Quezon City Controlled Disposal Facility Biogas Emission Reduction Project

(QCCDFBERP)

CDM Registration Reference number 1258

MONITORING REPORT

(Monitoring period: February 1st 2008, to August, 31th - 2008)

1st verification –version 7

September 2008

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; referred to this monitoring report this 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 7,500 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.

The plant was completed and commissioned in March 2008. It consists of a network of 48 wells divided into two areas of the dumpsite, the Old and New Mound, on a surface of about 10 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 3 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 capacity of the electricity generator presently installed is 200 kW. Currently, the electricity is produced only for the internal consumption of the plant.

A.3.2. Changes against the PDD
No major changes were made.

A.4. Monitoring period:
From February 1st, 2008, to August 31th , 2008.

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.

A.5.2. Monitoring methodology:
ACM0001 ver. 5 - Consolidated methodology for landfill gas project activities.

A.6. Intended deviations or revisions to the registered PDD:
No deviation to the registered PDD is requested.

A.7. Intended deviations or revisions to the registered"QCCDFBERP Monitoring plan"
No deviation to the registered PDD is requested.

A.8. Changes since last verification:
This is the first periodic verification.

A.9. Person(s) responsible for the preparation and submission of the monitoring report:
This monitoring report was developed and reviewed by:

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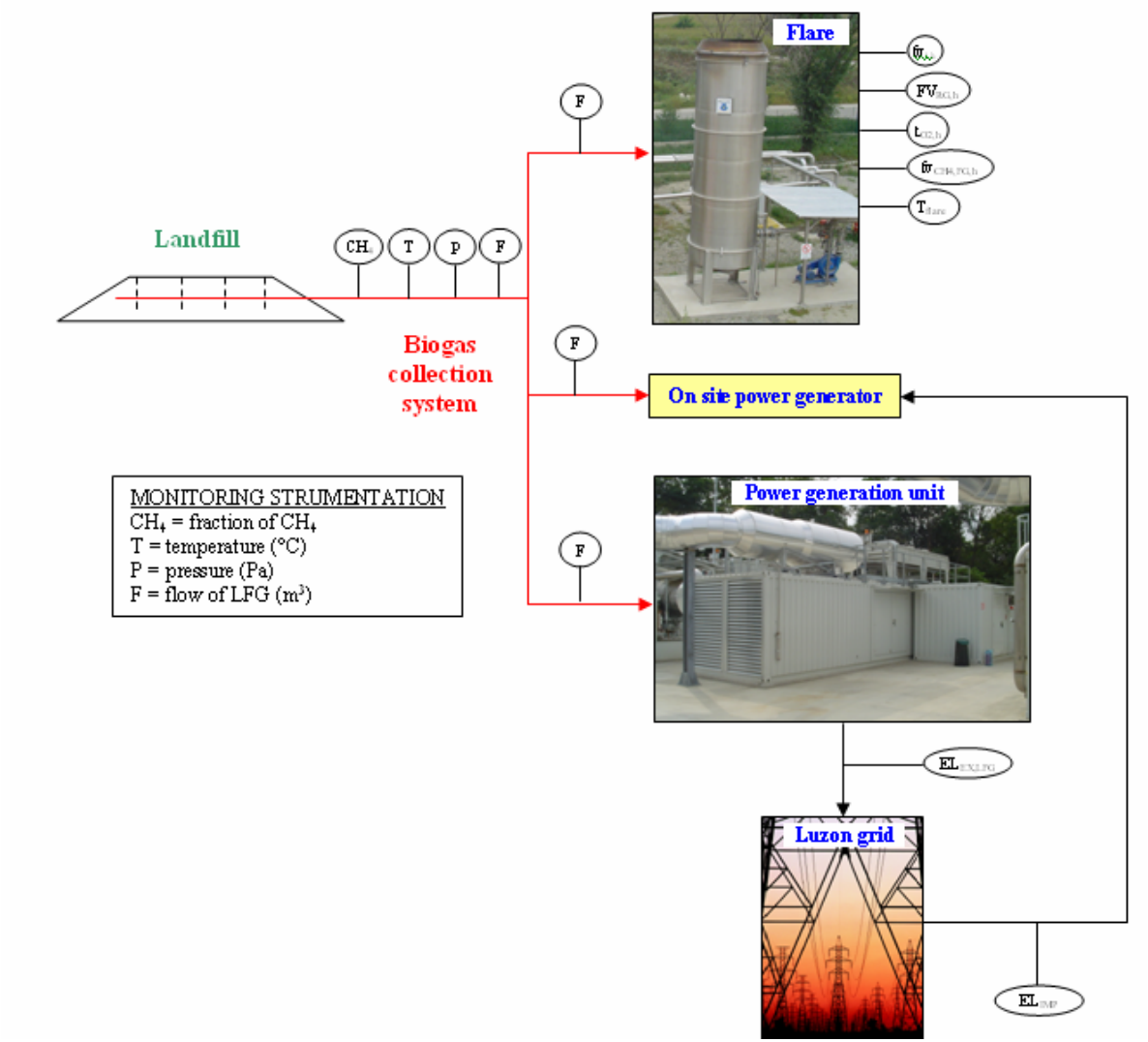
SECTION B. Key monitoring activities according to the"QCCDFBERP Monitoring plan" for the monitoring period stated in A.4. (referring to Decision 17/CP.7, Annex H, paragraph 53 (a) – (d) on data collection and archiving)

B.1. Monitoring equipment:

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



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
FT03	Flow Meter	RMG	TRZ-03 -34807	Main pipeline	0.26 %	130-2500 m^3/h	7 years	22/5/2007
FT04	Flow Meter	RMG	TRZ-03 - 34808	Flare pipeline	0.26 %	130-2500 m^3/h	7 years	28/7/2008
FT05	Flow Meter	RMG	TRZ-03 - 34809	Engine pipeline	0.26 %	13-250 m^3/h	7 years	23/5/2007
GA01	Methane content analyser	SIEMENS	ULTRAMAT23 – N1-V7-0538	Main pipeline	1% CH_4 0.5 % O_2	0-100% CH_4 0-25% O_2	Annual	13/3/2008
TT02	Temperature meter	ELSI	S	Main pipeline	0.17 %	0-250 C°	2 years	12/9/2007
PT04	Pressure meter	ABB	264HS	Main pipeline	0.075%	0-250 mbar	2 years	31/8/2007
TT03	Temperature meter	ELSI	Pt 100	Flare	0.21%	0-1600 C°	2 years	12/9/2007
GA02	Exhaust gas analyzer	SIEMENS	ULTRAMAT23 - N1-V0-0038	Flare	1% CH_4 0.5 % O_2	0-100% CH_4 0-25% O_2	Annual	13/3/2008
EM01	Electricity meter	GENIUS	EDMI N680 - 206584765	Main Electrical Panel	1%	5(20) A – 240V	2 years	14/3/2007
FT01	Flow meter line “A””	ABB	264DSE 6406030333	Line “A	0.075%	0-1200 m^3/h	2 years	3/9/2007
FT02	Flow meter line “B”	ABB	264DSE 6406030331	Line “B”	0.075%	0-1200 m^3/h	2 years	3/9/2007

Tab.1

The flow meters F01 and F02 are backup flow meters. The periodicity of calibration of all monitoring equipment were based on manufacturer recommendation (as there is no law or regulation in this regard). Other instrument installed for the plant management but not involved in the ER calculation are described in “Monitoring plan”.

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B.1.3. Calibration procedures:
See table 1

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 AMSI.D Version 10 (see PDD)

Table 2

B.2.2. List of variables

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

$f_{vCH4,h}$	Volumetric fraction of methane in the residual gas in the hour *h*	-	Directly measured
$t_{O2,h}$	Volumetric fraction of O_2 in the exhaust gas of the flare in the hour h	-	Directly measured
$f_{vCH4,FG,h}$	Volumetric flow rate of the exhaust gas in dry basis at normal conditions in the hour *h*	mg/m^3	Directly measured
T_{flare}	Temperature in the exhaust gas of the flare	°C	Directly measured
T	Temperature of the landfill gas	°C	Directly measured
P	Pressure of the landfill gas	Pa	Directly measured
$EL_{EX,LFG}$	Total amount of electricity exported out of the project boundary	MWh	Directly measured
EL_{IMP}	Total amount of electricity imported to meet project requirements	MWh	Directly measured

Table 4

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_ *mont_2008*** and whit 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 was greatly reduced. The subsidence of the garbage mounds was up to 2 feet in just 3 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 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””

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 5

The ε equivalent error calculation is applied the following variable:

$$\varepsilon_{PE\ flared} = \sqrt{(err_{PT04})^2 + (err_{TT03})^2 + (err_{FT04})^2 + (err_{GA02_{ch4}})^2 + (err_{GA02_{02}})^2}$$

$$\varepsilon_{MD\ flare\ d\ before\ PE\ \ reduction,\ y} = \sqrt{(err_{PT04})^2 + (err_{TT03})^2 + (err_{FT04})^2 + (err_{GA01})^2}$$

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

$$\varepsilon_{MD\ electrucity} = \sqrt{(err_{PT03})^2 + (err_{TT03})^2 + (err_{FL03})^2 + (err_{GA02})^2 + (err_{GA01})^2}$$

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

Where the err_{aabb} is the error associate to the instrument involved in the variable calculation (see table 1)

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 emissions reductions were rounded down with two decimals.

D.3. GHG emission reductions calculation

The data are available in the **ER calculation sheet_** ***month_2008*** and whit DOE

For PE_{flare} calculation details and equivalent error calculation and correction see also **ER calculation sheet_** *month_**2008.***.

D.3.3. Leakage:

No leakage calculation is required

D.3.4. Summary of the emissions reductions during the monitoring period:

Period	[t $CO_{2\ eq}$]
2008/02/01 to 2008/02/29	**0.00***
2008/03/01 to 2008/03/31	**1,922.92**
2008/04/01 to 2008/04/30	**5,900.17**
2008/05/01 to 2008/05/31	**5,901.18**
2008/06/01 to 2008/06/30	**5,982.70**
2008/07/01 to 2008/07/31	**5,811.92**
2008/08/01 to 2008/08/31	**5,505.09**
TOTAL ER REQUESTED	**31,023.98**

* The month of February has not ER because the plant operation started on March, 18th - 2008.

ANNEX I: monitoring equipment location