reiterates 60% gas price hike for Gujarat." Hindu Business Line. May 2007. This article documents the projected increase in imported natural gas prices from \$3.70 to \$5.90 per mmBtu. A small quantity of domestically produced natural gas is available to selected government-owned firms at a significantly reduced price (\$2.50/mmBtu). For this study it was assumed that the end-user facilities would not have access to domestic sources at the lower price. It should be noted that SCS did not directly contact either of the potential end-users to discuss their interest in a potential project, their energy requirements, or their pricing requirements for this pre-feasibility study.

- Capital investment (\$100,000) for the completion of the LFG collection system occurs in 2009.
- Purchase of LFG from landfill owner.
- Annual cost for operation and maintenance of the LFG collection system, flare, and power plant (see Section 6).

The following project expenditures were considered under the direct use option:

- Initial capital investment for LFG collection system, flare, and LFG treatment/compressor skid and pipeline occurs in 2008 (see Section 6).
- Capital investment (\$100,000) for the completion of the LFG collection system occurs in 2009.
- Purchase of LFG from landfill owner.
- Annual cost for operation and maintenance of the LFG collection system, flare, and LFG treatment/compressor skid and pipeline (see Section 6).

The following project expenditures were considered under the flaring only option:

- Initial capital investment for LFG collection system and flare occurs in 2008 (see Section 6).
- Capital investment (\$100,000) for the completion of the LFG collection system occurs in 2009.
- Purchase of LFG from landfill owner.
- Annual cost for operation and maintenance of the LFG collection system and flare (see Section 6).

7.3 PROJECT REVENUES

For the economic evaluation, the following revenues were considered under the power plant project:

- Under recovery Scenario 1, the power plant produces a total of 9,489 MWh/year from 2009 through 2016 and 4,744 MWh/year from 2017 through 2022. Under recovery Scenario 2, the power plant produces a total of 8,095 MWh/year from 2009 through 2014 and 4,047 MWh/year from 2014 through 2022. Generated electricity is sold to the power grid at a rate of U.S. \$0.058/kWh (in \$2008).
- GHG emission reductions are sold at a rate of U.S. \$8 or \$10 per tonne CO₂e. The sale of emission reductions is considered for the years 2009 through 2012 or for 2009 through 2018 depending on the assumed duration of revenues from GHG emission reductions.

- LFG collected in excess of the power plant capacity, along with LFG collected during plant downtime is assumed to be combusted in the flare.

For the economic evaluation, the following revenues were considered under the direct use project:

- Under recovery Scenario 1, the direct use project produces a maximum of 119,750 mmBtu/year of LFG in 2009 through 2015, and declining amounts in each subsequent year. Under recovery Scenario 2, the direct use project produces a maximum of 78,612 mmBtu/year of LFG in 2009 through 2015, and declining amounts in each subsequent year. The LFG is sold to the end-users at a rate of U.S. \$3.00 per mmBtu. The potential industrial end-users, which are located within 1 km of the landfill, have not yet been contacted for pricing information.
- GHG emission reductions are sold at a rate of U.S. \$8 or \$10 per tonne CO₂e. The sale of emission reductions is considered for the years 2009 through 2012 or for 2009 through 2018 depending on the assumed duration of revenues from GHG emission reductions.
- LFG collected in excess of the amount sold to end-users, including LFG collected during facility downtime, is assumed to be combusted in the flare.

For the economic evaluation, the following revenues were considered under the flaring only project:

- GHG emission reductions are sold at a rate of U.S. \$8 or \$10 per tonne CO₂e. The sale of emission reductions is considered for the years 2009 through 2012 or for 2009 through 2018 depending on the assumed duration of revenues from GHG emission reductions.
- All collected LFG is assumed to be combusted in the flare.

For the options detailed above, the rate of U.S. \$8 - \$10 per tonne of CO₂e was selected as a conservative long term price for GHG reduction credits over the duration of the project through 2018. The World Bank's "State and Trends of the Carbon Market: 2007" dated May 2007 stated that the average price of GHG reduction credits (Certified Emissions Reductions) was U.S. \$10.90 per tonne CO₂e in 2006. Limited volumes of similar GHG reduction credits have recently sold for over U.S. \$22 per tonne CO₂e for current and near term vintages on secondary markets. However, the Project Team assumed that this pricing may not be sustainable over the life of the project, and thus chose to adopt a conservative approach for its analysis.

Appendix E presents a more detailed summary of the anticipated project revenue streams.

7.4 SUMMARY OF ECONOMIC EVALUATIONS

Option 1 – LFGE Electric Generation

Tables 7-1 and 7-2 present a summary of the results of the economic evaluation of the power plant project under Recovery Scenario 1. Tables 7-3 and 7-4 present a summary of the results of

the economic evaluation of the power plant project under Recovery Scenario 2. Tables 7-1 and 7-3 assume emission reduction revenues through 2012, and Tables 7-2 and 7-4 assume emission reduction revenues through 2018. The tables provide a general comparison of the effects of the various financing and emission reductions sales price scenarios using the estimated net present value (NPV) and the internal rate of return (IRR) of the project. These values include revenues from both GHG emissions reductions and from LFG project utilization revenue. The results are presented on a pre-tax basis.

TABLE 7-1: SUMMARY OF ECONOMIC EVALUATION OF PROPOSED POWER PLANT PROJECT – RECOVERY SCENARIO 1 WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	- \$684	7.6%
2008 - 2022	10	100	- \$230	11.8%
2008 - 2022	8	25	- \$276	--*
2008 – 2022	10	25	\$179	33.2%

*IRR was a negative value that could not be calculated.

TABLE 7-2: SUMMARY OF ECONOMIC EVALUATION OF PROPOSED POWER PLANT PROJECT – RECOVERY SCENARIO 1 WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	\$76	14.6%
2008 - 2022	10	100	\$737	19.6%
2008 – 2022	8	25	\$484	30.4%
2008 – 2022	10	25	\$1,146	50.8%

As shown in Tables 7-1 and 7-2, economics for the electricity generation LFGE project under Recovery Scenario 1 appear unfavorable in three of the four emission reduction pricing and financing scenarios where revenues from emission reductions extend only through 2012, but moderately attractive under all emission reduction pricing and financing scenarios evaluated with emission reduction revenues through 2018. A higher emission reduction price (\$10), longer revenue period (through 2018), and project financing produce the highest NPV and IRR values.

TABLE 7-3: SUMMARY OF ECONOMIC EVALUATION OF PROPOSED POWER PLANT PROJECT – RECOVERY SCENARIO 2 WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	-\$1,344	-0.2%
2008 - 2022	10	100	-\$1,038	2.6%
2008 - 2022	8	25	-\$969	--*
2008 – 2022	10	25	-\$663	--*

*IRR was a negative value that could not be calculated.

TABLE 7-4: SUMMARY OF ECONOMIC EVALUATION OF PROPOSED POWER PLANT PROJECT – RECOVERY SCENARIO 2 WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	-\$829	6.7%
2008 - 2022	10	100	-\$376	10.7%
2008 – 2022	8	25	-\$454	-8.9%
2008 – 2022	10	25	-\$2	13.9%

As shown in Tables 7-3 and 7-4, economics for the electricity generation LFGE project under Recovery Scenario 2 appear relatively unattractive under all emission reduction pricing and financing scenarios evaluated, including under assumptions of a higher emission reduction price (\$10), longer revenue period (through 2018), and project financing.

Option 2 – Direct Use LFGE Project

Tables 7-5 and 7-6 present a summary of the results of the economic evaluation of the direct use project under Recovery Scenario 1. Tables 7-7 and 7-8 present a summary of the results of the economic evaluation of the direct use project under Recovery Scenario 2. Tables 7-5 and 7-7 assume emission reduction revenues through 2012, and Tables 7-6 and 7-8 assume emission reduction revenues through 2018. The tables provide a general comparison of the effects of the various financing and emission reductions sales price scenarios using the estimated NPV and the IRR of the project. These values include revenues from both GHG emissions reductions and from LFG project utilization revenue. The results are presented on a pre-tax basis.

TABLE 7-5: SUMMARY OF ECONOMIC EVALUATION OF PROPOSED DIRECT USE PROJECT – RECOVERY SCENARIO 1 WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	\$340	19.0%
2008 - 2022	10	100	\$799	26.4%
2008 - 2022	8	25	\$600	65.9%
2008 – 2022	10	25	\$1,051	98.9%

**TABLE 7-6: SUMMARY OF ECONOMIC EVALUATION OF
PROPOSED DIRECT USE PROJECT – RECOVERY SCENARIO 1
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	\$1,343	28.6%
2008 - 2022	10	100	\$2,060	36.2%
2008 – 2022	8	25	\$1,594	76.9%
2008 – 2022	10	25	\$2,311	105.9%

As shown in Tables 7-5 and 7-6, economics for the direct use LFGE project under Recovery Scenario 1 appear attractive under all emission reduction price and financing scenarios evaluated. Increases in emission reduction price, the extension of emission reduction revenues through 2018, and project financing all have a positive impact on NPV and IRR values.

**TABLE 7-7: SUMMARY OF ECONOMIC EVALUATION OF
PROPOSED DIRECT USE PROJECT – RECOVERY SCENARIO 2
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	-\$532	5.4%
2008 - 2022	10	100	\$234	10.1%
2008 - 2022	8	25	-\$296	--*
2008 – 2022	10	25	\$3	7.1%

*IRR was a negative value that could not be calculated.

**TABLE 7-8: SUMMARY OF ECONOMIC EVALUATION OF
PROPOSED DIRECT USE PROJECT – RECOVERY SCENARIO 2
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 - 2022	8	100	-\$18	13.8%
2008 - 2022	10	100	\$427	19.4%
2008 – 2022	8	25	\$218	25.3%
2008 – 2022	10	25	\$663	47.1%

As shown in Tables 7-7 and 7-8, economics for the direct use LFGE project under Recovery Scenario 2 appear attractive under selected emission reduction price and financing scenarios evaluated. If the project receives emission reduction revenues only through 2012, both NPV and IRR are significantly positive only with a \$10 emission reduction price and no project financing. If emission reduction revenues are extended through 2018, three out of four emission reduction price and financing scenarios have positive NPV and IRR values.

Option 3 – Flaring Only Project

Tables 7-9 and 7-10 present a summary of the results of the economic evaluation for the flaring only project under Recovery Scenario 1. Tables 7-11 and 7-12 show present a summary of the results of the economic evaluation for the flaring only project under Recovery Scenario 2. Tables 7-9 and 7-11 assume emission reduction revenues through 2012 and Tables 7-10 and 7-12 assume emission reduction revenues through 2018. The tables present a general comparison of the effects of various financing and emission reduction sales price scenarios, using the estimated NPV and IRR of the project. These values include revenues from GHG emissions reductions. The results are presented on a pre-tax basis.

**TABLE 7-9. SUMMARY OF ECONOMIC EVALUATION
OF THE PROPOSED FLARING ONLY PROJECT – RECOVERY SCENARIO 1
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 – 2012	8	100	- \$625	- 4.0%
2008 – 2012	10	100	- \$205	8.3%
2008 – 2012	8	25	- \$514	--*
2008 – 2012	10	25	- \$94	2.6%

*IRR was a negative value that could not be calculated.

**TABLE 7-10. SUMMARY OF ECONOMIC EVALUATION
OF THE PROPOSED FLARING ONLY PROJECT – RECOVERY SCENARIO 1
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 – 2018	8	100	-\$174	10.8%
2008 – 2018	10	100	\$431	21.4%
2008 – 2018	8	25	\$35	20.4%
2008 – 2018	10	25	\$639	67.3%

As shown in Tables 7-9 and 7-10, economics for the flaring project under Recovery Scenario 1 appear unattractive under all emission reduction price and financing scenarios where revenues from emission reductions last only through 2012, and under the low emission reduction price (\$8) with no financing scenario if revenues from emission reductions last through 2018. The flaring only project is attractive only under three of eight scenarios and requires revenues from emission reductions through 2018 and either project financing or an emission reduction price of \$10. Project financing appears to cause moderate increases in NPV and large increases in IRR.

**TABLE 7-11. SUMMARY OF ECONOMIC EVALUATION
OF THE PROPOSED FLARING ONLY PROJECT – RECOVERY SCENARIO 2
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2012**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 – 2012	8	100	-\$1,086	-21.2%
2008 – 2012	10	100	- \$809	-11.0%
2008 – 2012	8	25	- \$981	--*
2008 – 2012	10	25	- \$703	--*

*IRR was a negative value that could not be calculated.

**TABLE 7-12. SUMMARY OF ECONOMIC EVALUATION
OF THE PROPOSED FLARING ONLY PROJECT – RECOVERY SCENARIO 2
WITH EMISSION REDUCTION REVENUES FROM 2009 THROUGH 2018**

Project Period	Emission Reduction Price (\$/tonne)	Equity Investments (%)	Net Present Value (x1,000 \$)	Internal Rate of Return (%)
2008 – 2018	8	100	-\$838	-3.4%
2008 – 2018	10	100	-\$430	5.8%
2008 – 2018	8	25	-\$641	--*
2008 – 2018	10	25	-\$233	--*

As shown in Tables 7-11 and 7-12, economics for the flaring project under Recovery Scenario 2 appear unattractive under all emission reduction price and financing scenarios evaluated. The lower amount of emission reductions (the only source of revenues) under Recovery Scenario 2 result in poor flaring only project economics.

Summary of Economic Evaluation Results

As shown in Tables 7-1 through 7-12, the direct use LFGE project is the most economically attractive of the three proposed projects. It is the only project option which yields strongly

positive NPV and IRR values under all emission reduction price and financing scenarios analyzed under Recovery Scenario 1, and the only project option which yields both positive NPV and IRR values under any emission reduction price and financing scenarios analyzed under Recovery Scenario 2 (four out of eight scenarios had significantly positive NPV and IRR values). The electricity generation LFGE project appears less economically attractive than the direct use project, with lower NPV and IRR values that are both positive in only five of eight emission reduction price and financing scenarios evaluated under Recovery Scenario 1 (none under Recovery Scenario 2). The flaring only project yields the lowest NPV and IRR estimates which are positive only for the longer project period under the project financing or higher emission reduction price scenarios under Recovery Scenario 1.

The economic evaluation results appear to support the viability of a direct use LFGE project at the Pirana Landfill, given the estimated project costs and revenues. The much lower in NPV and IRR values occurring under Recovery Scenario 2 indicate that the estimates of project revenues are highly dependent on the projected amounts LFG recovery. The direct use project appears to be the only project option which is economically viable given the large uncertainty in the waste disposal estimates and the resulting LFG recovery projections. Also, because LFG generation will decline starting shortly after waste disposal at the landfill ceases, project economics are helped significantly by assumptions of rapid project development and a system start-up in January 2009. Any delays in achieving the project development schedule assumed in this study can have serious negative impacts on project economics.

SECTION 8 ENVIRONMENTAL BENEFITS

8.1 GREENHOUSE GAS EMISSIONS REDUCTIONS

Methane from solid waste disposal on land is one of the major sources of greenhouse gas (GHG) emissions. Its capture and oxidation to carbon dioxide results in an environmental benefit. This benefit may be measured and traded under a number of different emission reduction trading schemes world wide.

In order to qualify for trading of emission reductions, normally a project must be able to prove that there is no requirement under law, or mandated by waste disposal licenses or other regulations, to control the emission of the particular greenhouse gas relating to the project. This appears to be the case at Pirana Landfill.

While flaring is the normal method for thermal oxidation of LFG, any process which prevents the emission of methane to the atmosphere would also qualify for tradable emission reductions. The carbon dioxide created by the thermal oxidation of methane is considered to be "short cycle" and the product of the normal carbon cycle; and therefore does not need to be accounted for under the current methodologies.

The Project Team estimated the potential GHG emission reductions associated with a direct use LFGE project at the landfill (in metric tons of methane/year and metric tonnes of CO₂ equivalent/year using a methane/CO₂ equivalency factor of 21) for the evaluation period. Tables 8-1 and 8-2 present summaries of the GHG emission reduction projections for the period 2009 through 2022 under Recovery Scenario 1 and Recovery Scenario 2, respectively. A flaring only project would achieve the direct emission reductions shown in the table. A LFGE project would achieve both the direct and indirect emission reductions.

The projections shown in Tables 8-1 and 8-2 assume that all of the LFG recovered through the proposed project is combusted, and do not account for methane destruction efficiencies. The estimates include additional greenhouse gas emission reductions associated with the displacement of other fuels sources through direct LFG use.

8.2 ENVIRONMENTAL BENEFITS FROM LANDFILL GAS UTILIZATION

Environmental benefits resulting from LFG utilization include indirect emission reductions from the displacement of conventional fuels as well as direct emission reductions from the combustion of LFG at the industrial facility or flare. The environmental benefits can be described in a variety of ways which are listed below.

TABLE 8-1: SUMMARY OF PROJECTED GHG EMISSION REDUCTIONS UNDER RECOVERY SCENARIO 1

Year	Direct GHG Emission Reductions (Tonnes CO₂e/Year)	Indirect GHG Emission Reductions (Tonnes CO₂e/Year)	Total GHG Emission Reductions (Tonnes CO₂e/Year)
2009	115,645	5,218	120,863
2010	113,317	5,218	118,535
2011	98,151	5,218	103,369
2012	85,678	5,218	90,896
2013	75,381	5,218	80,599
2014	66,841	5,218	72,059
2015	59,724	5,218	64,942
2016	53,759	5,005	58,764
2017	48,730	4,543	53,273
2018	44,463	4,139	48,602
2019	40,817	3,802	44,619
2020	37,678	3,508	41,186
2021	34,956	3,259	38,215
2022	32,576	3,038	35,614
TOTALS FOR PERIOD	907,716	63,820	971,356

For a direct use project with an average net LFG flow to end users of 621 m³/hour over the 2009 through 2022 project period (under Recovery Scenario 1), annual environmental benefits include a reduction of 1,951 metric tonnes of methane from LFG combustion, which is equivalent to 40,969 tonnes of CO₂ emissions (direct benefit), and the displacement of 4,558 tonnes of CO₂ emissions from conventional energy sources (indirect benefit). Direct benefits would also include flaring of addition amount of methane not used at the LFGE facility. If all methane projected to be recovered by the project were combusted, an average of 3,087 tonnes of methane per year (64,838 tonnes CO₂e) will be combusted during the 14 year project period. After adding the average indirect benefits during the project period (4,558 tonnes per year of CO₂ reduction) average annual emission reductions are equivalent to 69,395 tonnes of CO₂. The combined total benefits are equivalent to the following:

- Removing emissions equivalent to 12,175 cars.
- Planting 17,349 acres of forest.
- Offsetting the use of 311 railcars of coal.
- Preventing the use of 147,649 barrels of oil.
- Heating 1,190 homes per year.

TABLE 8-2: SUMMARY OF PROJECTED GHG EMISSION REDUCTIONS UNDER RECOVERY SCENARIO 2

Year	Direct GHG Emission Reductions (Tonnes CO₂e/Year)	Indirect GHG Emission Reductions (Tonnes CO₂e/Year)	Total GHG Emission Reductions (Tonnes CO₂e/Year)
2009	74,237	3,684	77,921
2010	74,844	3,684	78,528
2011	65,791	3,684	69,475
2012	58,289	3,684	61,973
2013	52,040	3,684	55,724
2014	46,807	3,684	50,491
2015	42,399	3,684	46,083
2016	38,662	3,604	42,266
2017	35,472	3,303	38,775
2018	32,728	3,046	35,774
2019	30,352	2,826	33,178
2020	28,276	2,635	30,911
2021	26,450	2,466	28,916
2022	24,831	2,312	27,143
TOTALS FOR PERIOD	631,179	45,980	677,159

For a direct use project with an average net LFG flow to end users of 448 m³/hour over the 2009 through 2022 project period (under Recovery Scenario 2), annual environmental benefits include a reduction of 1,405 metric tonnes of methane from LFG combustion, which is equivalent to 29,515 tonnes of CO₂ emissions (direct benefit), and the displacement of 3,288 tonnes of CO₂ emissions from conventional energy sources (indirect benefit). Direct benefits would also include flaring of addition amount of methane not used at the LFGE facility. If all methane projected to be recovered by the project were combusted, an average of 2,147 tonnes of methane per year (45,084 tonnes CO₂e) will be combusted during the 14 year project period. After adding the average indirect benefits during the project period (3,288 tonnes per year of CO₂ reduction) average annual emission reductions are equivalent to 48,372 tonnes of CO₂. The combined total benefits are equivalent to the following:

- Removing emissions equivalent to 8,487 cars.
- Planting 12,094 acres of forest.
- Offsetting the use of 217 railcars of coal.
- Preventing the use of 102,925 barrels of oil.
- Heating 859 homes per year.

SECTION 9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS AND RECOMMENDATIONS

The Pirana Landfill is a moderate-sized landfill that has operated as a historic dump site since 1980. City of Ahmedabad waste disposal estimates indicate significantly greater total waste in the landfill than is apparent in scaled aerial photographs of the site. The Project Team estimates that the two disposal areas with waste depths suitable for project development will contain approximately 4.6 million tonnes of waste when the landfill closes in 2008. The smaller waste volume may have resulted from disposal over a shorter time period than reported by the City (Disposal Scenario 1) or from lower annual disposal rates (Disposal Scenario 2). The two alternative disposal scenarios create different LFG recovery estimates, with Scenario 2 producing significantly lower estimates.

Potential revenues from direct LFG sales and emission reductions that would result from an LFGE project would be sufficient to offset the estimated capital, operating, and maintenance costs of a project under all emission reduction and financing scenarios analyzed, given Recovery Scenario 1, and under selected emission reduction and financing scenarios analyzed, given Recovery Scenario 2. Potential revenues from an electricity generation LFGE project or from emission reductions that would result from a flaring only project were found to be sufficient to offset the estimated project costs only under selected emission reduction and financing scenarios analyzed, given Recovery Scenario 1, and under none of the emission reduction and financing scenarios analyzed, given Recovery Scenario 2.

Both the NPV and the IRR values were positive for all emission reduction and financing scenarios evaluated for the direct use LFGE project option under Recovery Scenario 1. Direct use project NPV and IRR values were both positive for most emission reduction and financing scenarios evaluated under Recovery Scenario 2 (although one scenario had only slightly positive values). The highest NPV value was achieved under the direct use LFGE project when an emission reduction price of \$10 per tonne is received through 2018 with project financing. In general, project economics are favored by the high revenues early in the project period. This observation emphasizes the importance of early project development. Any delays in achieving the project development schedule assumed in this study can have serious negative impacts on project economics.

The results of this study indicate that further evaluation of either an LFGE project beyond the scope of this pre-feasibility study is warranted. Recommended next steps in the process of moving towards project development would include the following:

- Conduct additional investigation into the inconsistent disposal data, including a survey of existing waste volumes, to determine which set of waste disposal estimates used in this study reflect actual site characteristics.

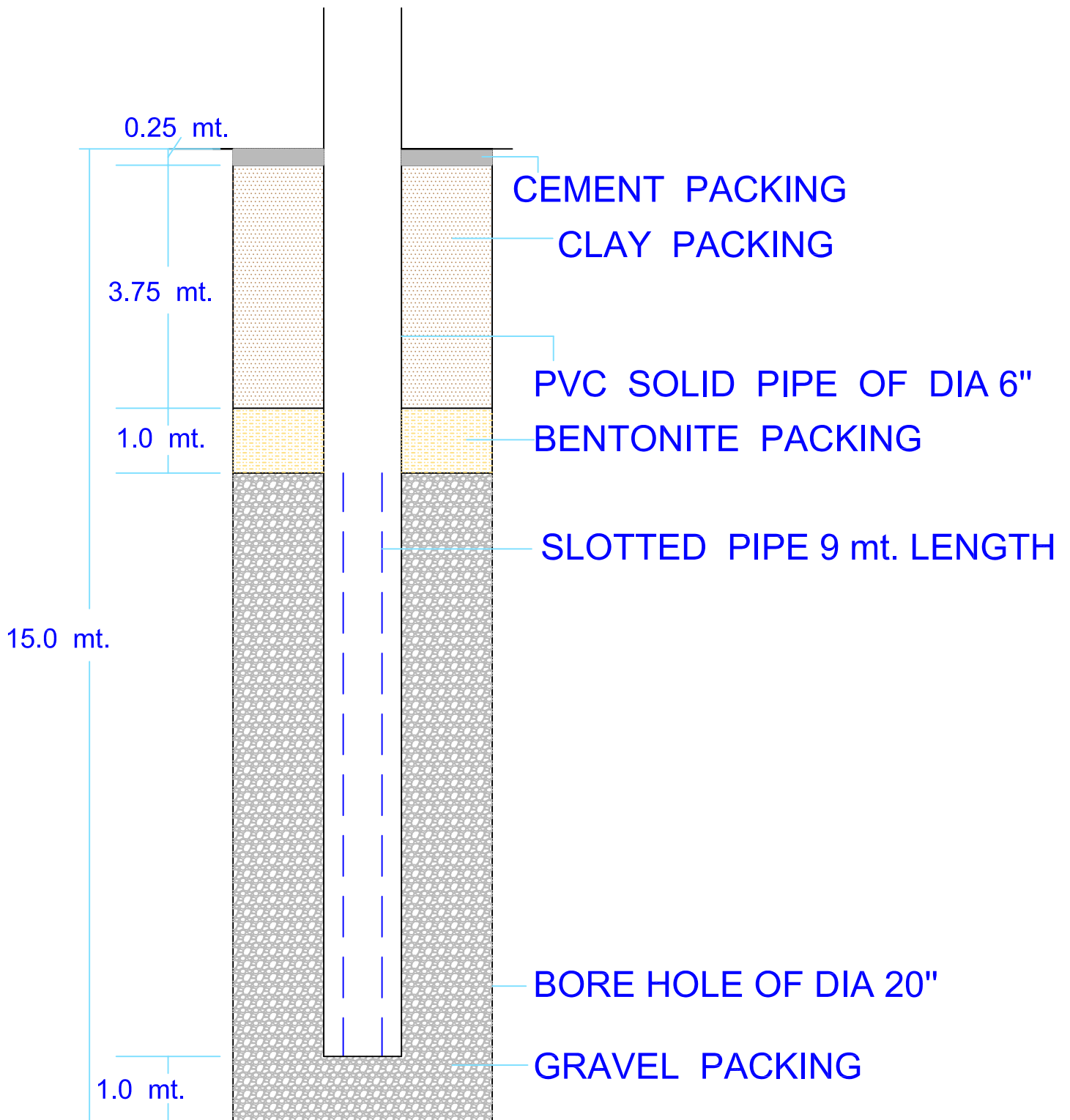
- Conduct a detailed evaluation of the potential for a direct use LFGE project, including a survey of potential end-users, and/or meetings to discuss end-users' interest in a potential project, their energy requirements, and their pricing requirements.
- Continue looking for interested parties for the development of an LFG project.
- Prepare detailed LFG collection system design and cost estimates.
- Conduct a detailed evaluation of potential revenues from emission reductions.
- If a site evaluation determines that Scenario 1 best reflects the disposal history, conduct a detailed evaluation of the potential for a LFGE electric generation project including wholesale electricity market pricing trends, electric sector regulations as they apply to small renewable generators, interconnect requirements, and tax implications.
- Potential project developers should discuss terms of participation, including revenue and risk sharing options, with the Ahmedabad Municipal Corporation.

Note that the economic analysis essentially indicates the cash flow to the project developer (assumed to be a third party). For this evaluation, the revenue to the City of Ahmedabad is represented by the sale of LFG at \$0.67 or \$0.84 per mmBtu (for emission reduction prices of \$8 or \$10, respectively). Adjustments to this rate have a significant impact on the cash flow to the developer. At this pre-feasibility phase, negotiable parameters such as this cannot be further refined.

The results of this study are based on limited contingency factors included in the cost estimates for capital and O&M. Further refinement of some of the assumptions used in the economic evaluation possibly may change the results of this pre-feasibility analysis.

APPENDIX A

PUMP TEST WELL CONSTRUCTION DIAGRAM



BORE LOG OF WELL CONSTRUCTION

APPENDIX B

PUMP TEST MONITORING DATA

Probe G 1-1-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	19.0	16.0	--
1-Aug-07	15.9	18.3	0.0
3-Aug-07	16.1	22.8	0.0
4-Aug-07	69.1	0.8	2.4
5-Aug-07	58.2	3.0	0.0
6-Aug-07	58.0	4.1	1.4
7-Aug-07	18.2	16.2	-0.1
9-Aug-07	26.3	13.9	-0.1
10-Aug-07	18.2	16.2	-0.1
11-Aug-07	26.3	13.9	-0.1
13-Aug-07	22.6	14.2	0.0
14-Aug-07	42.6	8.9	1.1
16-Aug-07	49.8	5.4	2.3
17-Aug-07	54.0	27.7	3.4
18-Aug-07	54.1	4.6	2.4
19-Aug-07	15.0	16.4	0.0
20-Aug-07	54.2	4.8	1.9

Probe G 2-1-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	74.1	0.6	--
1-Aug-07	70.6	0.4	2.8
3-Aug-07	71.0	0.4	0.9
4-Aug-07	70.7	0.5	2.7
5-Aug-07	74.6	0.1	2.7
6-Aug-07	70.5	0.5	2.5
7-Aug-07	68.9	0.5	2.9
9-Aug-07	72.5	0.3	3.3
10-Aug-07	71.7	0.4	3.6
11-Aug-07	71.4	0.3	5.9
13-Aug-07	70.4	0.3	3.6
14-Aug-07	71.2	0.2	3.3
16-Aug-07	69.9	0.2	1.9
17-Aug-07	72.6	0.1	3.2
18-Aug-07	71.5	0.1	3.1
19-Aug-07	70.2	0.0	3.4
20-Aug-07	69.9	0.3	2.6

Probe G 3-1-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	70.7	0.8	--
1-Aug-07	8.0	18.6	0.0
3-Aug-07	7.8	17.9	0.0
4-Aug-07	9.7	17.6	0.0
5-Aug-07	69.3	0.3	0.7
6-Aug-07	7.0	18.1	0.0
7-Aug-07	8.0	17.9	0.0
9-Aug-07	29.7	12.1	1.6
10-Aug-07	53.0	3.3	4.6
11-Aug-07	48.3	3.1	-2.4
13-Aug-07	46.3	7.2	-4.1
14-Aug-07	37.0	10.2	-6.6
16-Aug-07	41.1	8.2	0.7
17-Aug-07	13.8	16.8	-0.1
18-Aug-07	32.0	11.1	-5.3
19-Aug-07	23.7	12.7	1.1
20-Aug-07	9.5	17.1	-6.2

Probe G 1-1-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	45.5	7.6	--
1-Aug-07	54.6	2.8	1.8
3-Aug-07	59.0	0.5	1.8
4-Aug-07	40.9	17.7	0.0
5-Aug-07	21.3	15.8	-0.1
6-Aug-07	18.5	15.8	0.1
7-Aug-07	9.6	17.9	-0.1
9-Aug-07	10.5	18.1	0.0
10-Aug-07	9.6	18.3	0.0
11-Aug-07	27.4	12.7	0.7
13-Aug-07	9.5	17.9	0.5
14-Aug-07	11.4	17.5	0.0
16-Aug-07	8.2	18.0	0.0
17-Aug-07	8.3	18.3	0.0
18-Aug-07	10.8	17.8	0.0
19-Aug-07	54.5	4.3	2.6
20-Aug-07	17.1	15.7	0.0

Probe G 2-1-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	53.6	5.9	--
1-Aug-07	72.2	0.4	0.4
3-Aug-07	73.1	0.4	0.7
4-Aug-07	69.8	0.5	0.3
5-Aug-07	72.8	0.1	0.3
6-Aug-07	70.5	0.5	0.2
7-Aug-07	69.4	0.5	0.2
9-Aug-07	69.2	0.4	1.2
10-Aug-07	71.3	0.3	0.8
11-Aug-07	70.5	0.3	0.6
13-Aug-07	70.0	0.3	0.7
14-Aug-07	70.2	0.3	0.5
16-Aug-07	69.2	0.4	1.2
17-Aug-07	70.7	0.2	0.2
18-Aug-07	68.5	0.1	0.1
19-Aug-07	67.0	0.0	0.3
20-Aug-07	66.0	0.3	1.6

Probe G 3-1-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	43.9	6.3	--
1-Aug-07	65.9	0.9	0.8
3-Aug-07	68.9	0.8	0.7
4-Aug-07	67.7	0.7	0.5
5-Aug-07	10.8	18.3	0.0
6-Aug-07	67.7	0.6	0.6
7-Aug-07	66.9	0.6	0.9
9-Aug-07	69.4	0.3	1.7
10-Aug-07	69.2	0.2	1.3
11-Aug-07	67.7	3.8	1.2
13-Aug-07	69.7	0.3	1.4
14-Aug-07	69.9	0.1	1.1
16-Aug-07	67.8	0.3	1.0
17-Aug-07	68.2	0.1	0.8
18-Aug-07	66.4	0.2	0.9
19-Aug-07	66.7	0.0	0.9
20-Aug-07	65.5	0.5	0.7

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

GAS PROBES

Probe G 1-2-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	75.3	0.7	--
1-Aug-07	4.9	18.3	0.0
3-Aug-07	5.0	18.5	0.0
4-Aug-07	70.9	0.7	3.3
5-Aug-07	3.9	19.5	0.0
6-Aug-07	4.0	17.3	0.0
7-Aug-07	4.3	18.7	-0.1
9-Aug-07	4.6	19.2	-0.4
10-Aug-07	4.4	3.6	-2.2
11-Aug-07	4.6	18.9	0.0
13-Aug-07	4.1	18.7	0.0
14-Aug-07	4.7	19.1	0.0
16-Aug-07	4.6	18.5	0.0
17-Aug-07	4.2	18.5	0.0
18-Aug-07	4.4	18.4	0.0
19-Aug-07	4.5	18.0	0.0
20-Aug-07	5.3	18.6	0.0

Probe G 2-2-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	55.3	0.7	--
1-Aug-07	70.0	0.4	2.0
3-Aug-07	70.2	0.5	2.0
4-Aug-07	68.6	0.5	2.1
5-Aug-07	71.4	0.1	2.0
6-Aug-07	69.4	0.5	1.7
7-Aug-07	72.2	0.5	1.8
9-Aug-07	75.0	0.5	1.8
10-Aug-07	73.0	0.3	3.0
11-Aug-07	73.7	0.3	1.9
13-Aug-07	65.7	2.1	0.6
14-Aug-07	71.4	0.3	3.4
16-Aug-07	68.8	0.1	2.3
17-Aug-07	69.3	0.0	1.9
18-Aug-07	68.8	0.0	1.2
19-Aug-07	67.2	0.1	1.4
20-Aug-07	66.4	0.2	1.4

Probe G 3-2-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	73.1	0.6	--
1-Aug-07	70.2	0.6	1.0
3-Aug-07	69.6	0.7	0.9
4-Aug-07	70.1	0.5	1.2
5-Aug-07	73.0	0.2	0.6
6-Aug-07	69.9	0.5	1.0
7-Aug-07	69.4	0.4	1.6
9-Aug-07	71.6	0.4	2.4
10-Aug-07	71.4	0.3	1.9
11-Aug-07	70.7	0.3	1.6
13-Aug-07	72.2	0.3	2.0
14-Aug-07	71.1	0.3	1.5
16-Aug-07	69.4	0.2	1.2
17-Aug-07	70.4	0.3	1.1
18-Aug-07	69.2	0.3	1.2
19-Aug-07	68.7	10.2	0.7
20-Aug-07	68.5	0.3	1.4

Probe G 1-2-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	65.3	0.7	--
1-Aug-07	72.9	0.5	3.5
3-Aug-07	73.0	0.4	3.2
4-Aug-07	4.1	18.3	0.0
5-Aug-07	71.0	0.4	3.2
6-Aug-07	71.5	0.6	3.1
7-Aug-07	70.9	0.6	3.4
9-Aug-07	73.8	0.4	1.4
10-Aug-07	73.6	0.4	2.8
11-Aug-07	71.9	0.4	4.2
13-Aug-07	71.7	0.5	4.3
14-Aug-07	72.5	5.4	2.7
16-Aug-07	68.3	0.4	3.0
17-Aug-07	71.5	0.3	4.0
18-Aug-07	71.6	0.3	4.0
19-Aug-07	69.3	0.3	4.1
20-Aug-07	67.4	0.5	3.4

Probe G 2-2-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	73.3	0.3	--
1-Aug-07	71.5	0.5	0.5
3-Aug-07	72.2	0.4	1.3
4-Aug-07	69.2	0.5	0.0
5-Aug-07	72.7	0.1	0.4
6-Aug-07	69.9	0.5	0.3
7-Aug-07	67.9	0.5	1.2
9-Aug-07	72.9	0.3	1.6
10-Aug-07	72.1	0.4	2.5
11-Aug-07	69.5	0.5	2.7
13-Aug-07	67.8	0.3	2.6
14-Aug-07	68.6	3.2	2.0
16-Aug-07	67.5	0.1	1.7
17-Aug-07	68.9	0.0	1.4
18-Aug-07	69.8	0.0	1.0
19-Aug-07	67.8	0.0	1.2
20-Aug-07	67.9	0.2	1.0

Probe G 3-2-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	66.3	0.8	--
1-Aug-07	70.9	0.5	1.6
3-Aug-07	71.3	0.5	1.7
4-Aug-07	69.3	0.6	1.4
5-Aug-07	72.0	0.1	0.2
6-Aug-07	70.2	0.5	0.9
7-Aug-07	69.2	0.5	1.5
9-Aug-07	71.8	0.4	2.4
10-Aug-07	71.2	0.3	1.7
11-Aug-07	71.2	0.3	1.5
13-Aug-07	72.0	0.3	1.8
14-Aug-07	71.6	0.2	1.5
16-Aug-07	70.3	0.2	1.2
17-Aug-07	70.0	0.1	1.1
18-Aug-07	68.9	0.1	1.2
19-Aug-07	67.8	0.3	1.1
20-Aug-07	67.8	0.2	1.4

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

GAS PROBES

Probe G 1-3-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	70.4	0.7	--
1-Aug-07	4.6	19.0	0.0
3-Aug-07	5.0	17.6	0.0
4-Aug-07	4.6	17.4	0.0
5-Aug-07	3.8	19.4	0.0
6-Aug-07	3.9	17.2	0.0
7-Aug-07	3.7	18.8	0.0
9-Aug-07	5.2	19.0	0.0
10-Aug-07	3.8	19.0	0.0
11-Aug-07	3.8	18.7	0.0
13-Aug-07	3.5	19.8	0.0
14-Aug-07	4.2	19.7	0.0
16-Aug-07	4.0	18.8	0.0
17-Aug-07	3.8	18.5	0.0
18-Aug-07	4.0	18.9	0.0
19-Aug-07	3.5	19.0	0.0
20-Aug-07	4.1	18.9	0.0

Probe G 2-3-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	71.5	0.5	--
1-Aug-07	71.2	0.3	0.6
3-Aug-07	70.6	0.4	0.4
4-Aug-07	70.8	0.5	0.6
5-Aug-07	73.1	0.1	0.6
6-Aug-07	69.9	0.5	0.4
7-Aug-07	69.2	0.5	0.7
9-Aug-07	71.6	0.3	0.9
10-Aug-07	70.4	0.4	1.1
11-Aug-07	70.7	0.4	1.1
13-Aug-07	70.4	0.3	1.2
14-Aug-07	69.9	0.3	1.0
16-Aug-07	69.9	0.1	0.7
17-Aug-07	69.5	0.0	0.8
18-Aug-07	69.4	0.1	0.8
19-Aug-07	68.4	0.0	1.0
20-Aug-07	67.2	0.2	0.7

Probe G 3-3-D

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	72.8	0.5	--
1-Aug-07	69.5	0.6	4.2
3-Aug-07	70.9	0.5	4.1
4-Aug-07	69.2	0.6	4.7
5-Aug-07	71.0	0.1	5.1
6-Aug-07	69.0	0.4	3.9
7-Aug-07	69.0	0.4	4.9
9-Aug-07	69.5	0.2	5.5
10-Aug-07	70.1	0.3	5.7
11-Aug-07	69.4	0.3	4.6
13-Aug-07	70.0	0.3	5.0
14-Aug-07	70.0	0.1	4.6
16-Aug-07	67.9	0.1	3.5
17-Aug-07	68.9	0.1	3.5
18-Aug-07	68.0	0.1	3.5
19-Aug-07	67.5	0.1	3.8
20-Aug-07	66.4	0.3	3.0

Probe G 1-3-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	76.4	0.5	--
1-Aug-07	73.3	0.3	3.7
3-Aug-07	71.2	0.4	3.6
4-Aug-07	69.8	0.5	3.5
5-Aug-07	71.6	0.4	3.4
6-Aug-07	72.0	0.6	3.2
7-Aug-07	70.6	0.6	5.0
9-Aug-07	71.3	0.4	6.7
10-Aug-07	71.4	0.4	6.2
11-Aug-07	70.9	0.4	6.2
13-Aug-07	71.4	0.3	6.2
14-Aug-07	71.1	5.5	5.7
16-Aug-07	69.5	0.2	5.3
17-Aug-07	69.5	0.2	4.9
18-Aug-07	69.1	0.3	4.8
19-Aug-07	68.3	0.3	4.5
20-Aug-07	66.4	0.3	4.6

Probe G 2-3-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	73.2	0.5	--
1-Aug-07	72.7	0.4	0.6
3-Aug-07	72.1	0.3	0.6
4-Aug-07	69.4	0.7	0.3
5-Aug-07	72.0	0.1	0.2
6-Aug-07	70.0	0.5	0.1
7-Aug-07	68.8	0.4	0.0
9-Aug-07	71.0	0.3	0.9
10-Aug-07	70.1	0.4	0.2
11-Aug-07	69.5	0.3	0.3
13-Aug-07	70.0	0.3	0.4
14-Aug-07	70.5	0.2	0.2
16-Aug-07	69.4	0.1	0.3
17-Aug-07	70.5	0.0	0.1
18-Aug-07	69.6	0.0	0.1
19-Aug-07	67.6	0.0	0.1
20-Aug-07	68.4	0.2	0.1

Probe G 3-3-S

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]
24-Jul-07	70.9	0.6	--
1-Aug-07	69.7	0.4	4.4
3-Aug-07	71.7	0.4	4.7
4-Aug-07	68.6	0.7	4.5
5-Aug-07	72.0	0.1	4.5
6-Aug-07	68.4	0.4	4.1
7-Aug-07	67.6	0.4	4.8
9-Aug-07	70.0	0.2	5.7
10-Aug-07	69.8	0.2	5.3
11-Aug-07	69.4	0.3	5.2
13-Aug-07	70.0	0.3	5.2
14-Aug-07	70.0	0.1	4.4
16-Aug-07	69.3	0.2	3.4
17-Aug-07	69.4	0.1	3.9
18-Aug-07	67.7	0.1	4.5
19-Aug-07	67.0	0.1	3.6
20-Aug-07	67.7	0.2	1.9

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

Note: "--" indicates reading not taken.

GAS PROBES

Header

Date	Methane [%]	Oxygen [%]	Pressure [in. WC]	Temp. [°F]	Velocity [fpm]	LFG Flow [acfm]	Methane Flow [acfm]	LFG Flow @ 50% CH4 [scfm]
1-Aug-07	19.1	16.1	-12.7	94.0	143	12.5	2.4	4.4
3-Aug-07	21.7	15.5	-27.7	96.0	259	22.6	4.5	7.9
4-Aug-07	27.7	12.9	-26.2	94.0	224	19.5	5.3	9.2
5-Aug-07	33.8	11.5	-26.8	80.5	555	48.4	16.0	28.8
6-Aug-07	31.7	11.6	-26.2	94.5	325	28.4	9.2	16.1
7-Aug-07	26.8	12.8	-26.1	94.0	303	26.4	7.2	12.6
9-Aug-07	29.1	12.9	-26.4	91.3	391	34.1	8.3	14.7
10-Aug-07	27.4	13.5	-26.6	87.5	498	43.4	12.0	21.4
11-Aug-07	28.8	12.7	-26.6	87.8	308	26.9	8.2	14.6
12-Aug-07	24.0	14.5	-26.6	83.0	74	6.5	1.5	2.8
13-Aug-07	24.2	13.6	-30.1	89.8	234	20.4	4.6	8.1
14-Aug-07	33.6	11.0	-12.3	89.5	221	19.3	6.4	11.7
15-Aug-07	35.4	10.5	-11.4	93.5	300	26.2	9.6	17.5
16-Aug-07	31.2	11.4	-16.8	98.3	177	15.4	4.1	7.4
17-Aug-07	31.4	13.2	-18.6	100.0	122	10.6	3.7	6.6
18-Aug-07	35.2	10.2	-13.6	90.3	419	36.5	12.9	23.5
19-Aug-07	41.8	7.7	-14.1	97.3	245	21.3	8.8	15.9
20-Aug-07	44.1	5.8	-18.1	99.3	299	26.1	11.5	20.5
Averages	30.7	12.1	-21.5	92.2	283.0	24.7	7.6	13.5

APPENDIX C
LFG RECOVERY PROJECTIONS

TABLE C-1
PROJECTION OF POTENTIAL LANDFILL GAS RECOVERY AND RECOVERY UNDER MID-RANGE SCENARIO
DISPOSAL SCENARIO 1 - PIRANA LANDFILL, AHMEDABAD, INDIA

Year	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation (m ³ /hr) (cfm) (mmBtu/hr)			MID-RANGE RECOVERY SCENARIO								
						Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**		
							(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH4/yr)	(tonnes CO ₂ eq/yr)	
2000	193,130	193,130	0	0	0.0	0%	0	0	0.0	0.0	0	0	0	
2001	279,140	472,270	218	128	3.9	0%	0	0	0.0	0.0	0	0	0	
2002	0	472,270	528	311	9.4	0%	0	0	0.0	0.0	0	0	0	
2003	545,550	1,017,820	491	289	8.8	0%	0	0	0.0	0.0	0	0	0	
2004	630,070	1,647,890	1,033	608	18.5	0%	0	0	0.0	0.0	0	0	0	
2005	728,300	2,376,190	1,673	985	29.9	0%	0	0	0.0	0.0	0	0	0	
2006	809,860	3,186,050	2,343	1,379	41.9	0%	0	0	0.0	0.0	0	0	0	
2007	850,400	4,036,450	3,024	1,780	54.0	0%	0	0	0.0	0.0	0	0	0	
2008	553,550	4,590,000	3,668	2,159	65.6	0%	0	0	0.0	0.0	0	0	0	
2009	0	4,590,000	3,898	2,294	69.7	45%	1,754	1,032	31.3	2.9	0	5,507	115,645	
2010	0	4,590,000	3,437	2,023	61.4	50%	1,719	1,012	30.7	2.8	0	5,396	113,317	
2011	0	4,590,000	2,977	1,752	53.2	50%	1,489	876	26.6	2.5	0	4,674	98,151	
2012	0	4,590,000	2,599	1,530	46.4	50%	1,300	765	23.2	2.2	0	4,080	85,678	
2013	0	4,590,000	2,287	1,346	40.9	50%	1,143	673	20.4	1.9	0	3,590	75,381	
2014	0	4,590,000	2,028	1,193	36.2	50%	1,014	597	18.1	1.7	0	3,183	66,841	
2015	0	4,590,000	1,812	1,066	32.4	50%	906	533	16.2	1.5	0	2,844	59,724	
2016	0	4,590,000	1,631	960	29.1	50%	815	480	14.6	1.3	0	2,560	53,759	
2017	0	4,590,000	1,478	870	26.4	50%	739	435	13.2	1.2	0	2,320	48,730	
2018	0	4,590,000	1,349	794	24.1	50%	674	397	12.1	1.1	0	2,117	44,463	
2019	0	4,590,000	1,238	729	22.1	50%	619	364	11.1	1.0	0	1,944	40,817	
2020	0	4,590,000	1,143	673	20.4	50%	571	336	10.2	0.9	0	1,794	37,678	
2021	0	4,590,000	1,060	624	18.9	50%	530	312	9.5	0.9	0	1,665	34,956	
2022	0	4,590,000	988	582	17.7	50%	494	291	8.8	0.8	0	1,551	32,576	
2023	0	4,590,000	925	544	16.5	50%	462	272	8.3	0.8	0	1,451	30,481	
2024	0	4,590,000	868	511	15.5	50%	434	256	7.8	0.7	0	1,363	28,620	
2025	0	4,590,000	818	481	14.6	50%	409	241	7.3	0.7	0	1,284	26,957	
2026	0	4,590,000	772	455	13.8	50%	386	227	6.9	0.6	0	1,212	25,458	
2027	0	4,590,000	731	430	13.1	50%	366	215	6.5	0.6	0	1,148	24,098	
2028	0	4,590,000	693	408	12.4	50%	347	204	6.2	0.6	0	1,088	22,857	
2029	0	4,590,000	659	388	11.8	50%	329	194	5.9	0.5	0	1,034	21,718	
2030	0	4,590,000	627	369	11.2	50%	313	184	5.6	0.5	0	984	20,666	
2031	0	4,590,000	597	352	10.7	50%	299	176	5.3	0.5	0	938	19,690	
2032	0	4,590,000	570	335	10.2	50%	285	168	5.1	0.5	0	894	18,781	
2033	0	4,590,000	544	320	9.7	50%	272	160	4.9	0.4	0	854	17,930	
2034	0	4,590,000	520	306	9.3	50%	260	153	4.6	0.4	0	816	17,132	
2035	0	4,590,000	497	292	8.9	50%	248	146	4.4	0.4	0	780	16,381	

MODEL INPUT PARAMETERS:

Assumed Methane Content of LFG:	50%			
	Fast Decay	Med. Decay	Slow Decay	Total Site Lo
Decay Rate Constant (k):	0.220	0.044	0.011	
CH4 Generation Pot. (Lo) (ft3/ton):	1,910	5,176	5,595	2,044
Metric Equivalent Lo (m3/Mg):	60	162	175	64

NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **412,790 tonnes CO2e**

**TABLE C-2
PROJECTION OF LANDFILL GAS RECOVERY UNDER HIGH AND LOW RECOVERY SCENARIOS
DISPOSAL SCENARIO 1 - PIRANA LANDFILL, AHMEDABAD, INDIA**

Year	HIGH RECOVERY SCENARIO								LOW RECOVERY SCENARIO							
	Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**		Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**	
		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ e/yr)		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ e/yr)
2000	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2001	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2002	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2003	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2004	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2005	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2006	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2007	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2008	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2009	55%	2,144	1,262	38.3	3.5	0	6,731	141,343	30%	1,169	688	20.9	1.9	0	3,671	77,096
2010	60%	2,062	1,214	36.9	3.4	0	6,475	135,980	35%	1,203	708	21.5	2.0	0	3,777	79,322
2011	60%	1,786	1,051	31.9	3.0	0	5,609	117,781	35%	1,042	613	18.6	1.7	0	3,272	68,705
2012	60%	1,559	918	27.9	2.6	0	4,896	102,814	35%	910	535	16.3	1.5	0	2,856	59,975
2013	60%	1,372	808	24.5	2.3	0	4,307	90,457	35%	800	471	14.3	1.3	0	2,513	52,767
2014	60%	1,217	716	21.7	2.0	0	3,819	80,209	35%	710	418	12.7	1.2	0	2,228	46,789
2015	60%	1,087	640	19.4	1.8	0	3,413	71,668	35%	634	373	11.3	1.0	0	1,991	41,807
2016	60%	978	576	17.5	1.6	0	3,072	64,511	35%	571	336	10.2	0.9	0	1,792	37,631
2017	60%	887	522	15.8	1.5	0	2,785	58,476	35%	517	305	9.2	0.9	0	1,624	34,111
2018	60%	809	476	14.5	1.3	0	2,541	53,356	35%	472	278	8.4	0.8	0	1,482	31,124
2019	60%	743	437	13.3	1.2	0	2,332	48,980	35%	433	255	7.7	0.7	0	1,361	28,572
2020	60%	686	404	12.3	1.1	0	2,153	45,213	35%	400	235	7.1	0.7	0	1,256	26,375
2021	60%	636	374	11.4	1.1	0	1,997	41,947	35%	371	218	6.6	0.6	0	1,165	24,469
2022	60%	593	349	10.6	1.0	0	1,862	39,092	35%	346	204	6.2	0.6	0	1,086	22,804
2023	60%	555	327	9.9	0.9	0	1,742	36,577	35%	324	190	5.8	0.5	0	1,016	21,336
2024	60%	521	307	9.3	0.9	0	1,635	34,344	35%	304	179	5.4	0.5	0	954	20,034
2025	60%	491	289	8.8	0.8	0	1,540	32,348	35%	286	168	5.1	0.5	0	899	18,870
2026	60%	463	273	8.3	0.8	0	1,455	30,549	35%	270	159	4.8	0.4	0	849	17,820
2027	60%	439	258	7.8	0.7	0	1,377	28,918	35%	256	151	4.6	0.4	0	803	16,869
2028	60%	416	245	7.4	0.7	0	1,306	27,429	35%	243	143	4.3	0.4	0	762	16,000
2029	60%	395	233	7.1	0.7	0	1,241	26,061	35%	231	136	4.1	0.4	0	724	15,202
2030	60%	376	221	6.7	0.6	0	1,181	24,799	35%	219	129	3.9	0.4	0	689	14,466
2031	60%	358	211	6.4	0.6	0	1,125	23,628	35%	209	123	3.7	0.3	0	656	13,783
2032	60%	342	201	6.1	0.6	0	1,073	22,537	35%	199	117	3.6	0.3	0	626	13,146
2033	60%	326	192	5.8	0.5	0	1,025	21,516	35%	190	112	3.4	0.3	0	598	12,551
2034	60%	312	184	5.6	0.5	0	979	20,558	35%	182	107	3.3	0.3	0	571	11,992
2035	60%	298	175	5.3	0.5	0	936	19,657	35%	174	102	3.1	0.3	0	546	11,467

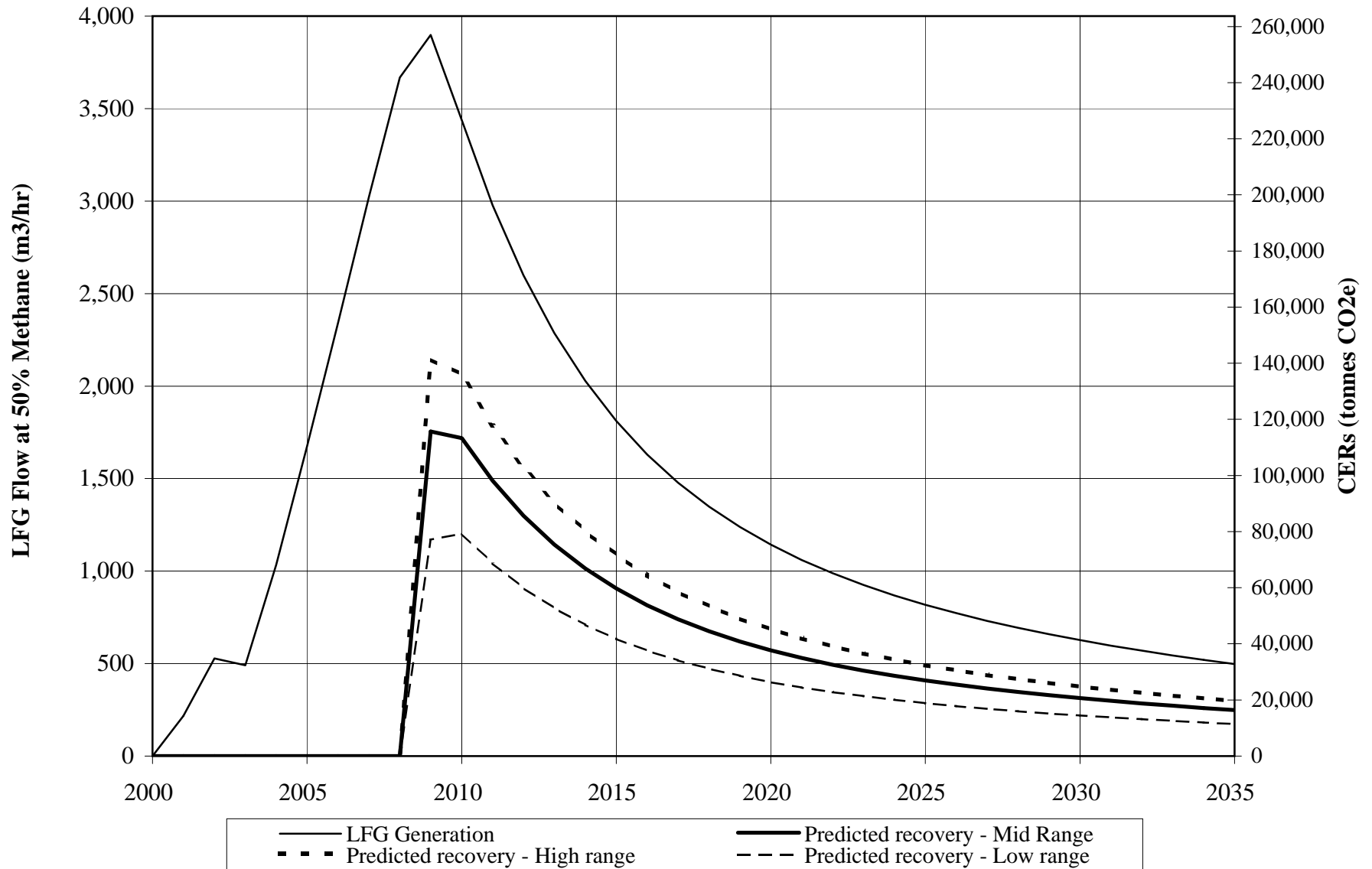
NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **497,918 tonnes CO₂e**

NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **285,098 tonnes CO₂e**

**Figure C-1. LFG Generation and Recovery Projection
Disposal Scenario 1 - Pirana Landfill, Ahmedabad, India**



**TABLE C-3
PROJECTION OF POTENTIAL LANDFILL GAS RECOVERY AND RECOVERY UNDER MID-RANGE SCENARIO
DISPOSAL SCENARIO 2 - PIRANA LANDFILL, AHMEDABAD, INDIA**

Year	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation (m ³ /hr) (cfm) (mmBtu/hr)			MID-RANGE RECOVERY SCENARIO							
						Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**	
							(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ eq/yr)
1985	98,850	98,850	0	0	0.0	0%	0	0	0.0	0.0	0	0	0
1986	126,690	225,540	111	66	2.0	0%	0	0	0.0	0.0	0	0	0
1987	135,850	361,390	252	148	4.5	0%	0	0	0.0	0.0	0	0	0
1988	134,080	495,470	386	227	6.9	0%	0	0	0.0	0.0	0	0	0
1989	128,810	624,280	500	295	8.9	0%	0	0	0.0	0.0	0	0	0
1990	172,460	796,740	593	349	10.6	0%	0	0	0.0	0.0	0	0	0
1991	216,420	1,013,160	721	424	12.9	0%	0	0	0.0	0.0	0	0	0
1992	204,490	1,217,650	888	523	15.9	0%	0	0	0.0	0.0	0	0	0
1993	215,230	1,432,880	1,026	604	18.3	0%	0	0	0.0	0.0	0	0	0
1994	159,720	1,592,600	1,156	681	20.7	0%	0	0	0.0	0.0	0	0	0
1995	121,580	1,714,180	1,209	712	21.6	0%	0	0	0.0	0.0	0	0	0
1996	150,580	1,864,760	1,207	710	21.6	0%	0	0	0.0	0.0	0	0	0
1997	164,810	2,029,570	1,236	727	22.1	0%	0	0	0.0	0.0	0	0	0
1998	171,900	2,201,470	1,284	756	22.9	0%	0	0	0.0	0.0	0	0	0
1999	179,790	2,381,260	1,339	788	23.9	0%	0	0	0.0	0.0	0	0	0
2000	186,690	2,567,950	1,399	823	25.0	0%	0	0	0.0	0.0	0	0	0
2001	132,050	2,700,000	1,461	860	26.1	0%	0	0	0.0	0.0	0	0	0
2002	0	2,700,000	1,458	858	26.0	0%	0	0	0.0	0.0	0	0	0
2003	183,190	2,883,190	1,301	766	23.2	0%	0	0	0.0	0.0	0	0	0
2004	211,570	3,094,760	1,357	799	24.3	0%	0	0	0.0	0.0	0	0	0
2005	244,550	3,339,310	1,467	863	26.2	0%	0	0	0.0	0.0	0	0	0
2006	271,940	3,611,250	1,604	944	28.7	0%	0	0	0.0	0.0	0	0	0
2007	425,200	4,036,450	1,758	1,035	31.4	0%	0	0	0.0	0.0	0	0	0
2008	553,550	4,590,000	2,068	1,217	37.0	0%	0	0	0.0	0.0	0	0	0
2009	0	4,590,000	2,502	1,473	44.7	45%	1,126	663	20.1	1.9	0	3,535	74,237
2010	0	4,590,000	2,270	1,336	40.6	50%	1,135	668	20.3	1.9	0	3,564	74,844
2011	0	4,590,000	1,996	1,175	35.7	50%	998	587	17.8	1.7	0	3,133	65,791
2012	0	4,590,000	1,768	1,041	31.6	50%	884	520	15.8	1.5	0	2,776	58,289
2013	0	4,590,000	1,579	929	28.2	50%	789	465	14.1	1.3	0	2,478	52,040
2014	0	4,590,000	1,420	836	25.4	50%	710	418	12.7	1.2	0	2,229	46,807
2015	0	4,590,000	1,286	757	23.0	50%	643	379	11.5	1.1	0	2,019	42,399
2016	0	4,590,000	1,173	690	21.0	50%	586	345	10.5	1.0	0	1,841	38,662
2017	0	4,590,000	1,076	633	19.2	50%	538	317	9.6	0.9	0	1,689	35,472
2018	0	4,590,000	993	584	17.7	50%	496	292	8.9	0.8	0	1,558	32,728

TABLE C-3
PROJECTION OF POTENTIAL LANDFILL GAS RECOVERY AND RECOVERY UNDER MID-RANGE SCENARIO
DISPOSAL SCENARIO 2 - PIRANA LANDFILL, AHMEDABAD, INDIA

Year	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation (m ³ /hr) (cfm) (mmBtu/hr)			MID-RANGE RECOVERY SCENARIO							
						Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**	
							(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH4/yr)	(tonnes CO ₂ eq/yr)
2019	0	4,590,000	921	542	16.5	50%	460	271	8.2	0.8	0	1,445	30,352
2020	0	4,590,000	858	505	15.3	50%	429	252	7.7	0.7	0	1,346	28,276
2021	0	4,590,000	802	472	14.3	50%	401	236	7.2	0.7	0	1,260	26,450
2022	0	4,590,000	753	443	13.5	50%	377	222	6.7	0.6	0	1,182	24,831
2023	0	4,590,000	709	418	12.7	50%	355	209	6.3	0.6	0	1,114	23,384
2024	0	4,590,000	670	394	12.0	50%	335	197	6.0	0.6	0	1,052	22,082
2025	0	4,590,000	634	373	11.3	50%	317	187	5.7	0.5	0	995	20,901
2026	0	4,590,000	601	354	10.7	50%	301	177	5.4	0.5	0	944	19,825
2027	0	4,590,000	571	336	10.2	50%	286	168	5.1	0.5	0	897	18,837
2028	0	4,590,000	544	320	9.7	50%	272	160	4.9	0.4	0	854	17,926
2029	0	4,590,000	518	305	9.3	50%	259	152	4.6	0.4	0	813	17,081
2030	0	4,590,000	494	291	8.8	50%	247	145	4.4	0.4	0	776	16,294
2031	0	4,590,000	472	278	8.4	50%	236	139	4.2	0.4	0	741	15,559
2032	0	4,590,000	451	265	8.1	50%	226	133	4.0	0.4	0	708	14,868
2033	0	4,590,000	431	254	7.7	50%	216	127	3.9	0.4	0	677	14,219
2034	0	4,590,000	413	243	7.4	50%	206	121	3.7	0.3	0	648	13,606
2035	0	4,590,000	395	233	7.1	50%	198	116	3.5	0.3	0	620	13,027

MODEL INPUT PARAMETERS:

Assumed Methane Content of LFG:	50%			
	<u>Fast Decay</u>	<u>Med. Decay</u>	<u>Slow Decay</u>	<u>Total Site Lo</u>
Decay Rate Constant (k):	0.220	0.044	0.011	
CH4 Generation Pot. (Lo) (ft3/ton):	1,910	5,176	5,595	2,044
Metric Equivalent Lo (m3/Mg):	60	162	175	64

NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **273,162 tonnes CO₂e**

**TABLE C-4
PROJECTION OF LANDFILL GAS RECOVERY UNDER HIGH AND LOW RECOVERY SCENARIOS
DISPOSAL SCENARIO 2 - PIRANA LANDFILL, AHMEDABAD, INDIA**

Year	HIGH RECOVERY SCENARIO								LOW RECOVERY SCENARIO							
	Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**		Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**	
		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ eq/yr)		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ eq/yr)
1985	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1986	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1987	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1988	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1989	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1990	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1991	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1992	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1993	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1994	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1995	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1996	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1997	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1998	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
1999	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2000	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2001	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2002	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2003	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2004	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2005	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2006	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2007	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2008	0%	0	0	0.0	0.0	0	0	0	0%	0	0	0.0	0.0	0	0	0
2009	55%	1,376	810	24.6	2.3	0	4,321	90,734	30%	751	442	13.4	1.2	0	2,357	49,491
2010	60%	1,362	802	24.3	2.3	0	4,277	89,813	35%	795	468	14.2	1.3	0	2,495	52,391
2011	60%	1,197	705	21.4	2.0	0	3,760	78,950	35%	699	411	12.5	1.2	0	2,193	46,054
2012	60%	1,061	624	19.0	1.8	0	3,331	69,946	35%	619	364	11.1	1.0	0	1,943	40,802
2013	60%	947	557	16.9	1.6	0	2,974	62,448	35%	553	325	9.9	0.9	0	1,735	36,428
2014	60%	852	501	15.2	1.4	0	2,675	56,169	35%	497	293	8.9	0.8	0	1,560	32,765
2015	60%	772	454	13.8	1.3	0	2,423	50,879	35%	450	265	8.0	0.7	0	1,413	29,680
2016	60%	704	414	12.6	1.2	0	2,209	46,395	35%	410	242	7.3	0.7	0	1,289	27,064
2017	60%	646	380	11.5	1.1	0	2,027	42,566	35%	377	222	6.7	0.6	0	1,182	24,830
2018	60%	596	351	10.6	1.0	0	1,870	39,274	35%	347	205	6.2	0.6	0	1,091	22,910
2019	60%	552	325	9.9	0.9	0	1,734	36,422	35%	322	190	5.8	0.5	0	1,012	21,246
2020	60%	515	303	9.2	0.9	0	1,616	33,932	35%	300	177	5.4	0.5	0	943	19,793
2021	60%	481	283	8.6	0.8	0	1,511	31,740	35%	281	165	5.0	0.5	0	882	18,515
2022	60%	452	266	8.1	0.7	0	1,419	29,797	35%	264	155	4.7	0.4	0	828	17,381
2023	60%	426	251	7.6	0.7	0	1,336	28,061	35%	248	146	4.4	0.4	0	779	16,369
2024	60%	402	237	7.2	0.7	0	1,262	26,498	35%	234	138	4.2	0.4	0	736	15,457
2025	60%	380	224	6.8	0.6	0	1,194	25,082	35%	222	131	4.0	0.4	0	697	14,631
2026	60%	361	212	6.4	0.6	0	1,133	23,790	35%	210	124	3.8	0.3	0	661	13,877
2027	60%	343	202	6.1	0.6	0	1,076	22,605	35%	200	118	3.6	0.3	0	628	13,186

**TABLE C-4
PROJECTION OF LANDFILL GAS RECOVERY UNDER HIGH AND LOW RECOVERY SCENARIOS
DISPOSAL SCENARIO 2 - PIRANA LANDFILL, AHMEDABAD, INDIA**

Year	HIGH RECOVERY SCENARIO								LOW RECOVERY SCENARIO							
	Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**		Collection System Efficiency (%)	Predicted LFG Recovery			Maximum Power Plant Capacity* (MW)	Baseline** LFG Flow (m ³ /hr)	Methane Emissions Reduction Estimates**	
		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ eq/yr)		(m ³ /hr)	(cfm)	(mmBtu/hr)			(tonnes CH ₄ /yr)	(tonnes CO ₂ eq/yr)
2028	60%	326	192	5.8	0.5	0	1,024	21,511	35%	190	112	3.4	0.3	0	598	12,548
2029	60%	311	183	5.6	0.5	0	976	20,497	35%	181	107	3.2	0.3	0	569	11,957
2030	60%	297	175	5.3	0.5	0	931	19,553	35%	173	102	3.1	0.3	0	543	11,406
2031	60%	283	167	5.1	0.5	0	889	18,670	35%	165	97	3.0	0.3	0	519	10,891
2032	60%	271	159	4.8	0.4	0	850	17,842	35%	158	93	2.8	0.3	0	496	10,408
2033	60%	259	152	4.6	0.4	0	813	17,063	35%	151	89	2.7	0.2	0	474	9,953
2034	60%	248	146	4.4	0.4	0	778	16,328	35%	144	85	2.6	0.2	0	454	9,524
2035	60%	237	140	4.2	0.4	0	744	15,632	35%	138	81	2.5	0.2	0	434	9,119

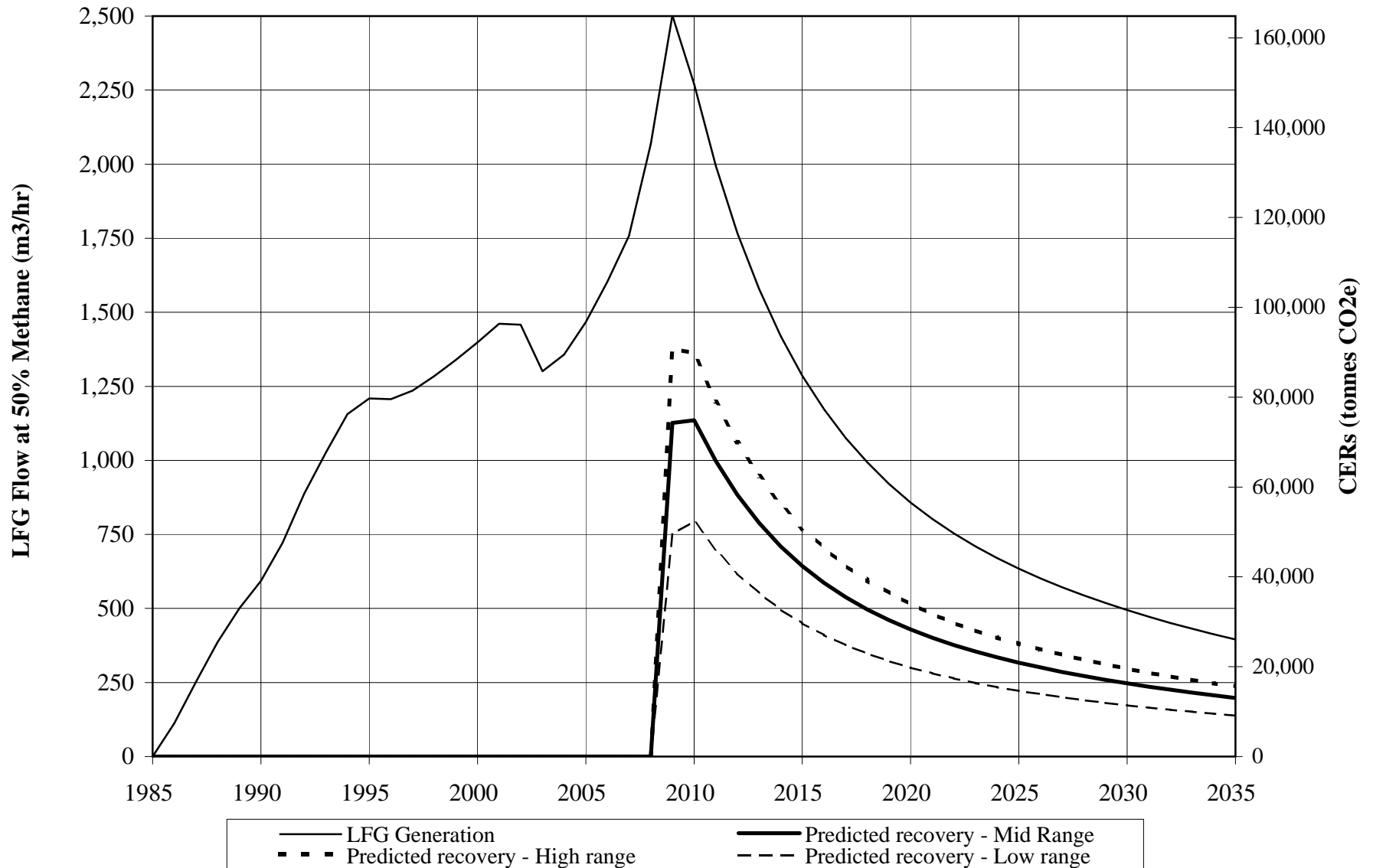
NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **329,444 tonnes CO₂e**

NOTES:

* Maximum power plant capacity assumes a gross heat rate of 10,800 Btus per kW-hr (hhv).
 **Baseline LFG flow assumes no LFG recovery (no combustion). CERs do not include electricity generation, system down-time, or methane destruction efficiency assumptions (default = 90%).
 Total estimated CERs for the 2009-2012 period = **188,739 tonnes CO₂e**

**Figure C-2. LFG Generation and Recovery Projection
Disposal Scenario 2 - Pirana Landfill, Ahmedabad, India**



APPENDIX D
CONSTRUCTION COST ESTIMATES

**TABLE D-1. ESTIMATE OF PROJECT CAPITAL COSTS (2008 - 2009)
LANDFILL GAS COLLECTION AND FLARING SYSTEM - SCENARIO 1
PIRANA LANDFILL, AMEDABAD, INDIA**

Cost Item	Quantity	Unit	Unit Cost (U.S. \$)	Total Initial Cost (U.S. \$)
Mobilization and Project Management	1	each	\$120,000	\$120,000
New vertical extraction wells (52 wells x 20m average depth)	1,040	m	\$260	\$270,000
Gas wellheads	52	each	\$600	\$31,000
Leachate pumping equipment (assumed required in 50% of wells)	26	each	\$5,000	\$130,000
Gas header piping (assume 300 mm [12 in]) - below ground	50	m	\$140	\$7,000
Gas header piping (assume 250 mm [10 in]) - below ground	1,400	m	\$120	\$168,000
Gas header piping (assume 200 mm [8 in]) - below ground	2,870	m	\$105	\$301,000
Gas header piping (assume 150 mm [6 in]) - below ground	1,600	m	\$90	\$144,000
Gas lateral piping (assume 100 mm [4 in]) - above ground	4,600	m	\$39	\$179,000
Main header valve (assume 300 mm [12 in]) - above ground	1	each	\$3,500	\$3,500
Main header valve (assume 250 mm [10 in]) - above ground	2	each	\$2,500	\$5,000
Main header valve (assume 200 mm [8 in]) - above ground	1	each	\$2,000	\$2,000
Condensate traps, self-draining	4	each	\$9,000	\$36,000
Condensate sumps with electric pumps	1	each	\$24,000	\$24,000
Security fencing around landfill	1	each	\$150,000	\$150,000
LFG enclosed flaring station (1,100 cfm/1,870 m ³ /hr LFG capacity)	1	each	\$175,000	\$175,000
Flare station construction and sitework	1	each	\$50,000	\$50,000
Flare start-up	1	each	\$15,000	\$15,000
Source test	1	each	\$25,000	\$25,000
LFG measurement and recording equipment	1	each	\$35,000	\$35,000
Engineering, Contingency, and Up-front CDM Transaction Costs	1	each	\$331,000	\$331,000
Total construction cost (2008 U.S. \$) =				\$2,201,500
2008 Costs (2008 U.S. \$) =				\$2,101,500
2009 Costs (2008 U.S. \$) =				\$100,000

Notes:

1. Extraction well costs include drilling and well construction. 25% was added to high end U.S. costs due to site conditions.
2. Flare station includes flare, blowers, flame arrester, controls, piping, valves, foundation and fencing.

**TABLE D-2. ESTIMATE OF PROJECT CAPITAL COSTS
1266 KW RECIPROCATING ENGINE LFGE PROJECT (SCENARIO 1)
PIRANA LANDFILL, AMEDABAD, INDIA**

Cost Item	Quantity	Unit	Unit Cost (U.S. \$)	Total Initial Cost (U.S. \$)
Mobilization and Project Management	1	each	\$120,000	\$120,000
Plant construction and sitework	1	each	\$80,000	\$80,000
LFG blower and treatment (no additional required)	0	each	\$200	\$0
LFG measurement and recording equipment	1	each	\$35,000	\$35,000
1266 kW LFG-fueled power plant (\$1000/kW installed capacity)	1,266	each	\$1,000	\$1,266,000
Plant Substation (switchgear, main breaker, step-up transformer)	1	each	\$200,000	\$200,000
Electric Interconnection	1	each	\$100,000	\$100,000
Right of Way (assumed right of way purchase not required)	0	each	\$0	\$0
Source Test	1	each	\$25,000	\$25,000
Engineering and Contingency	10%	percent	\$182,600	\$182,600
Total construction cost (2008 U.S. \$) =				\$2,008,600

*NOTE: Costs are additional to collection system and flare station costs

**TABLE D-3. ESTIMATE OF PROJECT CAPITAL COSTS (2008 - 2009)
LANDFILL GAS COLLECTION AND FLARING SYSTEM - SCENARIO 2
PIRANA LANDFILL, AMEDABAD, INDIA**

Cost Item	Quantity	Unit	Unit Cost (U.S. \$)	Total Initial Cost (U.S. \$)
Mobilization and Project Management	1	each	\$110,000	\$110,000
New vertical extraction wells (52 wells x 20m average depth)	1,040	m	\$260	\$270,000
Gas wellheads	52	each	\$600	\$31,000
Leachate pumping equipment (assumed required in 50% of wells)	26	each	\$5,000	\$130,000
Gas header piping (assume 250 mm [10 in]) - below ground	50	m	\$120	\$6,000
Gas header piping (assume 200 mm [8 in]) - below ground	1,400	m	\$105	\$147,000
Gas header piping (assume 150 mm [6 in]) - below ground	4,470	m	\$90	\$402,000
Gas lateral piping (assume 100 mm [4 in]) - above ground	4,600	m	\$39	\$179,000
Main header valve (assume 460 mm [18 in]) - above ground	0	each	\$16,000	\$0
Main header valve (assume 350 mm [14 in]) - above ground	0	each	\$7,000	\$0
Main header valve (assume 300 mm [12 in]) - above ground	1	each	\$3,500	\$3,500
Main header valve (assume 250 mm [10 in]) - above ground	2	each	\$2,500	\$5,000
Main header valve (assume 200 mm [8 in]) - above ground	1	each	\$2,000	\$2,000
Condensate traps, self-draining	4	each	\$9,000	\$36,000
Condensate sumps with electric pumps	1	each	\$24,000	\$24,000
Security fencing around landfill	1	each	\$150,000	\$150,000
LFG enclosed flaring station (700 cfm/1,190 m ³ /hr LFG capacity)	1	each	\$150,000	\$150,000
Flare station construction and sitework	1	each	\$50,000	\$50,000
Flare start-up	1	each	\$15,000	\$15,000
Source test	1	each	\$25,000	\$25,000
LFG measurement and recording equipment	1	each	\$35,000	\$35,000
Engineering, Contingency, and Up-front CDM Transaction Costs	1	each	\$316,000	\$316,000
Total construction cost (2008 U.S. \$) =				\$2,086,500
2008 Costs (2008 U.S. \$) =				\$1,986,500
2009 Costs (2008 U.S. \$) =				\$100,000

Notes:

1. Extraction well costs include drilling and well construction. 25% was added to high end U.S. costs due to site conditions.
2. Flare station includes flare, blowers, flame arrester, controls, piping, valves, foundation and fencing.

**TABLE D-4. ESTIMATE OF PROJECT CAPITAL COSTS
1080 KW RECIPROCATING ENGINE LFGE PROJECT (SCENARIO 2)
PIRANA LANDFILL, AMEDABAD, INDIA**

Cost Item	Quantity	Unit	Unit Cost (U.S. \$)	Total Initial Cost (U.S. \$)
Mobilization and Project Management	1	each	\$100,000	\$100,000
Plant construction and sitework	1	each	\$80,000	\$80,000
LFG blower and treatment (no additional required)	0	each	\$200	\$0
LFG measurement and recording equipment	1	each	\$35,000	\$35,000
1080 kW LFG-fueled power plant (\$1000/kW installed capacity)	1,080	each	\$1,000	\$1,080,000
Plant Substation (switchgear, main breaker, step-up transformer)	1	each	\$200,000	\$200,000
Electric Interconnection	1	each	\$100,000	\$100,000
Right of Way (assumed right of way purchase not required)	0	each	\$0	\$0
Source Test	1	each	\$25,000	\$25,000
Engineering and Contingency	10%	percent	\$162,000	\$162,000
Total construction cost (2008 U.S. \$) =				\$1,782,000

*NOTE: Costs are additional to collection system and flare station costs

APPENDIX E

ECONOMIC EVALUATION UNDER RECOVERY SCENARIO 1

**TABLE E-1. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING, \$8/TONNE GHG CREDITS THROUGH 2012**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798
Equity Contribution to Capital Cost	\$2,101,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,101,500	\$511,058	\$313,372	\$296,410	\$282,972	\$99,698	\$102,688	\$105,769
NET CASH FLOW	(\$2,101,500)	\$414,098	\$593,164	\$488,794	\$402,453	(\$99,698)	(\$102,688)	(\$105,769)
NPV		(\$625,991)						
INTERNAL RATE OF RETURN		-4.0%						

	<u>2008</u>	
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq) \$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr) \$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION 3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu) \$0.67
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE 3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr) \$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION 3.0%
EQUITY CONTRIBUTION	\$2,101,500	2009 REGISTRATION, MONITORING, VERIFICATION C \$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008) \$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008) \$86,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION 3.0%

**TABLE E-2. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT, \$8/TONNE GHG CREDITS THROUGH 2012**

	0	1	2	3	4	5	6	7
	2008	2009	2010	2011	2012	2013	2014	2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798
Equity Contribution to Capital Cost	\$525,375	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$497,221	\$497,221	\$497,221	\$497,221	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$525,375	\$1,008,280	\$810,594	\$793,632	\$780,194	\$99,698	\$102,688	\$105,769
NET CASH FLOW	(\$525,375)	(\$83,124)	\$95,943	(\$8,427)	(\$94,768)	(\$99,698)	(\$102,688)	(\$105,769)
NPV		(\$514,267)						
INTERNAL RATE OF RETURN		#NUM!						

	2008		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$525,375	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-3. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING, \$8/TONNE OF GHG CREDITS THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565
Equity Contribution to Capital Cost	\$2,101,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$139,009	\$126,959	\$116,843	\$108,329	\$101,142	\$95,054
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,101,500	\$511,058	\$313,372	\$296,410	\$282,972	\$272,472	\$264,426	\$258,434	\$254,168	\$251,356	\$249,774
NET CASH FLOW	(\$2,101,500)	\$414,098	\$593,164	\$488,794	\$402,453	\$330,574	\$270,302	\$219,355	\$175,904	\$138,487	\$105,930
NPV		(\$173,953)									
INTERNAL RATE OF RETURN		10.8%									

	<u>2008</u>		
INITIAL GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
INITIAL NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,101,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-4. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT, \$8/TONNE GHG CREDIT THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,597	3,183	2,844	2,560	2,320	2,117
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565
Equity Contribution to Capital Cost	\$525,375	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$139,009	\$126,959	\$116,843	\$108,329	\$101,142	\$95,054
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507
TOTAL ANNUAL COSTS	\$525,375	\$767,565	\$569,879	\$552,917	\$539,479	\$528,979	\$520,933	\$514,941	\$510,675	\$507,863	\$506,281
NET CASH FLOW	(\$525,375)	\$157,591	\$336,657	\$232,287	\$145,946	\$74,067	\$13,795	(\$37,152)	(\$80,603)	(\$118,020)	(\$150,577)
NPV		\$34,954									
INTERNAL RATE OF RETURN		20.4%									

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$525,375	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-5. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$52,706	\$52,706	\$52,706	\$52,706	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,544,720	\$1,543,105	\$1,439,289	\$1,357,552	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$4,110,100	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.0206	\$0.0212	\$0.0219	\$0.0225	\$0.0232	\$0.0239	\$0.0246	\$0.0253	\$0.0261	\$0.0269	\$0.0277	\$0.0285	\$0.0294	\$0.0303
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$4,110,100	\$721,239	\$529,858	\$519,391	\$512,643	\$336,258	\$346,346	\$356,736	\$367,438	\$245,336	\$252,696	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$4,110,100)	\$823,481	\$1,013,247	\$919,898	\$844,909	\$301,745	\$310,798	\$320,121	\$329,725	\$113,703	\$117,114	\$120,628	\$124,247	\$127,974	\$131,813
NPV															
INTERNAL RATE OF RETURN															

	2008	2017		
GROSS PLANT CAPACITY (MW)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.59	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kWhr)	\$0.020
EQUITY PERCENTAGE	100%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$4,110,100		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-6. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$52,706	\$52,706	\$52,706	\$52,706	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,544,720	\$1,543,105	\$1,439,289	\$1,357,552	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$1,027,525	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675
TOTAL ANNUAL COSTS	\$1,027,525	\$1,222,914	\$1,031,533	\$1,021,066	\$1,014,317	\$837,933	\$848,020	\$858,411	\$869,113	\$747,011	\$754,371	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$1,027,525)	\$321,806	\$511,572	\$418,223	\$343,234	(\$199,930)	(\$190,877)	(\$181,553)	(\$171,950)	(\$387,972)	(\$384,561)	\$120,628	\$124,247	\$127,974	\$131,813
NPV		(\$275,506)													
INTERNAL RATE OF RETURN		#NUM!													

	2008	2017		
GROSS PLANT CAPACITY (MW)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.59	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,027,525		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-7. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	6,588	6,588	6,588	6,588	3,294	3,294	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$26,353	\$26,353	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,544,720	\$1,543,105	\$1,439,289	\$1,357,552	\$1,293,755	\$1,244,577	\$1,207,353	\$1,179,941	\$775,235	\$751,867	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$4,110,100	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$139,009	\$126,959	\$116,843	\$108,329	\$101,142	\$95,054	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.026	\$0.027	\$0.027	\$0.028	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$4,110,100	\$721,239	\$529,858	\$519,391	\$512,643	\$509,032	\$508,083	\$509,401	\$512,664	\$384,481	\$386,893	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$4,110,100)	\$823,481	\$1,013,247	\$919,898	\$844,909	\$784,723	\$736,494	\$697,952	\$667,278	\$390,754	\$364,975	\$120,628	\$124,247	\$127,974	\$131,813
NPV	\$75,710														
INTERNAL RATE OF RETURN	14.6%														

	2008	2017		
GROSS PLANT CAPACITY (MW)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.59	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kWhr)	\$0.020
EQUITY PERCENTAGE	100%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$4,110,100		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-8. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	6,588	6,588	6,588	6,588	3,294	3,294	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$52,706	\$26,353	\$26,353	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,544,720	\$1,543,105	\$1,439,289	\$1,357,552	\$1,293,755	\$1,244,577	\$1,207,353	\$1,179,941	\$775,235	\$751,867	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$1,027,525	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$139,009	\$126,959	\$116,843	\$108,329	\$101,142	\$95,054	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,027,525	\$1,222,914	\$1,031,533	\$1,021,066	\$1,014,317	\$1,010,707	\$1,009,758	\$1,011,076	\$1,014,339	\$886,156	\$888,567	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$1,027,525)	\$321,806	\$511,572	\$418,223	\$343,234	\$283,048	\$234,819	\$196,277	\$165,603	(\$110,921)	(\$136,700)	\$120,628	\$124,247	\$127,974	\$131,813
NPV	\$484,290														
INTERNAL RATE OF RETURN	30.4%														

GROSS PLANT CAPACITY (MW)	2008	2017		
NET PLANT CAPACITY (MW) (7% parasitic load)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$8.00
PLANT CAPACITY FACTOR	92%	92%	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744	POWER PRICE ESCALATION	3.0%
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,027,525		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-9. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$46,413	\$46,413	\$46,413	\$46,413	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,315,695	\$1,307,399	\$1,196,700	\$1,107,874	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$2,541,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,541,500	\$581,098	\$385,513	\$370,716	\$359,507	\$178,528	\$183,884	\$189,401	\$191,574	\$189,360	\$188,082	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$2,541,500)	\$734,597	\$921,885	\$825,985	\$748,367	\$208,788	\$215,052	\$221,503	\$214,419	\$189,696	\$168,156	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$339,848														
INTERNAL RATE OF RETURN	19.0%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,541,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$2,541,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-10. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$8/TONNE GHG CREDITS THROUGH 2012; 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802
CER Revenue from Energy Displacement (\$/yr)	\$0	\$46,413	\$46,413	\$46,413	\$46,413	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,315,695	\$1,307,399	\$1,196,700	\$1,107,874	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$632,875	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$632,875	\$890,091	\$694,506	\$679,708	\$668,499	\$487,521	\$492,877	\$498,393	\$500,567	\$498,352	\$497,075	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$632,875)	\$425,604	\$612,893	\$516,992	\$439,374	(\$100,205)	(\$93,941)	(\$87,489)	(\$94,574)	(\$119,296)	(\$140,837)	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$600,273														
INTERNAL RATE OF RETURN	65.9%														

	<u>2009</u>	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$632,875	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-11. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,565	5,045	4,603	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$44,523	\$40,358	\$36,824	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,315,695	\$1,307,399	\$1,196,700	\$1,107,874	\$1,036,775	\$980,077	\$935,106	\$880,588	\$809,257	\$748,766	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$2,531,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,531,500	\$581,098	\$385,513	\$370,716	\$359,507	\$212,293	\$218,662	\$225,222	\$228,470	\$227,363	\$227,225	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$2,531,500)	\$734,597	\$921,885	\$825,985	\$748,367	\$824,482	\$761,415	\$709,884	\$652,118	\$581,894	\$521,541	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$1,342,681														
INTERNAL RATE OF RETURN	28.6%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$2,531,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-12. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$925,156	\$906,536	\$785,204	\$685,425	\$603,046	\$534,728	\$477,789	\$430,072	\$389,843	\$355,704	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,565	5,045	4,603	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$46,413	\$44,523	\$40,358	\$36,824	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,315,695	\$1,307,399	\$1,196,700	\$1,107,874	\$1,036,775	\$980,077	\$935,106	\$880,588	\$809,257	\$748,766	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$632,875	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$189,478	\$191,235	\$170,609	\$153,397	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$632,875	\$890,091	\$694,506	\$679,708	\$668,499	\$521,286	\$527,655	\$534,215	\$537,463	\$536,356	\$536,218	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$632,875)	\$425,604	\$612,893	\$516,992	\$439,374	\$515,489	\$452,422	\$400,892	\$343,125	\$272,901	\$212,548	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$1,594,334														
INTERNAL RATE OF RETURN	76.9%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$632,875	2009 REGISTRATION, MONITORING, VERIFICATION COST
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-13. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING, \$10/TONNE GHG CREDITS THROUGH 2012**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798
Equity Contribution to Capital Cost	\$2,101,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,101,500	\$559,135	\$361,894	\$339,699	\$321,894	\$99,698	\$102,688	\$105,769
NET CASH FLOW	(\$2,101,500)	\$597,310	\$771,276	\$641,806	\$534,888	(\$99,698)	(\$102,688)	(\$105,769)
NPV		(\$205,416)						
INTERNAL RATE OF RETURN		8.3%						

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,101,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-14. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT, \$10/TONNE GHG CREDITS THROUGH 2012**

	0	1	2	3	4	5	6	7
	2008	2009	2010	2011	2012	2013	2014	2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798
Equity Contribution to Capital Cost	\$525,375	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$497,221	\$497,221	\$497,221	\$497,221	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$525,375	\$1,056,356	\$859,116	\$836,921	\$819,115	\$99,698	\$102,688	\$105,769
NET CASH FLOW	(\$525,375)	\$100,089	\$274,054	\$144,585	\$37,666	(\$99,698)	(\$102,688)	(\$105,769)
NPV		(\$93,693)						
INTERNAL RATE OF RETURN		2.6%						

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$525,375	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-15. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING, \$10/TONNE OF GHG CREDITS THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565
Equity Contribution to Capital Cost	\$2,101,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$174,280	\$159,172	\$146,490	\$135,816	\$126,805	\$119,172
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,101,500	\$559,135	\$361,894	\$339,699	\$321,894	\$307,743	\$296,639	\$288,081	\$281,654	\$277,018	\$273,892
NET CASH FLOW	(\$2,101,500)	\$597,310	\$771,276	\$641,806	\$534,888	\$446,064	\$371,771	\$309,155	\$255,936	\$210,285	\$170,738
NPV		\$430,580									
INTERNAL RATE OF RETURN		21.4%									

	<u>2008</u>		
INITIAL GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
INITIAL NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,101,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-16. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT, \$10/TONNE GHG CREDIT THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,597	3,183	2,844	2,560	2,320	2,117
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565
Equity Contribution to Capital Cost	\$525,375	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$174,280	\$159,172	\$146,490	\$135,816	\$126,805	\$119,172
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507	\$256,507
TOTAL ANNUAL COSTS	\$525,375	\$815,642	\$618,402	\$596,206	\$578,401	\$564,250	\$553,146	\$544,588	\$538,162	\$533,526	\$530,399
NET CASH FLOW	(\$525,375)	\$340,803	\$514,769	\$385,299	\$278,381	\$189,557	\$115,264	\$52,648	(\$571)	(\$46,222)	(\$85,769)
NPV		\$639,488									
INTERNAL RATE OF RETURN		67.3%									

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,101,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$525,375	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

TABLE E-17. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$65,883	\$65,883	\$65,883	\$65,883	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,789,185	\$1,782,916	\$1,648,767	\$1,542,085	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$4,110,100	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.026	\$0.027	\$0.027	\$0.028	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$4,110,100	\$769,316	\$578,381	\$562,680	\$551,564	\$336,258	\$346,346	\$356,736	\$367,438	\$245,336	\$252,696	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$4,110,100)	\$1,019,870	\$1,204,535	\$1,086,087	\$990,521	\$301,745	\$310,798	\$320,121	\$329,725	\$113,703	\$117,114	\$120,628	\$124,247	\$127,974	\$131,813
NPV															
INTERNAL RATE OF RETURN															

	2008	2017
GROSS PLANT CAPACITY (MW)	1.27	0.63
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.59
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	9,489	4,744
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100	
EQUITY PERCENTAGE	100%	
EQUITY CONTRIBUTION	\$4,110,100	
DEBT INTEREST RATE	10.0%	
NPV RATE	14.0%	
FINANCING LIFE (years)	10.0	
CER SALES RATE (\$/tonne CO2eq)		\$10.00
2008 OFF SITE POWER SALES RATE (\$/kWhr)		\$0.058
POWER PRICE ESCALATION		3.0%
LFG PURCHASE RATE (\$/MMBtu)		\$0.84
FUEL ESCALATION RATE		3.0%
POWER PLANT O&M COST (\$/kWhr)		\$0.020
POWER PLANT O&M ESCALATION		3.0%
2009 REGISTRATION, MONITORING, VERIFICATION C		\$30,000
2009 GCCS O&M COST (\$2008)		\$86,000
2010 GCCS O&M COST (\$2008)		\$86,000
GCCS O&M/UPGRADES ESCALATION		3.0%

**TABLE E-18. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$65,883	\$65,883	\$65,883	\$65,883	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,789,185	\$1,782,916	\$1,648,767	\$1,542,085	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$1,027,525	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$266,125	\$273,919	\$281,833	\$289,870	\$298,034	\$306,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675
TOTAL ANNUAL COSTS	\$1,027,525	\$1,270,991	\$1,080,055	\$1,064,355	\$1,053,239	\$837,933	\$848,020	\$858,411	\$869,113	\$747,011	\$754,371	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$1,027,525)	\$518,195	\$702,861	\$584,412	\$488,846	(\$199,930)	(\$190,877)	(\$181,553)	(\$171,950)	(\$387,972)	(\$384,561)	\$120,628	\$124,247	\$127,974	\$131,813
NPV	\$178,747														
INTERNAL RATE OF RETURN	33.2%														

GROSS PLANT CAPACITY (MW)	2008	2017		
NET PLANT CAPACITY (MW) (7% parasitic load)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$10.00
PLANT CAPACITY FACTOR	1.18	0.59	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
ANNUAL POWER PRODUCTION (MWh/yr)	92%	92%	POWER PRICE ESCALATION	3.0%
ON SITE POWER CONSUMPTION (MWh/yr)*	9,489	4,744		
OFF SITE POWER SALE (MWh/yr)	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
TOTAL FACILITY INITIAL CAPITAL COST	9,489	4,744	FUEL ESCALATION RATE	3.0%
EQUITY PERCENTAGE	\$4,110,100		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY CONTRIBUTION	25%		POWER PLANT O&M ESCALATION	3.0%
DEBT INTEREST RATE	\$1,027,525		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
NPV RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-19. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	6,588	6,588	6,588	6,588	3,294	3,294	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$32,941	\$32,941	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,789,185	\$1,782,916	\$1,648,767	\$1,542,085	\$1,457,693	\$1,391,436	\$1,339,976	\$1,300,636	\$879,284	\$847,381	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$4,110,100	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$174,280	\$159,172	\$146,490	\$135,816	\$126,805	\$119,172	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.026	\$0.027	\$0.027	\$0.028	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$4,110,100	\$769,316	\$578,381	\$562,680	\$551,564	\$544,303	\$540,296	\$539,048	\$540,150	\$410,144	\$411,011	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$4,110,100)	\$1,019,870	\$1,204,535	\$1,086,087	\$990,521	\$913,390	\$851,139	\$800,929	\$760,486	\$469,140	\$436,371	\$120,628	\$124,247	\$127,974	\$131,813
NPV	\$737,197														
INTERNAL RATE OF RETURN	19.6%														

	2008	2017		
GROSS PLANT CAPACITY (MW)	1.27	0.63	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.59	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	100%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$4,110,100		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-20. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	0.63	0.63	0.63	0.63	0.63	0.63
Net Plant Capacity (MW)	0.00	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	0.59	0.59	0.59	0.59	0.59	0.59
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	9,489	9,489	9,489	9,489	9,489	9,489	9,489	9,489	4,744	4,744	4,744	4,744	4,744	4,744
Off Site Power Revenue	\$0	\$566,857	\$583,863	\$601,379	\$619,420	\$638,003	\$657,143	\$676,857	\$697,163	\$359,039	\$369,810	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	6,588	6,588	6,588	6,588	6,588	6,588	6,588	6,588	3,294	3,294	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$65,883	\$32,941	\$32,941	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,789,185	\$1,782,916	\$1,648,767	\$1,542,085	\$1,457,693	\$1,391,436	\$1,339,976	\$1,300,636	\$879,284	\$847,381	\$380,904	\$392,332	\$404,102	\$416,225
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$1,027,525	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$174,280	\$159,172	\$146,490	\$135,816	\$126,805	\$119,172	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$210,181	\$216,486	\$222,981	\$229,670	\$236,560	\$243,657	\$250,967	\$258,496	\$133,125	\$137,119	\$141,233	\$145,470	\$149,834	\$154,329
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$501,675	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,027,525	\$1,270,991	\$1,080,055	\$1,064,355	\$1,053,239	\$1,045,978	\$1,041,971	\$1,040,723	\$1,041,825	\$911,819	\$912,686	\$260,277	\$268,085	\$276,128	\$284,411
NET CASH FLOW	(\$1,027,525)	\$518,195	\$702,861	\$584,412	\$488,846	\$411,715	\$349,465	\$299,254	\$258,811	(\$32,535)	(\$65,304)	\$120,628	\$124,247	\$127,974	\$131,813
NPV	\$1,145,777														
INTERNAL RATE OF RETURN	50.8%														

GROSS PLANT CAPACITY (MW)	2008	2017	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.18	0.63	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	9,489	4,744		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	9,489	4,744	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$4,110,100		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,027,525		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$86,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$86,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE E-21. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFGE PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$58,017	\$58,017	\$58,017	\$58,017	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,558,587	\$1,545,636	\$1,404,605	\$1,290,834	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$2,531,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,531,500	\$629,175	\$434,036	\$414,005	\$398,429	\$178,528	\$183,884	\$189,401	\$191,574	\$189,360	\$188,082	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$2,531,500)	\$929,412	\$1,111,601	\$990,600	\$892,405	\$208,788	\$215,052	\$221,503	\$214,419	\$189,696	\$168,156	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$798,851														
INTERNAL RATE OF RETURN	26.4%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$2,531,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-22. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$10/TONNE GHG CREDITS THROUGH 2012; 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$58,017	\$58,017	\$58,017	\$58,017	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,558,587	\$1,545,636	\$1,404,605	\$1,290,834	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$632,875	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$632,875	\$938,167	\$743,028	\$722,997	\$707,421	\$487,521	\$492,877	\$498,393	\$500,567	\$498,352	\$497,075	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$632,875)	\$620,420	\$802,608	\$681,608	\$583,412	(\$100,205)	(\$93,941)	(\$87,489)	(\$94,574)	(\$119,296)	(\$140,837)	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$1,050,504														
INTERNAL RATE OF RETURN	98.9%														

	<u>2009</u>	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$632,875	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-23. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,565	5,045	4,603	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$55,654	\$50,448	\$46,030	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,558,587	\$1,545,636	\$1,404,605	\$1,290,834	\$1,199,140	\$1,125,362	\$1,066,157	\$999,237	\$916,807	\$846,898	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$2,531,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,531,500	\$629,175	\$434,036	\$414,005	\$398,429	\$212,293	\$218,662	\$225,222	\$228,470	\$227,363	\$227,225	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$2,531,500)	\$929,412	\$1,111,601	\$990,600	\$892,405	\$986,847	\$906,700	\$840,935	\$770,767	\$689,444	\$619,673	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$2,059,602														
INTERNAL RATE OF RETURN	36.2%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$2,531,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE E-24. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	791	791	791	791	791	791	791	758	687	627	576	531	493	460
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	711	711	711	711	711	711	711	682	619	564	518	478	444	414
Net LFG Flow to End-User(s) mmBtu/year	0	111,367	111,367	111,367	111,367	111,367	111,367	111,367	106,832	96,838	88,358	81,112	74,875	69,465	64,737
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$344,125	\$354,449	\$365,083	\$376,035	\$387,316	\$398,936	\$410,904	\$405,993	\$379,056	\$356,238	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovery Rate (m3/hr)	0	1,754	1,719	1,489	1,300	1,143	1,014	906	815	739	674	619	571	530	494
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	5,507	5,396	4,674	4,080	3,590	3,183	2,844	2,560	2,320	2,117	1,944	1,794	1,665	1,551
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	115,645	113,317	98,151	85,678	75,381	66,841	59,724	53,759	48,730	44,463	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$1,156,445	\$1,133,170	\$981,505	\$856,782	\$753,807	\$668,410	\$597,236	\$537,590	\$487,303	\$444,630	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,565	5,045	4,603	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$58,017	\$55,654	\$50,448	\$46,030	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,558,587	\$1,545,636	\$1,404,605	\$1,290,834	\$1,199,140	\$1,125,362	\$1,066,157	\$999,237	\$916,807	\$846,898	\$336,833	\$320,260	\$306,035	\$293,761
LFG Recovered (MMBtu/yr)	0	274,566	269,040	233,032	203,420	178,971	158,696	141,798	127,636	115,697	105,565	96,908	89,456	82,993	77,344
Equity Contribution to Capital Cost	\$632,875	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$237,555	\$239,757	\$213,898	\$192,318	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$70,040	\$72,141	\$74,305	\$76,535	\$78,831	\$81,196	\$83,631	\$82,632	\$77,149	\$72,505	\$68,556	\$65,183	\$62,287	\$59,789
Annual GCCS O&M and 2009 Expansion	\$0	\$191,580	\$91,237	\$93,975	\$96,794	\$99,698	\$102,688	\$105,769	\$108,942	\$112,210	\$115,577	\$119,044	\$122,615	\$126,294	\$130,083
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$308,992	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$632,875	\$938,167	\$743,028	\$722,997	\$707,421	\$521,286	\$527,655	\$534,215	\$537,463	\$536,356	\$536,218	\$187,600	\$187,798	\$188,581	\$189,872
NET CASH FLOW	(\$632,875)	\$620,420	\$802,608	\$681,608	\$583,412	\$677,854	\$597,708	\$531,942	\$461,774	\$380,452	\$310,680	\$149,233	\$132,462	\$117,454	\$103,889
NPV	\$2,311,255														
INTERNAL RATE OF RETURN	105.9%														

	2009	
PLANT DESIGN CAPACITY (m3/hour)	850	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	791	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	111,367	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	111,367	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,531,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$632,875	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

APPENDIX F

ECONOMIC EVALUATION UNDER RECOVERY SCENARIO 2

**TABLE F-1. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING, \$8/TONNE GHG CREDITS THROUGH 2012**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666
Equity Contribution to Capital Cost	\$1,986,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,986,500	\$438,064	\$243,141	\$234,699	\$228,307	\$93,901	\$96,718	\$99,620
NET CASH FLOW	(\$1,986,500)	\$155,833	\$355,614	\$291,633	\$238,002	(\$93,901)	(\$96,718)	(\$99,620)
NPV		(\$1,086,326)						
INTERNAL RATE OF RETURN		-21.2%						

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,986,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-2. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$8/TONNE GHG CREDITS THROUGH 2012**

	0	1	2	3	4	5	6	7
	2008	2009	2010	2011	2012	2013	2014	2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666
Equity Contribution to Capital Cost	\$496,625	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$470,012	\$470,012	\$470,012	\$470,012	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$496,625	\$908,076	\$713,153	\$704,711	\$698,319	\$93,901	\$96,718	\$99,620
NET CASH FLOW	(\$496,625)	(\$314,179)	(\$114,398)	(\$178,379)	(\$232,010)	(\$93,901)	(\$96,718)	(\$99,620)
NPV		(\$980,716)						
INTERNAL RATE OF RETURN		#NUM!						

	2008		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$496,625	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-3. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING, \$8/TONNE OF GHG CREDITS THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705
Equity Contribution to Capital Cost	\$1,986,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,986,500	\$438,064	\$243,141	\$234,699	\$228,307	\$223,633	\$220,403	\$218,391	\$217,412	\$217,313	\$217,968
NET CASH FLOW	(\$1,986,500)	\$155,833	\$355,614	\$291,633	\$238,002	\$192,686	\$154,055	\$120,803	\$91,885	\$66,462	\$43,860
NPV		(\$838,065)									
INTERNAL RATE OF RETURN		-3.4%									

	<u>2008</u>		
INITIAL GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$8.00
INITIAL NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,986,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-4. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$8/TONNE GHG CREDITTHROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705
Equity Contribution to Capital Cost	\$496,625	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470
TOTAL ANNUAL COSTS	\$496,625	\$680,534	\$485,611	\$477,169	\$470,777	\$466,103	\$462,873	\$460,862	\$459,883	\$459,783	\$460,438
NET CASH FLOW	(\$496,625)	(\$86,638)	\$113,144	\$49,162	(\$4,468)	(\$49,784)	(\$88,416)	(\$121,667)	(\$150,585)	(\$176,009)	(\$198,610)
NPV		(\$640,589)									
INTERNAL RATE OF RETURN		#DIV/0!									

	<u>2008</u>	
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION
ANNUAL POWER PRODUCTION (MWh/yr)	0	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$496,625	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION

**TABLE F-5. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$44,963	\$44,963	\$44,963	\$44,963	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,122,434	\$1,141,800	\$1,084,319	\$1,039,687	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$3,768,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.0206	\$0.0212	\$0.0219	\$0.0225	\$0.0232	\$0.0239	\$0.0246	\$0.0253	\$0.0261	\$0.0269	\$0.0277	\$0.0285	\$0.0294	\$0.0303
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$3,768,500	\$617,365	\$427,821	\$424,920	\$424,234	\$295,706	\$304,577	\$206,667	\$212,867	\$219,253	\$225,831	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$3,768,500)	\$505,069	\$713,979	\$659,400	\$615,453	\$248,562	\$256,019	\$82,040	\$84,501	\$87,036	\$89,647	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$1,343,836)														
INTERNAL RATE OF RETURN	-0.2%														

	2008	2017
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	\$0.020
EQUITY PERCENTAGE	100%	3.0%
EQUITY CONTRIBUTION	\$3,768,500	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

TABLE F-6. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)

**PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$44,963	\$44,963	\$44,963	\$44,963	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,122,434	\$1,141,800	\$1,084,319	\$1,039,687	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$942,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980
TOTAL ANNUAL COSTS	\$942,125	\$1,077,345	\$887,801	\$884,899	\$884,214	\$755,686	\$764,557	\$666,647	\$672,847	\$679,233	\$685,810	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$942,125)	\$45,090	\$253,999	\$199,420	\$155,473	(\$211,418)	(\$203,961)	(\$377,940)	(\$375,479)	(\$372,944)	(\$370,333)	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$969,214)														
INTERNAL RATE OF RETURN	#DIV/0!														

	2008	2017
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	
EQUITY PERCENTAGE	25%	
EQUITY CONTRIBUTION	\$942,125	
DEBT INTEREST RATE	10.0%	
NPV RATE	14.0%	
FINANCING LIFE (years)	10.0	
CER SALES RATE (\$/tonne CO2eq)		\$8.00
2008 OFF SITE POWER SALES RATE (\$/kWhr)		\$0.058
POWER PRICE ESCALATION		3.0%
LFG PURCHASE RATE (\$/MMBtu)		\$0.67
FUEL ESCALATION RATE		3.0%
POWER PLANT O&M COST (\$/kW-hr)		\$0.020
POWER PLANT O&M ESCALATION		3.0%
2009 REGISTRATION, MONITORING, VERIFICATION C		\$30,000
2009 GCCS O&M COST (\$2008)		\$81,000
2010 GCCS O&M COST (\$2008)		\$81,000
GCCS O&M/UPGRADES ESCALATION		3.0%

**TABLE F-7. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	5,620	5,620	2,810	2,810	2,810	2,810	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$44,963	\$44,963	\$44,963	\$44,963	\$44,963	\$44,963	\$22,481	\$22,481	\$22,481	\$22,481	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,122,434	\$1,141,800	\$1,084,319	\$1,039,687	\$1,005,549	\$980,016	\$650,383	\$629,147	\$612,545	\$599,787	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$3,768,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.0206	\$0.0212	\$0.0219	\$0.0225	\$0.0232	\$0.0239	\$0.0246	\$0.0253	\$0.0261	\$0.0269	\$0.0277	\$0.0285	\$0.0294	\$0.0303
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$3,768,500	\$617,365	\$427,821	\$424,920	\$424,234	\$425,438	\$428,262	\$325,439	\$327,671	\$330,880	\$334,941	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$3,768,500)	\$505,069	\$713,979	\$659,400	\$615,453	\$580,111	\$551,754	\$324,944	\$301,476	\$281,666	\$264,846	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$828,771)														
INTERNAL RATE OF RETURN	6.7%														

	2008	2017
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	\$0.020
EQUITY PERCENTAGE	100%	3.0%
EQUITY CONTRIBUTION	\$3,768,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

TABLE F-8. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)

**PIRANA LANDFILL, AMEDABAD, INDIA
WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	5,620	5,620	2,810	2,810	2,810	2,810	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$44,963	\$44,963	\$44,963	\$44,963	\$44,963	\$44,963	\$22,481	\$22,481	\$22,481	\$22,481	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,122,434	\$1,141,800	\$1,084,319	\$1,039,687	\$1,005,549	\$980,016	\$650,383	\$629,147	\$612,545	\$599,787	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$942,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$942,125	\$1,077,345	\$887,801	\$884,899	\$884,214	\$885,417	\$888,242	\$785,418	\$787,651	\$790,859	\$794,921	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$942,125)	\$45,090	\$253,999	\$199,420	\$155,473	\$120,132	\$91,775	(\$135,036)	(\$158,504)	(\$178,314)	(\$195,134)	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$454,149)														
INTERNAL RATE OF RETURN	-8.9%														

GROSS PLANT CAPACITY (MW)	2008	2017	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MWh/yr)	8,095	4,047	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$942,125		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-9. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFGE PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	399	373	350	
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	0	0	0	0	0	0	0	0	0	
CER Revenue from Energy Displacement (\$/yr)	\$0	\$32,762	\$32,762	\$32,762	\$32,762	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
GRAND TOTAL REVENUE	\$0	\$869,571	\$881,717	\$816,800	\$764,508	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	
Equity Contribution to Capital Cost	\$2,376,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
TOTAL ANNUAL COSTS	\$2,376,500	\$487,504	\$294,064	\$287,150	\$282,331	\$149,546	\$154,033	\$158,654	\$162,035	\$161,845	\$162,227	\$163,102	\$164,404	\$166,083	
NET CASH FLOW	(\$2,376,500)	\$382,067	\$587,653	\$529,650	\$482,176	\$123,853	\$127,569	\$131,396	\$129,945	\$114,078	\$99,994	\$87,371	\$75,942	\$65,486	
NPV		(\$531,889)													
INTERNAL RATE OF RETURN		5.4%													

PLANT DESIGN CAPACITY (m3/hour)	2009	600	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558		2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%		POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612			
ON SITE POWER CONSUMPTION (MWH/yr)*	0		LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MMBTU/yr)	78,612		FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500		2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	100%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,376,500		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-10. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$8/TONNE GHG CREDITS THROUGH 2012; 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$32,762	\$32,762	\$32,762	\$32,762	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$869,571	\$881,717	\$816,800	\$764,508	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$594,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$594,125	\$777,577	\$584,137	\$577,223	\$572,405	\$439,620	\$444,106	\$448,727	\$452,109	\$451,919	\$452,300	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$594,125)	\$91,994	\$297,579	\$239,576	\$192,103	(\$166,220)	(\$162,504)	(\$158,677)	(\$160,128)	(\$175,996)	(\$190,080)	\$87,371	\$75,942	\$65,486	\$55,820
NPV		(\$295,644)													
INTERNAL RATE OF RETURN		#DIV/0!													

PLANT DESIGN CAPACITY (m3/hour)	2009	600	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558		2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%		POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612			
ON SITE POWER CONSUMPTION (MWH/yr)*	0		LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MMBTU/yr)	78,612		FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500		2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$594,125		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-11. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$8/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	4,095	4,095	4,095	4,002	3,672	3,388	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,020	\$29,378	\$27,106	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$869,571	\$881,717	\$816,800	\$764,508	\$722,481	\$688,822	\$662,007	\$633,297	\$589,076	\$551,154	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$2,376,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,376,500	\$487,504	\$294,064	\$287,150	\$282,331	\$279,278	\$277,717	\$277,425	\$276,839	\$273,472	\$271,338	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$2,376,500)	\$382,067	\$587,653	\$529,650	\$482,176	\$443,203	\$411,104	\$384,581	\$356,458	\$315,604	\$279,817	\$87,371	\$75,942	\$65,486	\$55,820
NPV		(\$17,766)													
INTERNAL RATE OF RETURN		13.8%													

	2009		
PLANT DESIGN CAPACITY (m3/hour)	600	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MMBTU/yr)	78,612	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500	2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,376,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-12. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$8/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$593,897	\$598,755	\$526,332	\$466,309	\$416,319	\$374,458	\$339,195	\$309,297	\$283,775	\$261,828	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	4,095	4,095	4,095	4,002	3,672	3,388	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,762	\$32,020	\$29,378	\$27,106	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$869,571	\$881,717	\$816,800	\$764,508	\$722,481	\$688,822	\$662,007	\$633,297	\$589,076	\$551,154	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$594,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.67	\$0.69	\$0.71	\$0.73	\$0.75	\$0.78	\$0.80	\$0.82	\$0.85	\$0.87	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$121,634	\$126,308	\$114,361	\$104,359	\$95,966	\$88,906	\$82,950	\$77,908	\$73,623	\$69,967	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$594,125	\$777,577	\$584,137	\$577,223	\$572,405	\$569,351	\$567,791	\$567,499	\$566,913	\$563,545	\$561,411	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$594,125)	\$91,994	\$297,579	\$239,576	\$192,103	\$153,129	\$121,031	\$94,508	\$66,385	\$25,530	(\$10,257)	\$87,371	\$75,942	\$65,486	\$55,820
NPV	\$218,479														
INTERNAL RATE OF RETURN	25.3%														

	2009		
PLANT DESIGN CAPACITY (m3/hour)	600	CER SALES RATE (\$/tonne CO2eq)	\$8.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.67
OFF SITE POWER SALE (MMBTU/yr)	78,612	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500	2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$594,125	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-13. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING, \$10/TONNE GHG CREDITS THROUGH 2012**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666
Equity Contribution to Capital Cost	\$1,986,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,986,500	\$468,926	\$275,189	\$263,716	\$254,786	\$93,901	\$96,718	\$99,620
NET CASH FLOW	(\$1,986,500)	\$273,444	\$473,255	\$394,199	\$328,100	(\$93,901)	(\$96,718)	(\$99,620)
NPV		(\$808,902)						
INTERNAL RATE OF RETURN		-11.0%						

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,986,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-14. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$10/TONNE GHG CREDITS THROUGH 2012**

	0	1	2	3	4	5	6	7
	2008	2009	2010	2011	2012	2013	2014	2015
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$0.00	\$0.00	\$0.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666
Equity Contribution to Capital Cost	\$496,625	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0
Annual Debt Service	\$0	\$470,012	\$470,012	\$470,012	\$470,012	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$496,625	\$938,939	\$745,201	\$733,728	\$724,798	\$93,901	\$96,718	\$99,620
NET CASH FLOW	(\$496,625)	(\$196,568)	\$3,243	(\$75,813)	(\$141,912)	(\$93,901)	(\$96,718)	(\$99,620)
NPV		(\$703,292)						
INTERNAL RATE OF RETURN		#NUM!						

	2008		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$496,625	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	4.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-15. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING, \$10/TONNE OF GHG CREDITS THROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705
Equity Contribution to Capital Cost	\$1,986,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$1,986,500	\$468,926	\$275,189	\$263,716	\$254,786	\$247,983	\$242,961	\$239,438	\$237,180	\$235,994	\$235,721
NET CASH FLOW	(\$1,986,500)	\$273,444	\$473,255	\$394,199	\$328,100	\$272,416	\$225,111	\$184,555	\$149,442	\$118,725	\$91,564
NPV		(\$430,487)									
INTERNAL RATE OF RETURN		5.8%									

	<u>2008</u>		
INITIAL GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
INITIAL NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$1,986,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-16. ECONOMIC ANALYSIS OF PROPOSED FLARING ONLY PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$10/TONNE GHG CREDITTHROUGH 2018**

	<u>0</u> 2008	<u>1</u> 2009	<u>2</u> 2010	<u>3</u> 2011	<u>4</u> 2012	<u>5</u> 2013	<u>6</u> 2014	<u>7</u> 2015	<u>8</u> 2016	<u>9</u> 2017	<u>10</u> 2018
Gross Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Plant Capacity (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plant Capacity Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078
Off Site Power Sales (MWh/yr)	0	0	0	0	0	0	0	0	0	0	0
Off Site Power Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285
CERs from Energy Displacement (tonnes CO2eq/yr)	0	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705
Equity Contribution to Capital Cost	\$496,625	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720
Power Plant O&M Rate (\$/kWhr)	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Annual Power Plant O&M Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143
Annual Debt Service	\$0	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470	\$242,470
TOTAL ANNUAL COSTS	\$496,625	\$711,397	\$517,659	\$506,186	\$497,256	\$490,453	\$485,432	\$481,909	\$479,650	\$478,464	\$478,191
NET CASH FLOW	(\$496,625)	\$30,974	\$230,784	\$151,728	\$85,630	\$29,946	(\$17,359)	(\$57,916)	(\$93,029)	(\$123,745)	(\$150,906)
NPV		(\$233,012)									
INTERNAL RATE OF RETURN		#DIV/0!									

	<u>2008</u>		
GROSS PLANT CAPACITY (MW)	0.00	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	0.00	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	0%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	0		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWH/yr)	0	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$1,986,500	POWER PLANT O&M COST (\$/kW-hr)	\$0.000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$496,625	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-17. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$56,203	\$56,203	\$56,203	\$56,203	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,282,149	\$1,302,729	\$1,227,143	\$1,167,505	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$3,768,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.030	\$0.031
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$3,768,500	\$648,228	\$459,869	\$453,937	\$450,713	\$295,706	\$304,577	\$206,667	\$212,867	\$219,253	\$225,831	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$3,768,500)	\$633,922	\$842,860	\$773,206	\$716,792	\$248,562	\$256,019	\$82,040	\$84,501	\$87,036	\$89,647	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$1,037,682)														
INTERNAL RATE OF RETURN	2.6%														

	2008	2015
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	\$0.020
EQUITY PERCENTAGE	100%	3.0%
EQUITY CONTRIBUTION	\$3,768,500	\$30,000
DEBT INTEREST RATE	10.0%	\$81,000
NPV RATE	14.0%	\$81,000
FINANCING LIFE (years)	10.0	3.0%

**TABLE F-18. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,553	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$56,203	\$56,203	\$56,203	\$56,203	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,282,149	\$1,302,729	\$1,227,143	\$1,167,505	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$942,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980
TOTAL ANNUAL COSTS	\$942,125	\$1,108,207	\$919,849	\$913,916	\$910,693	\$755,686	\$764,557	\$666,647	\$672,847	\$679,233	\$685,810	\$723,606	\$739,584	\$746,771	\$754,175
NET CASH FLOW	(\$942,125)	\$173,942	\$382,880	\$313,227	\$256,812	(\$211,418)	(\$203,961)	(\$377,940)	(\$375,479)	(\$372,944)	(\$370,333)	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$663,061)														
INTERNAL RATE OF RETURN	#DIV/0!														

	2008	2017
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	
EQUITY PERCENTAGE	25%	
EQUITY CONTRIBUTION	\$942,125	
DEBT INTEREST RATE	10.0%	
NPV RATE	14.0%	
FINANCING LIFE (years)	10.0	
CER SALES RATE (\$/tonne CO2eq)		\$10.00
2008 OFF SITE POWER SALES RATE (\$/kWhr)		\$0.058
POWER PRICE ESCALATION		3.0%
LFG PURCHASE RATE (\$/MMBtu)		\$0.84
FUEL ESCALATION RATE		3.0%
POWER PLANT O&M COST (\$/kw-hr)		\$0.020
POWER PLANT O&M ESCALATION		3.0%
2009 REGISTRATION, MONITORING, VERIFICATION C		\$30,000
2009 GCCS O&M COST (\$2008)		\$81,000
2010 GCCS O&M COST (\$2008)		\$81,000
GCCS O&M/UPGRADES ESCALATION		3.0%

**TABLE F-19. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFGE PROJECT (SCENARIO 2)
PIRANA LANDFILL, AMEDABAD, INDIA
NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	5,620	5,620	2,810	2,810	2,810	2,810	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$56,203	\$56,203	\$56,203	\$56,203	\$56,203	\$56,203	\$28,102	\$28,102	\$28,102	\$28,102	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,282,149	\$1,302,729	\$1,227,143	\$1,167,505	\$1,120,870	\$1,084,871	\$740,802	\$712,092	\$689,109	\$670,864	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$3,768,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.026	\$0.027	\$0.027	\$0.028	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$3,768,500	\$648,228	\$459,869	\$453,937	\$450,713	\$449,788	\$450,820	\$346,486	\$347,439	\$349,560	\$352,694	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$3,768,500)	\$633,922	\$842,860	\$773,206	\$716,792	\$671,082	\$634,051	\$394,316	\$364,653	\$339,549	\$318,170	\$92,336	\$95,107	\$97,960	\$100,898
NPV		(\$376,306)													
INTERNAL RATE OF RETURN		10.7%													

	2008	2017
GROSS PLANT CAPACITY (MW)	1.08	0.54
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50
PLANT CAPACITY FACTOR	92%	92%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0
OFF SITE POWER SALE (MWh/yr)	8,095	4,047
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500	\$0.020
EQUITY PERCENTAGE	100%	3.0%
EQUITY CONTRIBUTION	\$3,768,500	\$30,000
DEBT INTEREST RATE	10.0%	\$81,000
NPV RATE	14.0%	\$81,000
FINANCING LIFE (years)	10.0	3.0%

**TABLE F-20. ECONOMIC ANALYSIS OF PROPOSED ELECTRIC POWER LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Plant Capacity (MW)	0.00	1.08	1.08	1.08	1.08	1.08	1.08	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Net Plant Capacity (MW)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Plant Capacity Factor	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Off Site Power Sales Rate (\$/kWh)	\$0.058	\$0.060	\$0.062	\$0.063	\$0.065	\$0.067	\$0.069	\$0.071	\$0.073	\$0.076	\$0.078	\$0.080	\$0.083	\$0.085	\$0.088
Off Site Power Sales (MWh/yr)	0	8,095	8,095	8,095	8,095	8,095	8,095	4,047	4,047	4,047	4,047	4,047	4,047	4,047	4,047
Off Site Power Revenue	\$0	\$483,575	\$498,082	\$513,025	\$528,415	\$544,268	\$560,596	\$288,707	\$297,368	\$306,289	\$315,478	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,553	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	5,620	5,620	5,620	5,620	5,620	5,620	2,810	2,810	2,810	2,810	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$56,203	\$56,203	\$56,203	\$56,203	\$56,203	\$56,203	\$28,102	\$28,102	\$28,102	\$28,102	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,282,149	\$1,302,729	\$1,227,143	\$1,167,505	\$1,120,870	\$1,084,871	\$740,802	\$712,092	\$689,109	\$670,864	\$324,942	\$334,690	\$344,731	\$355,073
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$942,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720	\$0	\$0	\$0	\$0
Power Plant O&M Rate (\$/kWhr)	\$0.020	\$0.021	\$0.021	\$0.022	\$0.023	\$0.023	\$0.024	\$0.025	\$0.025	\$0.026	\$0.027	\$0.028	\$0.029	\$0.029	\$0.030
Annual Power Plant O&M Cost	\$0	\$179,301	\$184,680	\$190,221	\$195,927	\$201,805	\$207,859	\$107,047	\$110,259	\$113,567	\$116,974	\$120,483	\$124,097	\$127,820	\$131,655
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$459,980	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$942,125	\$1,108,207	\$919,849	\$913,916	\$910,693	\$909,767	\$910,800	\$806,465	\$807,419	\$809,540	\$812,674	\$232,606	\$239,584	\$246,771	\$254,175
NET CASH FLOW	(\$942,125)	\$173,942	\$382,880	\$313,227	\$256,812	\$211,103	\$174,071	(\$65,664)	(\$95,327)	(\$120,431)	(\$141,810)	\$92,336	\$95,107	\$97,960	\$100,898
NPV	(\$1,684)														
INTERNAL RATE OF RETURN	13.9%														

	2008	2017		
GROSS PLANT CAPACITY (MW)	1.08	0.54	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (MW) (7% parasitic load)	1.00	0.50	2008 OFF SITE POWER SALES RATE (\$/kWhr)	\$0.058
PLANT CAPACITY FACTOR	92%	92%	POWER PRICE ESCALATION	3.0%
ANNUAL POWER PRODUCTION (MWh/yr)	8,095	4,047		
ON SITE POWER CONSUMPTION (MWh/yr)*	0	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MWh/yr)	8,095	4,047	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$3,768,500		POWER PLANT O&M COST (\$/kW-hr)	\$0.020
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$942,125		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-21. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2012, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$40,953	\$40,953	\$40,953	\$40,953	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,026,236	\$1,039,596	\$956,573	\$889,276	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$2,376,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring&Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,376,500	\$518,366	\$326,112	\$316,167	\$308,811	\$149,546	\$154,033	\$158,654	\$162,035	\$161,845	\$162,227	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$2,376,500)	\$507,869	\$713,484	\$640,406	\$580,465	\$123,853	\$127,569	\$131,396	\$129,945	\$114,078	\$99,994	\$87,371	\$75,942	\$65,486	\$55,820
NPV	(\$233,531)														
INTERNAL RATE OF RETURN		10.1%													

	<u>2009</u>	
PLANT DESIGN CAPACITY (m3/hour)	600	CER SALES RATE (\$/tonne CO2eq)
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION
ANNUAL MMBTUS TO END USER	78,612	
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)
OFF SITE POWER SALE (MMBTU/yr)	78,612	FUEL ESCALATION RATE
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500	2008 DIRECT USE FACILITY O&M COST (\$/year)
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION
EQUITY CONTRIBUTION	\$2,376,500	2009 REGISTRATION, MONITORING, VERIFICATION C
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION

**TABLE F-22. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT, \$10/TONNE GHG CREDITS THROUGH 2012; 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	0	0	0	0	0	0	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	0	0	0	0	0	0	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$40,953	\$40,953	\$40,953	\$40,953	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,026,236	\$1,039,596	\$956,573	\$889,276	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$594,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$594,125	\$808,440	\$616,186	\$606,240	\$598,884	\$439,620	\$444,106	\$448,727	\$452,109	\$451,919	\$452,300	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$594,125)	\$217,796	\$423,410	\$350,333	\$290,392	(\$166,220)	(\$162,504)	(\$158,677)	(\$160,128)	(\$175,996)	(\$190,080)	\$87,371	\$75,942	\$65,486	\$55,820
NPV	\$2,714														
INTERNAL RATE OF RETURN	7.1%														

PLANT DESIGN CAPACITY (m3/hour)	2009	600	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558		2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%		POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612			
ON SITE POWER CONSUMPTION (MWH/yr)*	0		LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MMBTU/yr)	78,612		FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500		2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	25%		POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$594,125		2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%		2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%		2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0		GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-23. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 NO FINANCING AND \$10/TONNE GHG CREDITS THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	4,095	4,095	4,095	4,002	3,672	3,388	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,025	\$36,722	\$33,882	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,026,236	\$1,039,596	\$956,573	\$889,276	\$834,751	\$790,627	\$754,996	\$718,627	\$667,364	\$623,388	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$2,376,500	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$2,376,500	\$518,366	\$326,112	\$316,167	\$308,811	\$303,628	\$300,276	\$298,472	\$296,607	\$292,153	\$289,091	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$2,376,500)	\$507,869	\$713,484	\$640,406	\$580,465	\$531,123	\$490,351	\$456,523	\$422,020	\$375,211	\$334,297	\$87,371	\$75,942	\$65,486	\$55,820
NPV	\$426,668														
INTERNAL RATE OF RETURN	19.4%														

	2009		
PLANT DESIGN CAPACITY (m3/hour)	600	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MMBTU/yr)	78,612	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500	2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	100%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$2,376,500	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION	3.0%

**TABLE F-24. ECONOMIC ANALYSIS OF PROPOSED DIRECT USE LFG PROJECT (SCENARIO 2)
 PIRANA LANDFILL, AMEDABAD, INDIA
 WITH 75% DEBT FINANCING AND \$10/TONNE GHG CREDIT THROUGH 2018, 14 YEARS OF GCCS OPERATION**

	0 2008	1 2009	2 2010	3 2011	4 2012	5 2013	6 2014	7 2015	8 2016	9 2017	10 2018	11 2019	12 2020	13 2021	14 2022
Plant Design Capacity (m3/hr)	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Net Plant Capacity/Maximum Available LFG (m3/hr)	0	558	558	558	558	558	558	558	545	500	462	428	399	373	350
Plant Capacity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Net LFG Flow to End-User(s) (m3/hr)	0	502	502	502	502	502	502	502	491	450	415	385	359	336	315
Net LFG Flow to End-User(s) mmBtu/year	0	78,612	78,612	78,612	78,612	78,612	78,612	78,612	76,831	70,491	65,039	60,316	56,191	52,562	49,344
LFG Sales Rate (\$/mmBtu)	\$3.00	\$3.09	\$3.18	\$3.28	\$3.38	\$3.48	\$3.58	\$3.69	\$3.80	\$3.91	\$4.03	\$4.15	\$4.28	\$4.41	\$4.54
LFG Sales Revenue (\$/yr)	\$0	\$242,912	\$250,199	\$257,705	\$265,437	\$273,400	\$281,602	\$290,050	\$291,980	\$275,923	\$262,221	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovery Rate (m3/hr)	0	1,126	1,135	998	884	789	710	643	586	538	496	460	429	401	377
Baseline Reduction (m3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane Emission Reduction (tonnes/yr)	0	3,535	3,564	3,133	2,776	2,478	2,229	2,019	1,841	1,689	1,558	1,445	1,346	1,260	1,182
Carbon Dioxide Equivalency (for CH4)	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
CERs from Methane Reductions (tonnes CO2eq/yr)	0	74,237	74,844	65,791	58,289	52,040	46,807	42,399	38,662	35,472	32,728	0	0	0	0
CER Sales Rate (\$/tonne CO2eq)	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00	\$10.00
CER Revenue from Methane Reductions (\$/yr)	\$0	\$742,371	\$748,444	\$657,915	\$582,886	\$520,399	\$468,072	\$423,993	\$386,622	\$354,719	\$327,285	\$0	\$0	\$0	\$0
CERs from Energy Displacement (tonnes CO2eq/yr)	0	4,095	4,095	4,095	4,095	4,095	4,095	4,095	4,002	3,672	3,388	0	0	0	0
CER Revenue from Energy Displacement (\$/yr)	\$0	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,953	\$40,025	\$36,722	\$33,882	\$0	\$0	\$0	\$0
GRAND TOTAL REVENUE	\$0	\$1,026,236	\$1,039,596	\$956,573	\$889,276	\$834,751	\$790,627	\$754,996	\$718,627	\$667,364	\$623,388	\$250,473	\$240,347	\$231,569	\$223,913
LFG Recovered (MMBtu/yr)	0	176,256	177,698	156,204	138,390	123,554	111,131	100,666	91,793	84,218	77,705	72,062	67,134	62,799	58,954
Equity Contribution to Capital Cost	\$594,125	\$100,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
LFG Purchase Price (\$/MMBtu)	\$0.84	\$0.87	\$0.89	\$0.92	\$0.95	\$0.97	\$1.00	\$1.03	\$1.06	\$1.10	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00
Annual Cost for LFG Purchase (\$)	\$0	\$152,496	\$158,356	\$143,378	\$130,838	\$120,316	\$111,465	\$103,997	\$97,676	\$92,304	\$87,720	\$0	\$0	\$0	\$0
Annual Direct Use Facility O&M Cost	\$0	\$49,440	\$50,923	\$52,451	\$54,024	\$55,645	\$57,315	\$59,034	\$59,427	\$56,159	\$53,370	\$50,979	\$48,918	\$47,131	\$45,573
Annual GCCS O&M and 2009 Expansion	\$0	\$186,430	\$85,933	\$88,511	\$91,166	\$93,901	\$96,718	\$99,620	\$102,608	\$105,687	\$108,857	\$112,123	\$115,487	\$118,951	\$122,520
Annual Registration, Monitoring & Verification	\$0	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$34,778	\$35,822	\$36,896	\$38,003	\$39,143	\$0	\$0	\$0	\$0
Annual Debt Service	\$0	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$290,073	\$0	\$0	\$0	\$0
TOTAL ANNUAL COSTS	\$594,125	\$808,440	\$616,186	\$606,240	\$598,884	\$593,701	\$590,349	\$588,546	\$586,680	\$582,226	\$579,164	\$163,102	\$164,404	\$166,083	\$168,093
NET CASH FLOW	(\$594,125)	\$217,796	\$423,410	\$350,333	\$290,392	\$241,050	\$200,278	\$166,450	\$131,946	\$85,138	\$44,224	\$87,371	\$75,942	\$65,486	\$55,820
NPV	\$662,913														
INTERNAL RATE OF RETURN	47.1%														

	2009		
PLANT DESIGN CAPACITY (m3/hour)	600	CER SALES RATE (\$/tonne CO2eq)	\$10.00
NET PLANT CAPACITY (m3/hr) (7% parasitic load)	558	2008 OFF-SITE LFG SALES RATE (\$/mmBtu)	\$3.00
PLANT CAPACITY FACTOR	90%	POWER PRICE ESCALATION	3.0%
ANNUAL MMBTUS TO END USER	78,612		
ON SITE POWER CONSUMPTION (MWH/yr)*	0	LFG PURCHASE RATE (\$/MMBtu)	\$0.84
OFF SITE POWER SALE (MMBTU/yr)	78,612	FUEL ESCALATION RATE	3.0%
TOTAL FACILITY INITIAL CAPITAL COST	\$2,376,500	2008 DIRECT USE FACILITY O&M COST (\$/year)	\$48,000
EQUITY PERCENTAGE	25%	POWER PLANT O&M ESCALATION	3.0%
EQUITY CONTRIBUTION	\$594,125	2009 REGISTRATION, MONITORING, VERIFICATION C	\$30,000
DEBT INTEREST RATE	10.0%	2009 GCCS O&M COST (\$2008)	\$81,000
NPV RATE	14.0%	2010 GCCS O&M COST (\$2008)	\$81,000
FINANCING LIFE (years)	10.0	GCCS O&M/UPGRADES ESCALATION	3.0%