Quezon City Controlled Disposal Facility Biogas Emission Reduction Project

(QCCDFBERP)

CDM Registration Reference number 1258

Geographical coordinates: Latitude 14.715469° Longitude 121.104114°

MONITORING REPORT

(Monitoring period: September 1st 2008, to June 30th 2009)

2nd verification

10th February 2011 **Rev. 9**

Contents:

Background

The monitoring report has been drafted according to the Monitoring plan procedures as reported in Section B.7 of the PDD. The Monitoring plan in the PDD was implemented by the project participants in the ”QCCDFBERP Monitoring plan (see Annex 2); referred to this monitoring report that document defines all the monitoring procedures implemented at the project activity site.

SECTION A: general project activity and monitoring information

A.1 Title of the project activity:

Quezon City Controlled Disposal Facility Biogas Emission Reduction Project (QCCDFBERP)

A.2. CDM registration number:

CDM Registration Reference number 1258; registered in February 1st, 2008,

A.3. Short description of the project activity:

A.3.1. Real Project Implementation

The Project activity involves the extraction, collection, processing and flaring, including the conversion into electricity of the biogas emissions at the Quezon City Controlled Disposal Facility (“Facility”) located in Area 2, Barangay Payatas, Quezon City, Philippines. This project activity was developed primarily to address the environment, health and safety concerns of the local government of Quezon City for its constituents, particularly those residing in the immediate surroundings of the Facility.

The project will be implemented in two phases. During phase 1, the combustion plant will be composed of a biogas extraction system (wells and blower), a high-temperature torch for flaring the methane extracted and an electrical engine for on-site power supply. The electrical engine will be fed by biogas during plant operation (about 8,000 hours/year). An electrical connection to the local grid will be provided in order to supply electricity requirement of the plant during engine maintenance and start-up operations. Phase 2 will begin on the third year.(phase 2 will include, depending of the availability of biogas and the technical and financial viability the installation of an additional engine – about 700 kW – as indicated in the PDD).

Picture 1 : flare and biogas plant

The plant was completed and commissioned in March 2008.

Picture 2 : substation and pipes from wells

From the first September 2008 until to the end of June 2009 the network included 64 wells divided into two areas of the dumpsite, the Old and New Mound, on a surface of about 22 ha. Wells are around 15-21 meters deep and are approximately 45 meters from each other to achieve optimum efficiency of biogas extraction process.

Each well is connected to a controlling substation (total of 4 units at present); Sub-stations convey biogas from each well into main lines up to the extraction plant.
Two extractor fans in parallel, of which one is active and one is on stand-by, allow flow of biogas to the high temperature flare and the electricity generator.
Before going into the electricity generator, the biogas collected passes through a heat exchanger and condensate trap to remove remaining moisture. The most important equipments' characteristics are described in Table 1.

Equipment	**Manufacturer**	**Type**	**Technical data**
Gas collection network	Various	Wells	• 250 mm pipe slotted • 15-25 m deep • Equipped with well head and regulation valve
		Pipeline	• HDPE material • 90 mm diameter
		Substation	• 5m x 2.5 - 2 arms • Iron anti corrosion painted • Butterfly valve equipped
		Main pipeline	• HDPE material • 90 diameter-160 mm
Biogas blower	Continental Industrie	051A.03	• Flow: 2,500 Nm^3/h • Discharge pressure: 80 mbar • Discharge temp: 56.4 °C • Electric engine supplied also by Continental Industrie, 37 kW
High temperature enclosed gas flare	Biotecnogas	BTG2500HT	• Capacity 500 – 2,500 Nm^3/h • External diam: 2,200 mm

Equipment	Manufacturer	Type	Technical data
			• Height 9.50 mm • Thickness 150 mm • Material: stainless steel AISI 304 • Feeding pressure: 50 mbar • Min CH_4 %: 30% • Ratio $CH_4/CO_2>1$ • Combustion chamber: refractory made of ceramic fiber modules, thickness 150 mm • Combustion temperature: > 850 C° • Retention time >= 0.3 sec • Critical temperature: 1,260 C° • Combustion coeff. (CO_2/ CO + CO_2): min 99% • Output signal of the temperature control: continuous, by a thermocouple Pt-Rh-Pt with output signal 4÷20 mA
Booster	Mapro	CL 18/01 G	• Nominal flow rate: 150 Nm^3/h ca • Pressure in: 50 mbar • Pressure out: 150 mbar • Power: 3.6 kW ca
Engine	Iveco -ATME	Iveco Aifo 8281	• 8 cylinder turbo engine • Biogas feeding set • capacity 250 kVA • 1500 rpm • 400/230 V 50 Hz • 3 phases

Table 1

The capacity of the electricity generator presently installed is 200 kW. Currently, the electricity is produced only for the internal consumption of the plant; the engine is not capable to run with fossil fuel at present.

The improvements from the start of plant activities have been directed, for the biogas collection system, to the new wells building (16 in addition) plus 1 substation; for the plant the new flow meters in the main, flare and engine line, have been installed to warranty a better reliability, and a new temperature meter has been installed in the flare at the same level of exhausts gas analyzer probe. The new flow meters installation didn't have impact in the CERs calculation.

The garbage disposal activity of the Disposal Facility Management Office (POG), requests periodically the partial disconnection of some wells located in the two Mound area ; this situation has caused and causes a loss in biogas production in the areas occupied by dumping activity (is this also the reason for significant less CERs compared to PDD); the lost production is partially recovered through the installation of new wells in elevation, and horizontal trenches. This situation, despite the increasing of wells number, affected negatively the target achieving fixed in the PDD. However from the plant start up, is demonstrable an increasing of the biogas production trend.

The missing data on days 4^{th} ,5^{th} ,6^{th} December 2008 related to $LFG_{total,y}$ were caused by a flare temperature signal defection, solved on 7^{th} December 2008 and the missing data on days 20^{th} -

26th June 2009 related the $LFG_{electricity,y}$ were referred to the engine biogas chiller defection due to the compressor failure, all the events are indicated in the Plant daily report.

Period	Wells	Horizontal trenches	Total	Substation
1st monitoring period (1st February 2008 – 31th August 2008)	48	-	**48**	3
2nd monitoring period (1st September 2008 – 30th June 2009)	64	-	**64**	4

Table 2

The structures for biogas capitation have been implemented to partially recover the lost production caused by the waste dumping activity; to support the existing drilled wells we built the increasing wells made for the biogas capitation in dumping areas constructed in elevation and the horizontal trenches, with the same function, but made putting horizontal slotted pipes in the waste.

Picture 3 : plant picture from old moud

A.3.2. Changes against the PDD

No major changes were made.

A.4. Monitoring period:

From September 1st, 2008, to June 30th, 2009.

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

ACM0001 ver. 5 - Consolidated methodology for landfill gas project activities
AMS-I.D. ver. 10 – Grid connected renewable electricity generation

A.5.2. Monitoring methodology:

ACM0001 ver. 5 - Consolidated methodology for landfill gas project activities
AMS-I.D. ver. 10 – Grid connected renewable electricity generation

A.6. Intended deviations or revisions to the registered "QCCDFBERP Monitoring plan"

The project activity has deviated from the registered PDD since:

- From the plant start operation just to 9th November 2008 the "Temperature in the exhaust gas of the flare" (as defined in the "Tool to determine project emissions from flaring gases containing methane") has been measured with a T_{flare} probe (TT03) installed 1.80 meters above the burner .This deviation from the Methodological Tool has been investigated by the DOE and it's confirmed that it would have been addressed and resolved installing a second T_{flare} probe at the correct height of the flare (same level of the oxygen and methane fraction probes) to allow to fully comply with the methodology. According to this, no amendment of the Methodology was required. The deviation was accepted on EB n. 45 11-13 February 2009.
  On 8th November, 2008, an additional T_{flare} probe (TT05) has been installed at the same level of the oxygen and methane fraction probes correcting the deviation. For the period 1st September 2008- 9th November 2008 a same deviation, accepted on EB n. 45 11-13 February 2009, was requested. The deviation I-DEV0273 entitled "Location of the T_{flare} probe and measure of total amount of landfill gas captured $LFG_{TOTAL,y}$" has been accepted, on 8th February 2010.

- The $LFG_{total,y}$ parameter has been measured using two additional Annubar-type meters on lines A and B instead of a turbine meter on the main line, as defined in the registered PDD. This change in the $LFG_{total,y}$ measurement approach has been applied by the project participants due to the breakdown of the main turbine meter. The redundancy of the measurement equipments which was in place has allowed Pangea to use the two Annubar meters to estimate the $LFG_{total,y}$ and to compare it with the sum of the flow data $LFG_{flare,y}$ and $LFG_{electricity,y}$. The results obtained confirm that this approach, due to the accuracy of the Annubar meters, have allowed to perform the required verification ($LFG_{total,y} = LFG_{flare,y} + LFG_{electricity,y}$) in a reliable way. The deviation was accepted on EB n. 45 11-13 February 2009.
  On 27th March 2009 a new flow meter FT03_a has been installed instead of broken turbine meter to measure $LFG_{total,y}$ correcting the deviation. For the period 1st September 2008- 27th March 2009 a same deviation, accepted on EB n. 45 11-13 February 2009, was requested. The deviation I-DEV0273 entitled "Location of the T_{flare} probe and measure of total amount of landfill gas captured $LFG_{TOTAL,y}$" has been accepted, on 8 February 2010.

A.7. Changes since last verification:

This is the second periodic verification. No major changes has been made.

A.8. Person(s) responsible for the preparation and submission of the monitoring report:

This monitoring report was developed and reviewed by:

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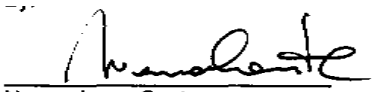

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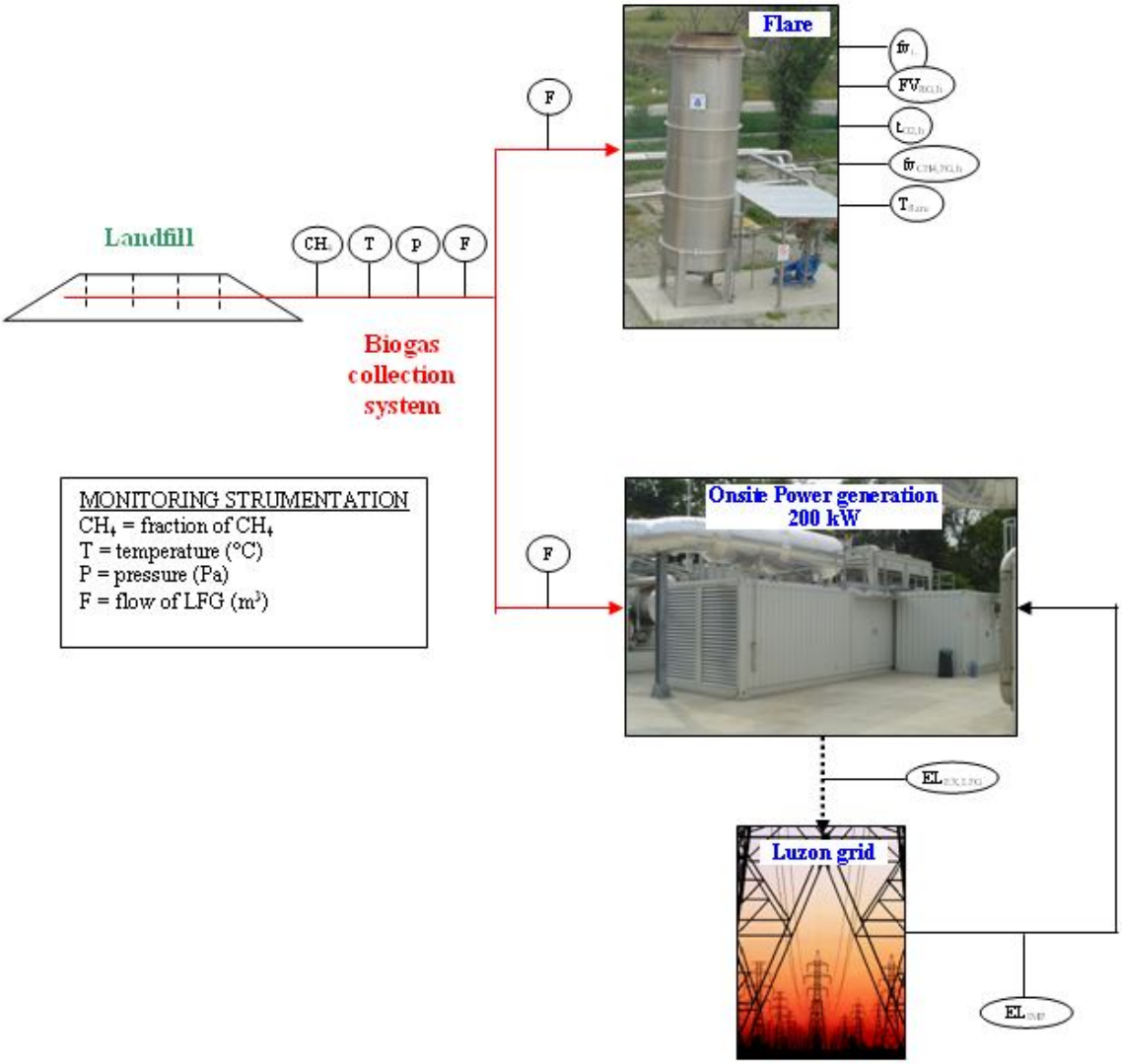
SECTION B. Key monitoring activities according to the "QCCDFBERP Monitoring plan" for the monitoring period stated in A.4. (referring to Decision 17/CP.7, Annex H, paragraph 53 (a) – (d) on data collection and archiving)

B.1. Monitoring equipment:

The picture below provides schematic information on which monitoring equipment was installed



*At time of the second verification the Phase 1 is active: the electricity produced is completely used for the plant consumption.

B.1.2. Table providing information on the equipment used for ER calculation (including type, manufacturer, model, serial number, location, information to specific uncertainty, range calibration frequency and last calibration):

ID	Type	Manufacturer	Model -Serial Number	Location	Error / Uncertainty	Range	Calibration frequency	Last calibration	Calibration Entity	Oper. period
FT03	Flow Meter	RMG	TRZ-03 -34807	Main pipeline	0.37% / 0.26%	130-2,500 m^3/h	7 years	21/5/2007	RMG Messtechnik (authorized by PTB-DE)	1/9/2008 - 26/3/2009
FT03_a	Flow Meter	EMERSON - ROSEMOUNT	485 - 0075923 3051S1CD1A2E12A1AB 4D2E1L4Q4 -8696153	Main pipeline	0.0087% / 0.025%	130-2,500 m^3/h	2 years	28/2/2009	EMERSON – PROCESS MANAGEMENT	27/3/2009 – 30/6/2009
FT04	Flow Meter	RMG	TRZ-03 - 34808	Flare pipeline	0.49% / 0.26%	130-2,500 m^3/h	7 years	29/5/2008	RMG Messtechnik (authorized by PTB-DE)	1/9/2008 - 26/3/2009
FT04_a	Flow Meter	EMERSON - ROSEMOUNT	485 - 0075924 3051S1CD1A2E12A1AB 4D2E1L4Q4 -8696152	Flare pipeline	0.01% / 0.025%	130-2,500 m^3/h	2 years	28/2/2009	EMERSON – PROCESS MANAGEMENT	27/3/2009 – 30/6/2009
FT05	Flow Meter	RMG	TRZ-03 - 34809	Engine pipeline	0.11% / 0.26%	13-250 m^3/h	7 years	23/5/2007	RMG Messtechnik (authorized by PTB-DE)	1/9/2008 - 10/6/2009
FT05_a	Flow Meter	EMERSON - ROSEMOUNT	485 - 0075925 3051S1CD1A2E12A1AB 4D2E1L4Q4 -8696154	Engine pipeline	0.01% / 0.025%	13-250 m^3/h	2 years	29/4/2009	EMERSON – PROCESS MANAGEMENT	11/6/2009- 30/6/2009
GA01	Methane content analyser	SIEMENS	ULTRAMAT 23 – N1-V7-0538	Main pipeline	0,111% CH_4 0.5% O_2	0-100% CH_4 0-25% O_2	Annual	13/3/2008 19/3/2009	SIEMENS PANGEA - AIR LIQUIDE	1/9/2008 - 30/6/2009
TT02	Temperature meter	ELSI	Probe Model: G1.U10-P20-B0150-S00, Transmitter Model: Y1-SEM203P - Serial number 08-07/290	Main pipeline	0.20% / 0.15%	0-250 °C	2 years	12/9/2007	Elsi Calibration center	1/9/2008 - 30/6/2009

ID	Type	Manufacturer	Model -Serial Number	Location	Error / Uncertainty	Range	Calibration frequency	Last calibration	Calibration Entity	Oper. period
PT04	Pressure meter	ABB	264HS-6407024078	Main pipeline	0.49%	0-250 mbar	2 years	25/9/2007 10/8/2009	ABB quality test check PREMIER Phisic metrologie	1/9/2008 - 30/6/2009
TT03	Temperature meter flare bottom	ELSI	Probe Model: M1.U07-S00-M00400.1-S20, Transmitter Model: Y1-SEM210/S - Serial number 10-05/9387	Flare bottom	0.08% / 0.21%	0-1,600 °C	2 years	12/9/2007	Elsi Calibration center	1/9/2008 - 6/12/2008
TT03	Temperature meter flare bottom	ELSI	Probe Model: M1.U07-S00-M00400.1-S20, Transmitter Model: Y1-SEM210/S - Serial number 12-08/3358	Flare bottom	0.107% / 0.21%	0-1,600 °C	2 years	04/12/2008	Elsi Calibration center	7/12/2008 - 30/6/2009
TT05	Temperature meter Flare top	ELSI	Probe Model: M1.U07-S00-M00400.1-S20, Transmitter Model: Y1-SEM210/S - Serial number 10-07/748	Flare Top	0.19% / 0.29%	0-1,600 °C	Annual	15/12/2007 20/8/2008 10/8/2009	Elsi Calibration center PREMIER Phisic metrologie PREMIER Phisic metrologie	8/11/2008 – 30/6/2009
GA02	Exhaust gas analyzer	SIEMENS	ULTRAMAT23 - N1-V0-0038	Flare	0% CH_4 0.5% O_2	0-100% CH_4 0-25% O_2	Annual	13/3/2008 19/3/2009	SIEMENS PANGEA - AIR LIQUIDE	1/9/2008 - 30/6/2009
EM01	Electricity meter	GENIUS	EDMI N680 - 206584765	Main Electrical Panel	0.148%	5(20) A – 240V	2 years	14/3/2007 10/3/2009	ERC Philippines ERC Philippines	1/9/2008 - 30/6/2009
FT01	Flow meter line “A””	EMERSON - ROSEMOUNT ABB	285G050ZCSP1S17 - 0053154 264DS - 6407021990	Line “A	0.1%	0-1,200 m^3/h	2 years	3/9/2007 10/8/2009	ABB quality test check PREMIER Phisic metrologie	1/9/2008 - 30/6/2009
FT02	Flow meter line “B”	EMERSON - ROSEMOUNT. ABB	285G050ZCSP1S17 - 0050959 264DS - 6407021989	Line “B”	0.1%	0-1,200 m^3/h	2 years	31/8/2007 10/8/2009	ABB quality test check PREMIER Phisic metrologie	1/9/2008 - 30/6/2009
HC01	Plant hours counter	BIOTECNOGAS	SCADA	Plant pc	---------	0-999999 h	Not required	----------	----------	1/9/2008 - 30/6/2009

Table 3

The FT03_a, FT04_a, FT05_a flow meter, have been installed respectively on 27th March 2009, 27th March 2009, and 11th June 2009 with the same function of original FT03, FT04, FT05 to permit the maintenance operations and realize a more reliable flow measuring system.
The TT05 was installed on 8th November 2008.
The flow meters FT01 and FT02 are backup flow meters. Other instrument installed for the plant management (pressure meter lines A and B, pressure meter before the blowers, temperature meter before the blower, portable gas analyzer) but not involved in the ER calculation are described in "QCCDFBERP Monitoring plan"in Annex 2.

The calibration frequency of all instruments involved in the ER calculation is in compliance with "Guidelines for assessing compliance with the calibration frequency requirements" version 01, EB 52 Annex 60.
With reference to the delay of calibration related the two instruments GA01 and GA02 (1st calibration 13/3/2008, 2nd calibration 19/3/2009 – 6 days of delay), in the ER calculation we have considered, as indicated in the "Guidelines for assessing compliance with the calibration frequency requirements – version 01, EB 52 Annex 60", the case "B" – point "4.b" (…*Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment…*) a conservative approach . Hence, the errors identified have been calculated as difference between the effective calibration values and the read values of methane concentrations, before the calibrations, dated 19/3/2009; the values obtained are 4.783% for GA01 and 1.923% for GA02 .The errors 4.783% for GA01 and 1.923% for GA02 are used in ER calculation during the period 1/9/2008 -19/3/2009 (most long period respect the effective days not covered by calibration) . This approach is the most conservative and reduce the ER value calculated (for details see the ER calculation sheet of September 2008 - March 2009).
The error used for GA01 and GA02, in the period covered by calibration (19/3/2009 -30/6/2009), is the error calculated after calibration done on 19/3/2009 (0,111% for GA01 and 0% for GA02).

B.1.3. Calibration procedures:
See Table 3

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default values:

Parameter	Description	Value	Unit of measure	Source
GWP_{CH4}	Global Potential Warming of methane	21	t CO_{2eq}	Intergovernmental Panel on Climate Change, Climate Change 1995: The Science of Climate Change (Cambridge, UK: Cambridge University Press, 1996)
D_{CH4}	Methane density	0,0007168	t/m^3	Intergovernmental Panel on Climate Change, Climate Change 1995: The Science of Climate Change (Cambridge, UK: Cambridge University Press, 1996)
$CEF_{electricity,y}$	CO_2 emissions intensity of the electricity displaced	0,46	t CO_2/MWh	Calculated according to AMS – I.D. Version 10 (see PDD)

Table 4

B.2.2. List of variables

Parameter	Description	Unit of measure	Source	Frequency
$LFG_{total,y}$	Total amount of landfill gas	m^3	Directly measured	Continuously , h
$LFG_{flare,y}$	Amount of landfill gas flared	m^3	Directly measured	Continuously , h
$LFG_{electricity,y}$	Amount of landfill gas combusted in power plant	m^3	Directly measured	Continuously , h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	Nm^3/h	Directly measured	Continuously , h
$f_{vCH4,h}$	Volumetric fraction of	%	Directly	Continuously ,

Parameter	Description	Unit of measure	Source	Frequency
	methane in the residual gas in the hour *h*		measured	h
$t_{O2,h}$	Volumetric fraction of O_2 in the exhaust gas of the flare in the hour *h*	%	Directly measured	Continuously , h
$f_{vCH4,FG,h}$	Concentration of methane in the exhaust gas of the flare in dry basis at normal condition in the hour *h*	mg/m^3	Directly measured	Continuously , h
T_{flare}	Temperature in the exhaust gas of the flare	°C	Directly measured	Continuously , h
T	Temperature of the landfill gas	°C	Directly measured	Continuously , h
P	Pressure of the landfill gas	mbar[1] (Pa)	Directly measured	Continuously , h
$EL_{EX,LFG}$	Total amount of electricity exported out of the project boundary	MWh	Directly measured	Continuously , h
EL_{IMP}	Total amount of electricity imported to meet project requirements	MWh	Directly measured	Continuously , h
H	Working plant hours	h	Directly measured	Continuously , h

Table 5

B.2.3. Data concerning GHG emissions of the baseline (referring to paragraph 53(b)) and of the project activity (referring to paragraph 53(a)):

The data are available in the **ER calculation sheet_ *200X_month* and** provided to DOE

B.2.4. Data concerning leakage (referring to paragraph 53(c)):

According to ACM0001 Version 05 no leakage needs to be considered.

B.2.6. Data concerning environmental impacts (referring to paragraph 53(d)):

Since the beginning of plant operation, gas odor on top of the mounds has been greatly reduced. The subsidence of the garbage mounds was up to 5 feet in just 10 months of gas and leachate extraction. This means that the mounds have better compaction and the quantity of perched water and leachate was also reduced thereby improving stability of the slopes of the dump. Continuous

[1] 1mbar = 100 Pa

extraction of gas from the dump reduced the risk of fire and explosion in the area. There were no incidences of fire and explosion due to the project.

SECTION C. Quality assurance and quality control measures

See “QCCDFBERP Monitoring plan” in Annex 2

SECTION D. Calculation of GHG emission reductions (referring to Decision 17/CP.7, Annex H, paragraph 53 (f) and 59)

D.1. Table providing the formulae used.

Variable	Description	Unit of measure	Equation used
PE_{flare}	Project emissions	t CO_{2eq}	$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \cdot (1-\eta_{flare,h}) \cdot \frac{GWP_{CH4}}{1000}$
$MM_{RG,h}$	Molecular mass of the residual gas	kg/kmol	$MM_{RG,h} = \sum_{i} (fv_{i,h} * MM_i)$ ($fv_{i,h}$= $fv_{CH4,h}$)
$\rho_{RG,h}$	Density of the residual gas	kg/m^3	$\rho_{RG,n,h} = \frac{P_n}{\frac{R_u}{MM_{RG,h}} \times T_n}$
$FM_{RG,h}$	Mass flow rate of the residual gas	kg/h	$FM_{RG,h} = \rho_{RG,n,h} \times FV_{RG,h}$
$TV_{n,FG,h}$	Volumetric flow rate of he exhaust gas	m^3/h	$TV_{n,FG,h} = V_{n,FG,h} \times FM_{RG,h}$
$TM_{FG,h}$	Mass flow rate of methane in the exhaust gases	kg/h	$TM_{FG,h} = \frac{TV_{n,FG,h} * fv_{CH4,FG,h}}{1000000}$
$TM_{RG,h}$	Mass flow rate of methane in the residual gas	kg/h	$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$
η_{flare}	Flare efficiency		$\eta_{flare,h} = 1 - \frac{TM_{FG,h}}{TM_{RG,h}}$
$MD_{electricity}$	Methane destroyed by generation of electricity	t CH_4	$MD_{electricity,y} = LFG_{electricity,y} \cdot w_{CH4} \cdot D_{CH4}$
MD_{flared}	Methane flared	t CH_4	$MD_{flared,y} = \{LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4})$
$MD_{project}$	Methane flared/combusted	t CH_4	$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y}$
EL_y	Net exported electricity	MWh	$EL_y = EL_{EX,LGFG} - EL_{IMP}$
ER_y	Emission reductions	t CO_{2eq}	$ER_y = MD_{project,y} * GWP_{CH4} + EL_y * CEF_{electricity,y}$

Table 6

The ε equivalent error calculation is applied the following variable:

$$\varepsilon_{PE\ flared} = \sqrt{(err_{PT04})^2 + (err_{TT02})^2 + (err_{FT04})^2 + (err_{GA02_{CH4}})^2 + (err_{GA02_{02}})^2}$$

$$\varepsilon_{MD\ flare\ d\ before\ PE\ \ reduction,y} = \sqrt{(err_{PT04})^2 + (err_{TT02})^2 + (err_{FT04})^2 + (err_{GA01})^2}$$

(error related the product $LFG_{flare,y} * w_{CH4} * D_{CH4}$ *)*

$$\varepsilon_{MD_{electrucity}} = \sqrt{(err_{PT04})^2 + (err_{TT02})^2 + (err_{FT05})^2 + (err_{GA01})^2}$$

$$\varepsilon_{EL} = \sqrt{(err_{EM01})^2}$$

Where the err_{aabb} is the sum of error plus uncertain associated to the instrument involved in the variable calculation (see Table 3).

The variable correction after equivalent error calculation is :

$$XX_{corr} = XX_y * (1 - \varepsilon_{XX})$$

D.2. Description and consideration of measurement uncertainties and error propagation

The data parameters are measured rounded to four decimals.
In the baseline calculation the numbers were rounded down after four decimals and in calculation of the project emissions the numbers were rounded up after four decimals. Then, the final emissions reductions were rounded down to the unit.

D.3. GHG emission reductions calculation

The data are available in the **ER calculation sheet_** ***200X_month*** and provided to DOE

For PE_{flare} calculation details and equivalent error calculation and correction see also **ER calculation sheet_** ***200X_month***.

The Table 7 shows the Baseline Emission and the Project Emission during the monitoring period.

Period	*BE* [t $CO_{2\ eq}$]	*PE* [t $CO_{2\ eq}$]
1st September – 30 September 2008	**5,506.8**	**0.8**
1st October – 31 October 2008	**6,412.5**	**0.4**
1st November – 30 November 2008	**7,062.0**	**0.7**
1st December – 31 December 2008	**6,512.2**	**5.9**
1st January – 31 January 2009	**8,210.9**	**0.2**
1st February – 28 February 2009	**7,276.9**	**0.2**
1st March – 31 March 2009	**8,580.2**	**0.8**
1st April – 30 April 2009	**8,418.2**	**0.5**
1st May – 30 May 2009	**8,889.7**	**0.5**
1st June – 30 June 2009	**8,520.9**	**3.6**
TOTAL	**75,390**	**14**

Table 7

D.3.1. Leakage:

No leakage calculation is required

D.3.2. Summary of the emissions reductions during the monitoring period:

The Table 8 shows the Emission Reduction during the monitoring period.

Period	[t $CO_{2\ eq}$]
1st September – 30 September 2008	**5,506.0**
1st October – 31 October 2008	**6,412.1**
1st November – 30 November 2008	**7,061.3**
1st December – 31 December 2008	**6,506.3**
1st January – 31 January 2009	**8,210.7**
1st February – 28 February 2009	**7,276.7**
1st March – 31 March 2009	**8,579.4**
1st April – 30 April 2009	**8,417.7**
1st May – 30 May 2009	**8,889.2**
1st June – 30 June 2009	**8,517.3**
TOTAL ER REQUESTED	**75,376**

Table 8

D.3.3. Comparison of actual emission reductions with estimates in the CDM-PDD:

Considering the values applied in ex-ante calculation of the registered CDM-PDD (yearly values - 148,338 for the year 2008 and 141,505 for the year 2009), the PDD reference value is based on the average monthly values, multiplied by the number of months for each year (4 months for the year 2008 and 6 months for the year 2009). The value obtained with this approach is equal to 120,199 tCO_2e.
A comparison of actual value of the emission reductions achieved during the current monitoring period (2^{nd} MR) with the estimation in the registered CDM-PDD is reported in the Table 9 below.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**120,199**	**75,376**

Table 9

D.3.4. Remarks on difference from estimated value in the PDD:

There isn't any increase in the actual emission reductions achieved during the current monitoring period compared to that stated in the registered CDM-PDD, but a reduction.
The garbage disposal activity of the Disposal Facility Management Office (POG), requests periodically the partial disconnection of some wells located in the two Mound area; this situation has caused and causes a loss in biogas production in the areas occupied by dumping activity (is this also the reason for significant less CERs compared to PDD). The lost production is partially recovered through the installation of new wells in elevation, and horizontal trenches. This situation, despite the increasing of wells number, affected negatively the target achieving fixed in the PDD. However from the plant start up, is demonstrable an increase of the biogas production trend.

ANNEX I: monitoring equipment location

LEGEND			
FT01	Flow meter line “A””	TT01	Temperature meter
FT02	Flow meter line “B”	TT02	Temperature meter
FT03	Flow Meter (total)	TT03	Temperature meter
FT03_a	Flow Meter (total)	TT04	Temperature meter
FT04	Flow Meter (flare)	TT05	Temperature meter
FT04_a	Flow Meter (flare)	PT01	Pressure meter
FT05	Flow Meter (engine)	PT02	Pressure meter
FT05_a	Flow Meter (engine)	PT03	Pressure meter
GA01	Methane content analyser	PT04	Pressure meter
GA02	Exhaust gas analyzer	PT05	Pressure meter
EM01	Electricity meter	HC01	Plant hours counter