MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Exploitation of the biogas from controlled landfill in solid waste management central – CTRS / BR.040
Reference number of the project activity	3464
Version number of the monitoring report	Version 2
Completion date of the monitoring report	29/10/2012
Registration date of the project activity	04/06/2011
Monitoring period number and duration of this monitoring period	Monitoring period #1 (04/06/2011 – 30/09/2011)
Project participant(s)	Consórcio Horizonte Asja Asja Brasil Serviços para o Meio Ambiente Ltda.
Host Party(ies)	Brazil
Sectoral scope(s) and applied methodology(ies)	Sectoral scope 13 – Waste handling and disposal ACM0001 “Consolidated baseline and monitoring methodology for landfill gas project activities” (Version 11)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	68,336 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	81,709 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Purpose of the project activity and the measures taken to reduce greenhouse gas emissions

The Project consists of a collection, transport and treatment system for landfill gas with production of electricity for self-consumption and incorporation to the national grid. Since the landfill gas major constituent is methane, whose GHG potential is 21 times the CO2, the Project reduces the emission of GHG into the atmosphere by means of methane destruction in high temperature flares and of displacement of electricity generated from fossil fuel sources.

Brief description of the installed technology and equipments

The LFG is collect through vertical wells drilled in the waste mass and is transported through a pipeline system connected to blowers towards the gas use section, where energy production and flare combustion sections are located.

Entering the gas use section, the LFG collected is treated from humidity and other impurities to be then sent to the electricity generation sets and/or to the enclosed flares. The LFG preferably flows to the power house; therefore, the major part of the LFG collected is turned into electric energy. The enclosed flare section aims to safely combust the surplus of gas in case the LFG flow exceeds the maximum utilization capacity of the power house or it is in maintenance. Both uses leads to a complete destruction of the methane present in the LFG.

The electric energy produced from LFG is set both for the self consumption of the plant and the supply to the grid. The Project total installed capacity of project activity is 5.704 MW having four engines of 1.426 MW individual capacities. The details of the technology have been explained in section A.4 of this report.

Relevant dates for the project activity

The landfill began accepting waste in 1975. By the end 2006, more than 17,400,000 m^3 of solid urban waste have been filled over the landfill. The maximum landfill height is about 64 meters. The lifetime of the landfill was 32 years, ending on December 2007.

The Project's infrastructure construction started in December 2008 and the first landfill gas collection wells were drilled by the beginning of 2009.

The landfill gas aspiration and flare combustion plant was installed in 12/09/2009 and it is operational since 29/10/2009. Combustion plant was initially composed by 2 enclosed flares of 2,500 Nm^3/h of capacity each one.

The electricity generation plant was commissioned in the second fortnight of November and start operating in 29/11/2010.

In 04/06/2011 one of the enclosed flares installed in the combustion plant was definitively turned off, because it had been idle since the generation plant started operating.

CDM validation was contracted in 19/10/2008 and completed in 24/02/2010. The project activity accomplished its CDM registration in 04/06/2011 with the reference number 3464.

Total emission reductions achieved in this monitoring period

In the monitoring period, from 04/06/2011 to 30/09/2011 (both dates included), the Project achieved 81,709 tCO_2e.

A.2. Location of project activity

>>

The Project is locate in CTRS / BR.040 Landfill, to be found on highway BR.040, section Belo Horizonte – Sete Lagoas, near km 531, Jardim Filadélfia neighbourhood in Belo Horizonte city, Minas Gerais state, Brazil.

CTRS / BR.040 landfill is located, according to Google Earth, at the following coordinates:

- Latitude S: 19.9159°
- Longitude W: 44.0181°

The figures below present the detailed location of the landfill:

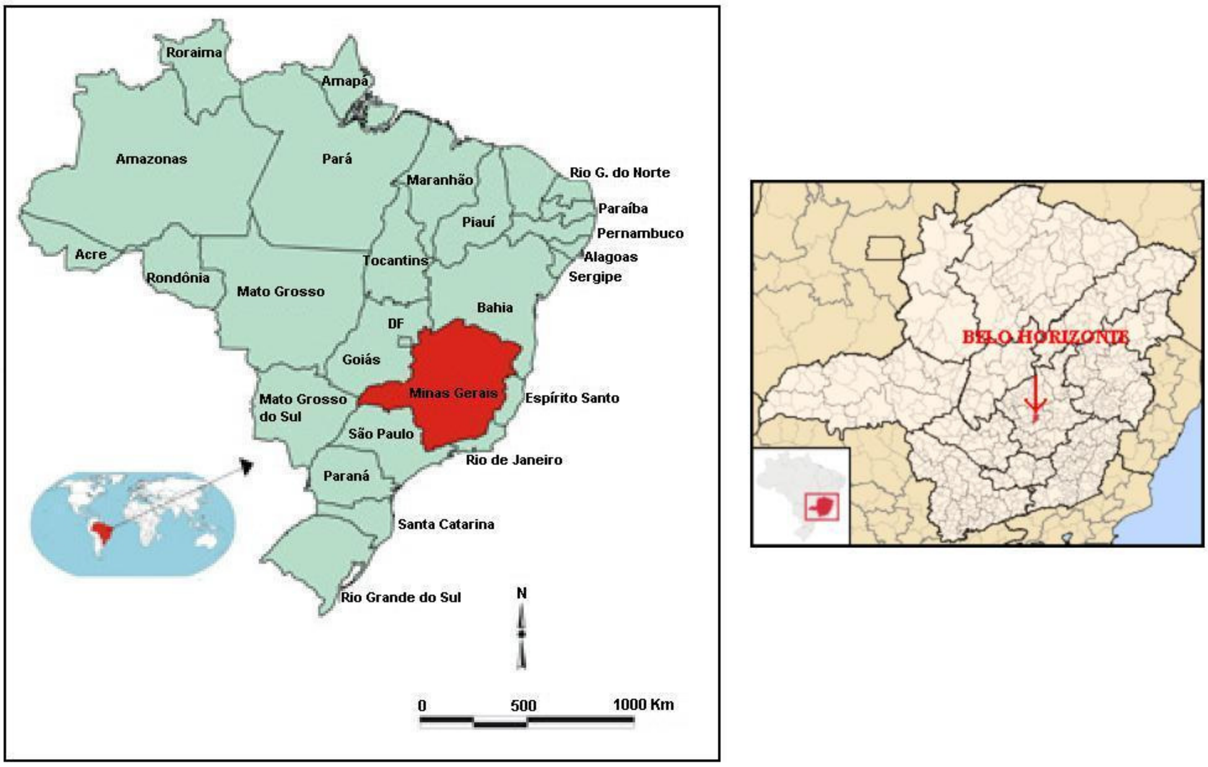

Figure 1: Project location.

Figure 2: CTRS / BR.040 landfill location. (Source: Google Earth)

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Consórcio Horizonte Asja (Private entity) Asja Brasil Serviços para o Meio Ambiente Ltda. (Private entity)	No

A.4. Reference of applied methodology

>>

The Project applies the following methodology and related tools:

- ACM0001 “Consolidated baseline and monitoring methodology for landfill gas project activities” (Version 11);
- “Tool for the demonstration and assessment of additionality” (Version 05.2);
- “Tool to determine project emissions from flaring gases containing methane” (Version 01);
- “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01);
- “Tool to calculate the emission factor for an electricity system” (Version 02);
- “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02);
- “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” (Version 05).

A.5. Crediting period of project activity

>>

Crediting period from 04/06/2011 to 03/06/2021.

Choice of crediting period: fixed for 10 years (120 months).

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>>
The Project's infrastructure construction started in December 2008 and the first landfill gas collection wells were drilled by the beginning of 2009. The landfill gas aspiration and flare combustion plant, composed by 2 enclosed flares of capacity of 2,500 Nm^3/h each one, was installed in 12/09/2009 and it is operational since 29/10/2009. The electricity generation plant was commissioned in the second fortnight of November and start operating in 29/11/2010. From this day on the major part of LFG is converted into energy and so the flare combustion section became super estimated; for this reason one of the enclosed flares (Flare 2) was turned off in 04/06/2011.

The project activity accomplished its CDM registration in 04/06/2011 with the reference number 3464.

The first CDM/CER period for verification is from 04/06/2011 to 30/09/2011, both dates included.

Events such planned and forced outages for change of equipments did not require corrective actions, since no emission reduction was claimed for the moments on which the plant was out of service. All changes of equipments were done using calibrated and certified devices and do not have impacts on the GHG emission reductions calculation.

All equipment exchanges during the present monitoring report are resumed on the table below; anyway, more detailed information was presented for each specific on the Section D.2.

None of mentioned events impacts any applicability conditions stated in the Version 11 of ACM0001 – *"Consolidated baseline and monitoring methodology for landfill gas project activities"*.

Table 1: Exchange of equipments during the monitoring period.

Changes date (dd/mm/yyyy)	Position at the plant	Old equipments serial number	New equipments serial number
04/06/2011	Flow meter – Flare 2 line	Rosemount Annubar 285 78150	N/A*
04/06/2011	Differential pressure sensor – Flare 2 line	ABB 264 DS 6409016455	N/A*
04/06/2011	Relative pressure probe – Flare 2 line	SMAR U305231	N/A*
04/06/2011	Temperature probe – Flare 2 line	Ecil 1037.157694	N/A*
04/06/2011	Thermocouple – Flare 2 (80% height)	Ecil 0950.064322	N/A*
04/06/2011	Relative Pressure Probe – Energy line	ABB 6410003214	SMAR U305352
04/06/2011	Temperature Probe – Energy line	Ecil 0913.999002	Ecil 1037.157655
04/06/2011	Temperature Probe – Main line	Ecil 1003.073042	Ecil 1028.138141
04/06/2011	Thermocouple – Flare 1 (80% height)	Ecil 0950.064338	Ecil 0950.064353

* Flare 2 was definitively turned off in 04/06/2011 because it had been idle since the engines started operating, in 29/11/2010.

Important clarifications:

- Calibrations are performed by an external certified company.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

>>
Not applicable.

B.2.2. Corrections

>>
Not applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

>>
Not applicable.

B.2.4. Changes to project design of registered project activity

>>
The project design was changed from Version 2a of 25/11/2009 (registered PDD) to Version 3 of 03/10/2012 (revised PDD), after the project activity registration.

In the registered PDD, the indicative output power of the project activity is stated to be 4.5 MW, planned to be implemented in two phases; the first phase of 0.5 MW to occur in 2009 and the second phase of 4.0 MW, in 2010. However the project has been implemented in three phases as follows:

1. On November 2010, three engines of 1.426 MW each were installed, totalizing 4.278 MW of capacity;
2. On September 2011, an additional engine of 1.426 MW was installed, totalizing 5.704 MW of capacity; and
3. In January 2013, the forth engine will be removed and sold. Therefore the energy plant will have a installed capacity of 4.278 MW.

Other minor changes in the registered PDD were:

- The equipment indicated in the general layout of biogas plant was reorganized and includes two additional boosters as per the implemented project (Picture A.4.3-1 of registered PDD);
- The total number of drilled vertical wells was increased from 165 to 195, as per the implemented project;
- The collection efficiency of the degassing system was changed from 80% to 85% as the number of wells increased and the closed landfill permitted a more efficient suction of the landfill gas; and
- The operational lifetime of the project activity was changed from 10 years to 12 years, since it is linked to the production of CERs and since registration date has delayed two years from the first estimative in the validation.

The changes did not adversely affect the additionality, the scale of CDM project activity and/or the applicability and application of the baseline methodology.

B.2.5. Changes to start date of crediting period

>>
Not applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

>>
Not applicable.

SECTION C. Description of monitoring system

>>
According to version 11 of ACM0001 – *"Consolidated baseline and monitoring methodology for landfill gas project activities"*, direct monitoring is conducted on the LFG captured, destroyed by flare and used for power generation.

An operative manual of the project is available. This Management Manual is the applicative document of the monitoring plan (description of the project and responsibilities, operative procedures for measurements and handlings of data and details about internal audits, etc.).

1. Parameters monitored

The following parameters are monitored and logged in accordance to the Monitoring Plan:

- Landfill gas collected from project wells;
- Landfill gas flow into flares;
- Landfill gas flow into power plant;
- Methane content in the landfill gas;
- Temperature of exhaust gas from flaring;
- Methane and oxygen content in the exhaust gas from flaring;
- Electricity imported from the power grid;
- Electricity exported to the power grid;
- Power plant working hours;
- Emissions from flaring;
- Local and national regulatory framework;
- Carbon emission factor from the grid;
- TDL_y = average technical transmission and distribution losses for providing electricity to the Project in the year y; and
- $MD_{project,y}$ = amount of methane destroyed by the project activity during the year y of the project activity (tCH_4).

The equipments in the plant are connected through a Programmable Logic Control (PLC) that permits the operator to quickly check the main working parameters through a user-friendly interface. The process parameters are continuously sampled and stored in the data logger of the plant. Then information registered is automatically aggregated per hour in a standard form used for reporting purposes.

All measurements instruments are subject to regular checks and calibrations whose procedures are described in detail in the Managing Manual of the plant. All procedures comply with manufacturer's instructions or specifications of methodology applied.

The PM (Project Manager) is responsible for the general management of the plant, including controlling equipments subjected to regular checks and calibration, in order not to surpass the frequencies established

for each QA/QC procedure, and for checking the equipment's proper working order, as well as checking and storing up the calibration certificates and records.

Calibrations performed internally, by the plant's operators themselves, are registered in specific forms for each activity and calibrations performed by external companies receive calibration certificates. Both forms and certificates are stored in the plant.

Description of how parameters are properly monitored is found below.

1.1. Landfill gas collected from project wells, flowed into flares and into power plant

Instant flows collected from the project wells, sent to the flares and to the power plant are measured by flow meters installed in each line, as represented in the Figure 3 below. Flows are normalized according to landfill gas temperature and pressure automatically measured by probes connected to each flow meter, so PLC continuously monitors the Nm^3/h flowing into the plant.

These data is hourly aggregated to summarize the Nm^3 of LFG being collected from the wells, being delivered to each flare and being sent to the power plant. Emission reduction generated by the Project is calculated based on hourly aggregated data.

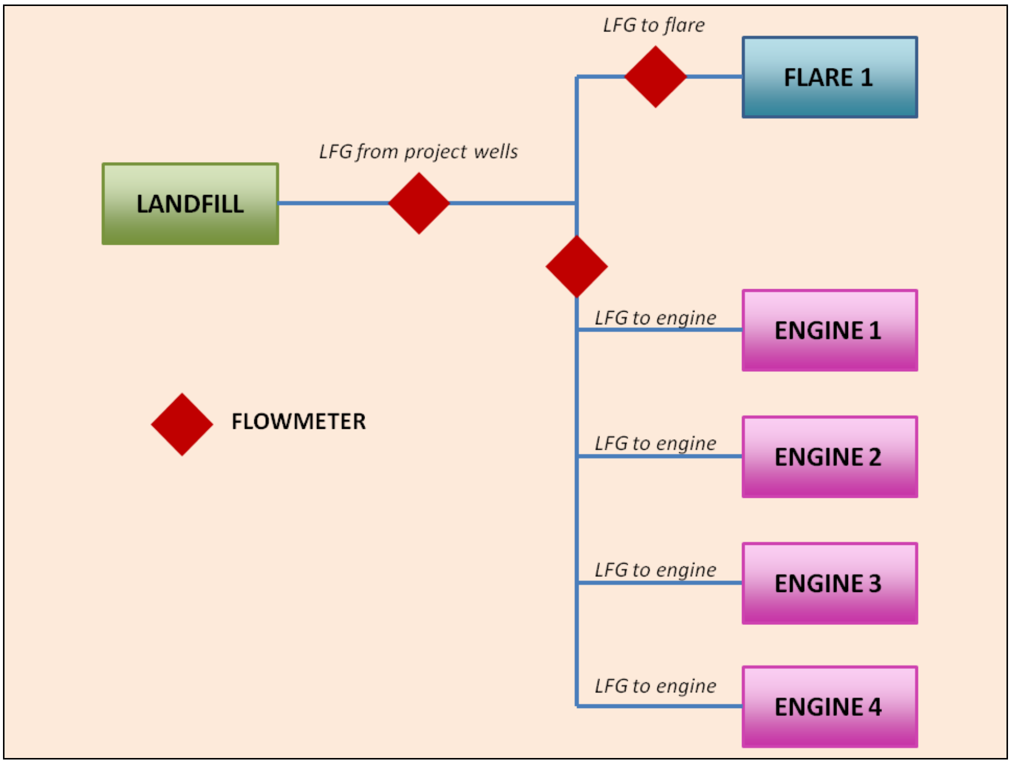

Figure 3: Flow meters' position in the landfill gas plant.

1.2. Methane content in the landfill gas

Methane content of the landfill gas is continuously measured with an infrared ray system analyzer (Siemens – Ultramat 23) and data sampled is stored in the data logger of the plant and aggregated per hour.

The gas analyzer is subject to regular maintenance according to manufacturer's instructions, and calibration records are kept available in the plant.

1.3. Temperature of exhaust gas from flaring

The temperature of the exhaust gas is continuously measured with a thermocouple installed in upper section of each flare, at 80% of flare's height. Data is registered in continuous base by the PLC and aggregated per hour.

As required by methodology, the flare efficiency is correlated with the temperature of the exhaust gas, and is only calculated if temperature of exhaust gas is higher that 500°C for more than 40 minutes during the hour considered. All calculations are made by the software (PLC) that in a conservative approach imposes a maximum flare efficiency of 99.999%, i.e. flare efficiency range is 0 to 0.99999.

1.4. Methane and oxygen content in the exhaust gas from flaring

The quantity of methane and oxygen emitted by the flares is measured by continuous analyzer (Siemens – Ultramat 23) equipped with a sampling probe for collection of exhaust gas samples installed in the upper section of each flare, at 80% of flare's height. Data is registered in continuous base by the PLC and aggregated per hour.

The gas analyzer is subject to regular maintenance according to manufacturer's instructions, and calibration records are kept available in the plant.

1.5. Electricity imported from the power grid

Electricity imported from the national grid during the monitoring period was measured by an electricity meter owned by the local electricity supplier – CEMIG (Companhia Energética de Minas Gerais). The quantity of electricity imported is determined monthly through the bills issued by the supplier company (every month) and values are recorded in a specific controlling form.

Electricity meter's management and maintenance are made by CEMIG. Project Proponents are not allowed to work on it.

When there is no electrical power the blower of the biogas plant cannot operate, therefore no landfill gas stream is available. The flow meter detects no landfill gas stream and does not count any CO_2e emission reduction. No special actions are possible to avoid this.

1.6. Electricity exported to the power grid

Electricity produced from landfill gas and exported to the national grid is continuously measured by an electricity meter whose management and maintenance are made by the buyer company – CEMIG (Companhia Energética de Minas Gerais). Project Proponents are not allowed to work on it. Amounts of electricity sold to the grid can be attested thanks to official electricity bills.

The power plant is able to supply the energy needed for the entire Project. However the power plant is dependent of availability of power grid, i.e. generating engines cannot work if no electricity is available in national grid and no emission reduction is produced in this case.

1.7. Power Plant Working Hours

Engines' working hour meters are connected to the PLC and so this parameter is continuously monitored and hourly reported.

1.8. Emissions from flaring

Project emissions from flaring of the residual gas stream in year y (tCO_2e) are determined by the procedure described in the *"Tool to determine project emissions from flaring gases containing Methane"* for each flare. Please refer to the Section E.1 of this document.

1.9. Local and National Regulatory Framework

An external contractor keeps an updated legal data bank and sends to the Project Proponents weekly news about the latest developments in relation to national, regional and municipal environmental legislation.

1.10. Carbon emission factor from the grid

Since "*ex post*" option has been chosen in the Operating Margin calculations applying the "*Tool to calculate the emission factor for an electricity system*", the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) will be used throughout all crediting periods.

For more information, please refer to Section E.1 of this document

1.11. TDL_y

Project emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and TDL – a factor to account for transmission losses.

The Average technical transmission and distribution losses for providing electricity to the Project in year *y* is monitored annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.

TDL_y should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.

Internal Audits are going to be performed in order to ensure correct monitoring of this parameter.

1.12. $MD_{project\ y}$

Amount of methane destroyed by the Project during the year y (tCH_4).

The methane destroyed by the project activity is determined by monitoring the quantity of methane actually flared and used to generate electricity and the total quantity of methane captured and calculated, as described in Section E.1 of this document.

2. *Monitoring equipments and installation*

All measuring equipments are maintained and managed on general technical standards. The Management Manual determines the quality control regime for each equipment that includes regular maintenance and calibration. In order to determine the quantity of ERs generated during the project operation the following equipments, represented in the Figure 4 below, are installed.

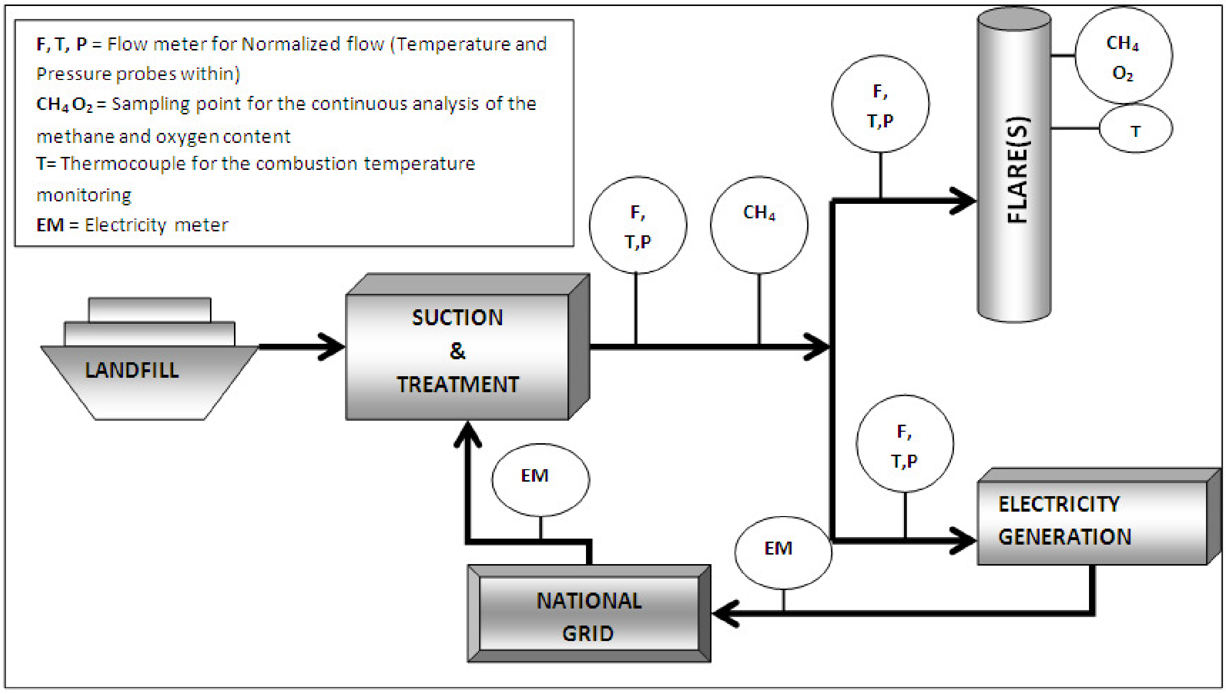

Figure 4: Monitoring points.

To assure a correct monitoring, the personnel are trained on the following subjects:

- General knowledge about the equipment used in the landfill;
- Reading and recording data;
- Calibration methodology; and
- Emergency situation.

The personnel had been trained before the plant entered in operation. Chosen trainees have a good understanding of the processes and installation of the technology for the landfill gas extraction. See Organization Figure 5 below.

A Management Manual describing all operation and calibration procedures in details is also available.

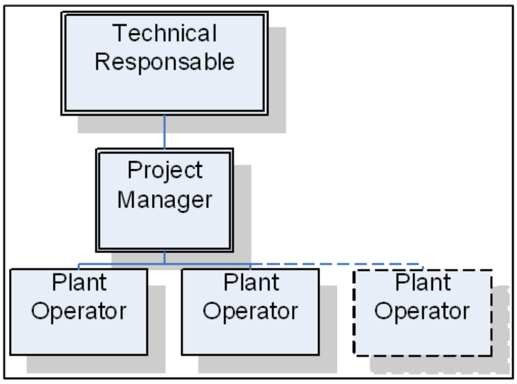

Figure 5: Organization chart.

The PLC continuously receives the value of the parameters monitored on-site and automatically generates spreadsheets that are archived. The information archived is hourly aggregated in a standard format for reporting purposes.
The quality control system ensures that all the necessary documents (such as operational manual, drawings, maintenance and calibration instructions, etc.) are available and stored in a proper manner.
Monitored data and Monitoring Sheets are daily copied to local extra HD and to Project Proponent's digital server every 6 months.
All data, including calibration records and Monitoring Reports, will be kept until 2 years after the end of the crediting period.

3. Audit review

Internal audits are performed by an auditor not involved in the daily operation of the biogas plant, in order to assess the implementation of the Monitoring Plan and to prepare the Monitoring Report.
All the audit findings, including corrective actions, are recorded and available on-site at the time of verification.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data/Parameter	**Regulatory requirements relating to landfill gas**
Unit	-
Description	Regulatory requirements relating to landfill gas
Source of data	Publicly available information of the Brazilian's regulatory requirements relating to landfill gas. The Designated National Authority (DNA) has been contacted to provide information.
Value(s) applied	Brazilian government does not mandate to flare or collect the Landfill Gas (LFG) emitted from landfills (communication *Ofício nº058/2008/CIMGC*).
Purpose of data	The information though recorded annually is not used to change the adjustment factor (AF) or directly the amount of methane that would have been destroyed/combusted during the year y in the absence of the project ($MD_{BL,y}$) at renewal of the credit period because for this Project it has been chosen a fixed Crediting Period.
Additional comment	An external contractor keeps an updated legal data bank and sends weekly news about the latest developments in relation to national, regional and municipal environmental legislation.

Data/Parameter	**η PV**
Unit	%
Description	Capture efficiency of the baseline passive venting system
Source of data	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value(s) applied	37%
Purpose of data	As per measurements made in 11 Dutch landfills, in the closed unlined period, Oonk and Boom (1995) measures efficiencies in between 10 and 80%, the average being 37%.
Additional comment	Used to calculate Adjustment Factor.

Data/Parameter	η_{LFGF}
Unit	%
Description	Landfill Gas (LFG) Flaring efficiency of the passive venting system's connected wells
Source of data	Version 01 of the *"Tool to determine project emissions from flaring gases containing methane"*;
Value(s) applied	50%
Purpose of data	It can be considered that lighted wells can burn methane less efficiently than an open flare. In the *"Tool to determine project emissions from flaring gases containing methane"* open flares are defined as devices where the residual gas is burned in an open air tip with or without any auxiliary fluid assistance, therefore it is conservative to adopt for these wells the open flare efficiency value which is equal to 50%.
Additional comment	Used to calculate Adjustment Factor.

Data/Parameter	**GWP_{CH4}**
Unit	t CO_2e / t CH_4
Description	Global Warming Potential (GWP) of methane
Source of data	ACM0001 version 11 *"Consolidated baseline and monitoring methodology for landfill gas project activities"*
Value(s) applied	21
Purpose of data	Decisions under UNFCCC and the Kyoto Protocol (a value of 21 is to be applied for the first commitment period of the Kyoto Protocol).
Additional comment	Parameter is fixed since for this Project Activity crediting period is fixed and the landfill is already closed.

Data/Parameter	**N_{fw}**
Unit	-
Description	Number of wells lighted on in the baseline
Source of data	Survey data, see Annex 3 of *CDM Project Design Document* (CDM PDD) *"Baseline information"* for the Survey Report
Value(s) applied	25
Purpose of data	It has been measured that the average number of wells lighted on in the CTRS / BR.040 landfill in the survey period was 23; in the calculation it has been assumed a value of 25 to be more conservative. Moreover the

	ignited wells were conservatively considered to remain lighted all day long, for the whole year, not taking into account seasonal rains, windy days and the frequent quenching attested from the survey in order to act in the most conservative way. No other data source was available.
Additional comment	Used to calculate Adjustment Factor.

Data/Parameter	N_{vw}
Unit	-
Description	Total number of wells present on site that could be ignited
Source of data	Survey data, see Annex 3 of *CDM Project Design Document* (CDM PDD) *"Baseline information"* for the Survey Report
Value(s) applied	123
Purpose of data	Attested from the Survey, see Report attached to CDM PDD with picture and drawings, no other data source were available.
Additional comment	Used to calculate Adjustment Factor.

Data/Parameter	D_{CH4}
Unit	tCH_4/m^3CH_4
Description	Methane Density
Source of data	-
Value(s) applied	0.0007168
Purpose of data	At standard temperature and pressure (0 degree Celsius and 1.013 bar) the density of methane is 0.0007168 tCH_4/m^3CH_4
Additional comment	--

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data/Parameter	**$LFG_{total,y}$**
Unit	Nm^3
Description	Total amount of landfill gas captured at normal Temperature and Pressure
Measured/Calculated /Default	Measured
Source of data	Flow meter
Value(s) of monitored parameter	Instant flow is measured by a flow meter, normalized according to landfill gas temperature and pressure. Automatic measurement of temperature and pressure are made by probes connected to the flow meter. The flow is measured continuously in Nm^3/h and data is aggregated hourly to summarize Nm^3 of LFG being delivered to the plant. Calculation of emission reductions is made based on data aggregated every one hour. As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below: **Month** – **$LFG_{total,y}$ (Nm^3)** 04/06/2011 – 30/06/2011: 2,476,168.99 01/07/2011 – 31/07/2011: 2,855,910.21 01/08/2011 – 31/08/2011: 2,818,465.17 01/09/2011 – 30/09/2011: 2,828,950.17 Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.
Monitoring equipment	The monitoring equipments are listed in the sheet below. For the calibration frequency, date of last calibration and validity please refer to "QA/QC procedures applied". Flowmeter Brand: Rosemount Type: Annubar 285 Accuracy: +/- 0.25% Serial Number: 78147 Differential pressure sensor Brand : ABB Type: 264 DS Accuracy: +/- 0.075% Serial Number: 6409016459 Relative pressure probe Brand: ABB Type: 264 HS Accuracy: +/- 0.075% Serial number: 6409016561 Temperature probe Brand: Ecil Type: Pt-100 Accuracy: 0.15 ºC + 0.002*T, where T is the measured temperature (ºC) Serial number: 1028.138141
Measuring/Reading/ Recording frequency	Monitoring frequency: continuous Recording frequency: every two minutes Aggregation frequency: hourly, daily, monthly
Calculation method (if applicable)	Not applicable.
QA/QC procedures	**Flowmeter** A calibration is required each 10 years, for this equipment, according to manufacturer specifications. In this monitoring period, no calibration was necessary, since the last one (12/09/2009) is still valid.

Differential pressure sensor

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
ABB 264 DS 6409016459	Annual	14/07/2010 – 13/07/2011	C-0177/10 (Lamon)
		13/07/2011 – 12/07/2012	P00266 (Lamon)

Relative pressure probe

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
ABB 264 HS 6409016561	Annual	23/03/2011 – 22/03/2012	CAL 00141 (Lamon)

Temperature probe

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
Ecil 1028.138141	Annual	31/03/2011 – 10/03/2012	2212/11 (Ecil)

Purpose of data	Baseline emission calculations.
Additional comment	-

Data/Parameter	**$LFG_{flare,y}$**
Unit	Nm^3
Description	Amount of landfill gas flared
Measured/Calculated /Default	Measured
Source of data	Flow meter
Value(s) of monitored parameter	Instant flow is measured by a flow meter normalized according to landfill gas temperature and pressure. Automatic measurement of temperature and pressure was made by probes connected to the flow meter. The flow is measured continuously in Nm^3/h and data is aggregated hourly to summarize Nm^3 of LFG being delivered to the plant. Calculation of emission reductions is made based on data aggregated every one hour. As an illustrative representation of the values of this parameter , in the monitoring period, data were aggregated monthly as shown in the table below:

Month	$LFG_{flare,y}$ (Nm^3)
04/06/2011 – 30/06/2011	293,794.84
01/07/2011 – 31/07/2011	431,129.02
01/08/2011 – 31/08/2011	281,969.80
01/09/2011 – 30/09/2011	43,439.10

<table>
<tr><td></td><td>Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipments are listed in the sheet below. For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.
<table>
<tr><td><u>Flowmeter</u>
Brand: Rosemount
Type: Annubar 285
Accuracy: ± 0.25%
Serial Number: 78149</td><td><u>Differential pressure sensor</u>
Brand : ABB
Type: 264 DS
Accuracy: ± 0.075%
Serial Number: 6409016458</td></tr>
<tr><td><u>Relative pressure probe</u>
Brand: ABB
Type: 264 HS
Accuracy: ± 0.075%
Serial number: 6409016558</td><td><u>Temperature probe</u>
Brand: Ecil
Type: Pt-100
Accuracy: 0.15 ºC + 0.002*T ºC, where T is the measured temperature (ºC)
Serial number: 1037.157644</td></tr>
</table></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td><u>Flowmeter</u>
A calibration is required each 10 years, for this equipment, according to manufacturer specifications. In this monitoring period, no calibration was necessary, since the last one (12/09/2009) is still valid.

<u>Differential pressure sensor</u>
External calibration is applied to this equipment annually.
<table>
<tr><th>Brand and Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date and validity [dd/mm/yyyy]</th><th>Calibration certificate nº (name of company)</th></tr>
<tr><td rowspan="2">ABB 264 DS 6409016458</td><td rowspan="2">Annual</td><td>14/07/2010 – 13/07/2011</td><td>C-0176/10 (Lamon)</td></tr>
<tr><td>13/07/2011 – 12/07/2012</td><td>CAL00263 (Lamon)</td></tr>
</table>
<u>Relative pressure probe</u>
External calibration is applied to this equipment annually.
<table>
<tr><th>Brand and Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date and validity [dd/mm/yyyy]</th><th>Calibration certificate nº (name of company)</th></tr>
<tr><td>ABB 264 HS 6409016558</td><td>Annual</td><td>23/03/2011 – 22/03/2012</td><td>CAL00142 (Lamon)</td></tr>
</table>
<u>Temperature probe</u>
External calibration is applied to this equipment annually.
<table>
<tr><th>Brand and Serial nº of</th><th>Calibration frequency</th><th>Calibration date and validity</th><th>Calibration certificate nº</th></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><th>equipment</th><th></th><th>[dd/mm/yyyy]</th><th>(name of company)</th></tr>
<tr><td>Ecil 1037.157644</td><td>Annual</td><td>14/12/2010 – 13/12/2011</td><td>8618/10 (Ecil)</td></tr>
</table></td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>$LFG_{electricity,y}$</td></tr>
<tr><td>Unit</td><td>Nm^3</td></tr>
<tr><td>Description</td><td>Amount of landfill gas combusted in power plant</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Flow meter</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Instant flow was measured by a flow meter, normalized according to landfill gas temperature and pressure. Automatic measurement of temperature and pressure was made by probes connected to the flow meter. The flow is measured continuously in Nm^3/h and data is aggregated hourly to summarize Nm^3 of LFG being delivered to the plant. Calculation of emission reductions is made based on data aggregated every one hour.
As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:
<table>
<tr><th>Month</th><th>$LFG_{electricity,y}$ (Nm^3)</th></tr>
<tr><td>04/06/2011 – 30/06/2011</td><td>1,948,136.42</td></tr>
<tr><td>01/07/2011 – 31/07/2011</td><td>2,257,743.20</td></tr>
<tr><td>01/08/2011 – 31/08/2011</td><td>2,408,358.17</td></tr>
<tr><td>01/09/2011 – 30/09/2011</td><td>2,671,936.73</td></tr>
</table>
Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipments are listed in the sheet below. For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.
<table>
<tr><td><u>Flowmeter</u>
Brand: Rosemount
Type: 285
Accuracy: ± 0.25%
Serial Number: 78151</td><td><u>Differential pressure sensor</u>
Brand: ABB
Type:264 DS
Accuracy: ± 0.075%
Serial Number: 6409016454</td></tr>
<tr><td><u>Relative pressure probe</u>
Brand: SMAR
Type: LD301M
Accuracy: ± 0.05%
Serial number: U305352</td><td><u>Temperature probe</u>
Brand: Ecil
Type: Pt-100
Accuracy: 0.15 ºC + 0.002*T ºC, where T is the measured temperature (ºC)
Serial number: 1037.157655</td></tr>
</table></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
<tr><td>Calculation method</td><td>Not applicable.</td></tr>
</table>

(if applicable)	
QA/QC procedures	**Flowmeter** A calibration is required each 10 years, for this equipment, according to manufacturer specifications. In this monitoring period, no calibration was necessary, since the last one (12/09/2009) is still valid.

Differential pressure sensor

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
ABB 264 DS 6409016454	Annual	14/07/2010 – 13/07/2011	C-0179/10 (Lamon)
		13/07/2011 – 12/07/2012	CAL00265 (Lamon)

Relative pressure probe

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
SMAR U305352	Annual	12/05/2011 – 11/05/2012	U305352⁽¹⁾ (SMAR)

(1) For this equipment the provider does not give a calibration certificate number. It is necessary to watch at the serial number in the certificate to identify the equipment.

Temperature probe

External calibration is applied to this equipment annually.

Brand and Serial nº of equipment	Calibration frequency	Calibration date and validity [dd/mm/yyyy]	Calibration certificate nº (name of company)
Ecil 1037.157655	Annual	14/12/2010 – 13/12/2011	8616/10 (Ecil)

Purpose of data	Baseline emission calculations.
Additional comment	-

<table>
<tr><td>Data/Parameter</td><td>$w_{CH4,y}$</td></tr>
<tr><td>Unit</td><td>m^3CH_4/ m^3LFG</td></tr>
<tr><td>Description</td><td>Methane fraction in the landfill gas</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Continuous methane analyzer</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:
<table>
<tr><th>Month</th><th>$w_{CH4,y}$ (%)</th></tr>
<tr><td>04/06/2011 – 30/06/2011</td><td>54.78</td></tr>
<tr><td>01/07/2011 – 31/07/2011</td><td>53.60</td></tr>
<tr><td>01/08/2011 – 31/08/2011</td><td>53.60</td></tr>
<tr><td>01/09/2011 – 30/09/2011</td><td>52.26</td></tr>
</table>
Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>Brand: Siemens
Type: Ultramat 23
Accuracy: +/-1% for the CH_4 and 0.5% for the O_2
Serial Number: ULT 01 - N1 X 6-991
For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>The supplier of the methane analyzer recommends calibrating the instrument every six or twelve months depending on the application. However, it has been decided to perform the calibration on a monthly basis in order to get a more conservative measure.

The methane analyzer is calibrated every month by a trained plant operator and supervised by the Project Manager (PM). The plant operator applies the calibration procedure suggested by the manufacturer which is documented within the Plant Maintenance Manual. The internal calibration is registered on the respective form:

(1) “Formulario de calibração analisador fixo de biogás” – FO CAL/002.

The plant operator and the PM have been trained in order to be qualified to carry out the calibration procedure correctly. All the training certificates are available at the plant. The process for calibration is performed by use of gas cylinders which are purchased from a certified gas supplier. The cylinders have a quality certificate that assures the quality of the calibration gases.

Calibrated gases cylinders’ certificate numbers are listed below:</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><th>Period of use</th><th>Type of gas mixture</th><th>Cylinder nº</th><th>Calibration date (validity)</th><th>Certificate nº (name of company)</th></tr>
<tr><td>18/10/2010 to current moment</td><td>60% CH_4 and 40% CO_2</td><td>EGE 8142</td><td>06/09/2010 (36 months)</td><td>2318/10 (Linde)</td></tr>
<tr><td>13/01/2011 to current moment</td><td>100% N_2</td><td>EGE 8143</td><td>09/2010 (36 months)</td><td>1125/11 (Linde)</td></tr>
</table>
During the monitoring period Ultramat 23 was calibrated in the following dates:

30/05/2011
28/06/2011
25/07/2011
22/08/2011
19/09/2011

</td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Operation of the energy plant</td></tr>
<tr><td>Unit</td><td>Hours</td></tr>
<tr><td>Description</td><td>Operation of the energy plant</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Engine’s working hour counter meters</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:
<table>
<tr><th rowspan="2">Month</th><th colspan="4">Working hours of engines [h]</th></tr>
<tr><th>Engine 1</th><th>Engine 2</th><th>Engine 3</th><th>Engine 4</th></tr>
<tr><td>04/06/2011 – 30/06/2011</td><td>575</td><td>607</td><td>621</td><td>0</td></tr>
<tr><td>21/07/2011 – 31/07/2011</td><td>636</td><td>586</td><td>684</td><td>0</td></tr>
<tr><td>01/08/2011 – 31/08/2011</td><td>727</td><td>510</td><td>695</td><td>0</td></tr>
<tr><td>21/09/2011 – 30/09/2011</td><td>697</td><td>697</td><td>559</td><td>222</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Engine’s working hour counter meters.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Not applicable.</td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>EL_{LFG}</td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Net amount of electricity generated using landfill gas</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Electricity meter</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Values based on the Project invoices delivered to the energy buyer.
<table>
<tr><th>Period related</th><th>Reference nº</th><th>Amount of electricity exported to the grid [MWh]</th></tr>
<tr><td rowspan="2">June (2)</td><td>Nº 000.000.029</td><td rowspan="2">2,477.976(2)</td></tr>
<tr><td>Nº 000.000.030</td></tr>
<tr><td rowspan="2">July</td><td>Nº 000.000.034</td><td rowspan="2">2,523.769</td></tr>
<tr><td>Nº 000.000.035</td></tr>
<tr><td rowspan="2">August</td><td>Nº 000.000.037</td><td rowspan="2">2,602.653</td></tr>
<tr><td>Nº 000.000.038</td></tr>
<tr><td>September</td><td>Nº000.000.041</td><td>2,793.885</td></tr>
</table>
(2) Calculated value of invoice sent to CEMIG subtracting the first three days of June 2011. The calculation is made from the total amount of energy sold in June divided by the total number of days in the month, and multiplying the daily average of June for 27 days.</td></tr>
<tr><td>Monitoring equipment</td><td>Data measured continuously with an electricity meter specifying the total amount of electricity exported in the time interval.
In accordance with the local energy concessionaire CEMIG specifications, the electricity meter do not need regular maintenance to ensure its accuracy.
The equipment has an accuracy of +/- 0.2S.
The initial calibration done by CAM Endesa are the following:

Main Electricity Meter
<table>
<tr><th>Brand and type</th><th>Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date [dd/mm/yyyy]</th><th>Calibration certificate nº</th></tr>
<tr><td>Schneider ION 8600C</td><td>PT-0912A354-01</td><td>None</td><td>27/01/2010</td><td>852/2010</td></tr>
</table>

Standby Electricity Meter
<table>
<tr><th>Brand and type</th><th>Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date [dd/mm/yyyy]</th><th>Calibration certificate nº</th></tr>
<tr><td>Schneider ION 8600C</td><td>PT-0912A361-01</td><td>None</td><td>26/01/2010</td><td>734/2010</td></tr>
</table></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording and aggregation frequency: monthly (CEMIG’s invoices emission frequency)</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Electricity meter belongs to CEMIG, which is responsible for its maintenance.</td></tr>
</table>

Purpose of data	Baseline emission calculations.
Additional comment	-

<table>
<tr><td>Data/Parameter</td><td>EL_{PR}</td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Total amount of electricity imported to meet the requirements of the Project</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Electricity meter</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>In accordance with the local energy concessionaire – CEMIG specifications, the electricity meter do not need regular maintenance to ensure its accuracy.
<table>
<tr><th>Period related</th><th>Reference nº</th><th>Amount of electricity imported from the grid [kWh]</th></tr>
<tr><td>June(3)</td><td>N°000802507</td><td>631(3)</td></tr>
<tr><td>July</td><td>N°001585876</td><td>277</td></tr>
<tr><td>August</td><td>N°000029978</td><td>258</td></tr>
<tr><td>September</td><td>Nº004025768</td><td>685</td></tr>
</table>
(3) Calculated value for the 27 days of June 2011 using June’s average daily value multiplied for the 27 days of project activity.</td></tr>
<tr><td>Monitoring equipment</td><td>Data measured continuously with an electricity meter specifying the total amount of electricity imported in that time interval.
In accordance with the local energy concessionaire CEMIG specifications, the electricity meter do not need regular maintenance to ensure its accuracy.
The equipment has an accuracy of +/- 0.2S.
The initial calibration done by CAM Endesa are the following:

Main Electricity Meter
<table>
<tr><th>Brand and type</th><th>Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date [dd/mm/yyyy]</th><th>Calibration certificate nº</th></tr>
<tr><td>Schneider ION 8600C</td><td>PT-0912A354-01</td><td>None</td><td>27/01/2010</td><td>852/2010</td></tr>
</table>
Standby Electricity Meter
<table>
<tr><th>Brand and type</th><th>Serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date [dd/mm/yyyy]</th><th>Calibration certificate nº</th></tr>
<tr><td>Schneider ION 8600C</td><td>PT-0912A361-01</td><td>None</td><td>26/01/2010</td><td>734/2010</td></tr>
</table></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording and aggregation frequency: monthly (CEMIG’s bill emission frequency)</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Electricity meter belongs to CEMIG, which is responsible for its maintenance.</td></tr>
</table>

Purpose of data	Project emission calculations.
Additional comment	-

Data/Parameter	$\mathbf{CEF_{elecy,BL,y}}$
Unit	tCO_2/MWh
Description	Carbon Emission Factor for electricity
Measured/Calculated /Default	Calculated
Source of data	Official data from DNA for 2011.
Value(s) of monitored parameter	0.1988 tCO_2/MWh
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annual.
Calculation method (if applicable)	Please refer to the Section E.1.
QA/QC procedures	Internal audits are performed in order to ensure correct monitoring of this parameter. The audits will be performed each year through the verification of the parameters in the site of the government of Brazil. http://www.mct.gov.br/index.php/content/view/333605.html#ancora (Web site checked in 29/10/2012)
Purpose of data	Baseline emission calculations.
Additional comment	-

Data/Parameter	$\mathbf{PE_{EC,y}}$
Unit	tCO_2
Description	Project emissions from electricity consumption by the project activity during the year y.
Measured/Calculated /Default	Calculated
Source of data	Calculated as per the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"*.
Value(s) of monitored parameter	Total $PE_{EC,y}$ in the monitoring period is 0.441 tCO_2e.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Calculated for monitoring period as it depends on the $CEF_{elecy,BL},_y$ to be applied (the most recent available).
Calculation method (if applicable)	Please refer to the Section E.2 of this document.
QA/QC procedures	Internal audits are going to be performed in order to ensure correct monitoring of this parameter.
Purpose of data	Project emission calculations.
Additional comment	-

Data/Parameter	**$TDL_{j,y}$**
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
Measured/Calculated /Default	Default
Source of data	According to the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption",* scenario A applies to the project as the source of electricity consumption and, since no recent, accurate and reliable data were available, the option to choose a default value of 20% was chosen.
Value(s) of monitored parameter	20%
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Monitored annually. Data will be archived electronically during the crediting period and two years after.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Internal audits are performed in order to ensure correct monitoring of this parameter.
Purpose of data	Project emission calculations.
Additional comment	-

Data/Parameter	**$EF_{CM,y}$**
Unit	tCO_2/MWh
Description	Combined margin emissions factor required to evaluate CO_2 emissions due to the power consumption of the project activity imported from the National Grid.
Measured/Calculated /Default	Calculated
Source of data	Official data from DNA for 2011.
Value(s) of monitored parameter	0.1988 tCO_2/MWh
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	Please refer to Section E.1 of this document.
QA/QC procedures	Internal audits are performed in order to ensure correct monitoring of this parameter.
Purpose of data	Project emission calculations.
Additional comment	-

Data/Parameter	**$fv_{i,h}$**
Unit	-
Description	Volumetric fraction of component i in the residual gas in the hour h where i = CH_4, CO, CO_2, O_2,H_2, N_2
Measured/Calculated /Default	Measured
Source of data	Continuous gas analyzer
Value(s) of monitored parameter	As a simplified approach, in this Project it is only measured the methane content of the residual gas and considered the remaining part as N_2. See parameter $w_{CH4,y}$.
Monitoring equipment	See parameter $w_{CH4,y}$.
Measuring/Reading/ Recording frequency	See parameter $w_{CH4,y}$.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	See parameter $w_{CH4,y}$.
Purpose of data	Baseline emissions calculations.
Additional comment	-

<table>
<tr><th>Data/Parameter</th><th>$t_{O2,h}$</th></tr>
<tr><td>Unit</td><td>-</td></tr>
<tr><td>Description</td><td>Volumetric fraction of O_2 in the exhaust gas of the flare in the hour h (only in case the flare efficiency is continuously monitored)</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Continuous gas extractive sampling analyzer with water and particulates removal devices.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:
<table>
<tr><th>Month</th><th>t_{O2} [%]</th></tr>
<tr><td>04/06/2011 – 30/06/2011</td><td>8.04</td></tr>
<tr><td>01/07/2011 – 31/07/2011</td><td>8.14</td></tr>
<tr><td>01/08/2011 – 31/08/2011</td><td>5.20</td></tr>
<tr><td>01/09/2011 – 3009/2011</td><td>1.57</td></tr>
</table>
Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>Brand: Siemens
Type: Ultramat 23
Accuracy: +/-1% for the CH_4 and 0.5% for the O_2
Serial Number: ULT 02 - N1X6-992
For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
</table>

<table>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>
<p>The supplier of the gas analyzer recommends calibrating the instrument every six or twelve months depending on the application. However, it has been decided to perform the calibration on a monthly basis in order to get a more conservative measure.</p>
<p>The gas analyzer is every month calibrated by a trained operator and the PM. The PM applies the calibration procedure suggested by the manufacturer which is documented within the Plant Maintenance Manual. The internal calibration is registered on the respective form:</p>
<p>(1) “Formulario de calibração analisador fixo de fumos” – FO CAL/003.</p>
<p>The plant operator and the PM have been trained in order to be qualified to carry out the calibration procedure correctly. All the training certificates are available at the plant. The process for calibration is performed by use of gas cylinders which are purchased from a certified gas supplier. The cylinders have a quality certificate that makes assures the quality of the calibration gases.</p>
<p>Calibrated gases cylinders’ certificate numbers are listed below:</p>
<table>
<tr><th>Period of use</th><th>Type of gas mixture</th><th>Cylinder nº</th><th>Calibration date [dd/mm/yyyy]</th><th>Certificate nº (name of company)</th></tr>
<tr><td>17/12/2010 to current moment</td><td>2587 vpm CH_4</td><td>EGE 8114</td><td>09/09/2010 (24 months)</td><td>2391/10 (Linde)</td></tr>
<tr><td>13/01/2011 to current moment</td><td>100% N_2</td><td>EGE 8143</td><td>09/2010 (36 months)</td><td>1125/11 (Linde)</td></tr>
</table>
<p>During the monitoring period the Ultramat 23 was calibrated in the following dates:</p>

30/05/2011
28/06/2011
25/07/2011
22/08/2011
19/09/2011

</td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data/Parameter	$\mathbf{fv_{CH4,FG,h}}$
Unit	mg/m^3
Description	Concentration of methane in the exhaust gas of the flares in dry basis at normal conditions in the hour *h*
Measured/Calculated /Default	Measured
Source of data	Continuous gas extractive sampling analyzer with water and particulates removal devices.

<table>
<tr><td>Value(s) of monitored parameter</td><td>As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:
<table>
<tr><th>Month</th><th>$fv_{CH4,FG,h}$ (mg/m^3)</th></tr>
<tr><td>04/06/2011 – 30/06/2011</td><td>0.04</td></tr>
<tr><td>01/07/2011 – 31/07/2011</td><td>0.01</td></tr>
<tr><td>01/08/2011 – 31/08/2011</td><td>0.00</td></tr>
<tr><td>01/09/2011 – 3009/2011</td><td>0.00</td></tr>
</table>
Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>Brand: Siemens
Type: Ultramat 23
Accuracy: ± 1% CH_4 and 0.5% O_2
Serial Number: ULT 02 - N1X6-992

For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Ultramat 23 reads ppm values. To convert from ppmv to mg/m^3 value is multiplied by 0.716.</td></tr>
<tr><td>QA/QC procedures</td><td>The supplier of the gas analyzer recommends calibrating the instrument every six or twelve months depending on the application. However, it has been decided to perform the calibration on a monthly basis in order to get a more conservative measure.

The gas analyzer is every month calibrated by a trained operator and the PM. The PM applies the calibration procedure suggested by the manufacturer which is documented within the Plant Maintenance Manual. The internal calibration is registered on the respective form:

(1) “Formulario de calibração analisador fixo de fumos” – FO CAL/003.

The plant operator and the PM have been trained in order to be qualified to carry out the calibration procedure correctly. All the training certificates are available at the plant. The process for calibration is performed by use of gas cylinders which are purchased from a certified gas supplier. The cylinders have a quality certificate that makes assures the quality of the calibration gases.

Calibrated gases cylinders’ certificate numbers are listed below:
<table>
<tr><th>Period of use</th><th>Type of gas mixture</th><th>Cylinder nº</th><th>Calibration date [dd/mm/yyyy]</th><th>Certificate nº (name of company)</th></tr>
<tr><td>17/12/2010 to current moment</td><td>2587 vpm CH_4</td><td>EGE 8114</td><td>09/09/2010 (24 months)</td><td>2391/10 (Linde)</td></tr>
<tr><td>13/01/2011</td><td>100% N_2</td><td>EGE</td><td>09/2010</td><td>1125/11</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td>to current moment</td><td></td><td>8143</td><td>(36 months)</td><td>(Linde)</td></tr></table>During the monitoring period the Ultramat 23 was calibrated in the following dates:
30/05/2011
28/06/2011
25/07/2011
22/08/2011
19/09/2011</td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>T_{flare}</td></tr>
<tr><td>Unit</td><td>ºC</td></tr>
<tr><td>Description</td><td>Temperature in the exhaust gas of the enclosed flares</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Thermocouple type S</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below:<table><tr><th>Month</th><th>T_{flare} (ºC)</th></tr><tr><td>04/06/2011 – 30/06/2011</td><td>369.79</td></tr><tr><td>01/07/2011 – 31/07/2011</td><td>346.43</td></tr><tr><td>01/08/2011 – 31/08/2011</td><td>290.59</td></tr><tr><td>01/09/2011 – 3009/2011</td><td>80.36</td></tr></table>Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which are used to calculate the emission reductions of project.</td></tr>
<tr><td>Monitoring equipment</td><td>Brand: Ecil
Type: Thermocouple that withstands temperatures up to 1,600°C
Accuracy: +/-1.5ºC or 0.25% of the temperature (the one which is greater)
Serial number: 0950.064353

For the calibration frequency, date of last calibration and validity please refer to “QA/QC procedures applied”.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Monitoring frequency: continuous
Recording frequency: every two minutes
Aggregation frequency: hourly, daily, monthly</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>External calibration is applied to this equipment annually.<table><tr><th>Brand and serial nº of equipment</th><th>Calibration frequency</th><th>Calibration date and validity [dd/mm/yyyy]</th><th>Calibration certificate nº (name of company)</th></tr><tr><td>Ecil
0950.064353</td><td>Annual</td><td>24/05/2011 – 23/05/2012</td><td>3504/11 (Ecil)</td></tr></table></td></tr>
<tr><td>Purpose of data</td><td>Baseline emission calculations.</td></tr>
</table>

Additional comment	-

Data/Parameter	$\mathbf{PE_{flare,y}}$
Unit	tCO_{2e}
Description	Project emissions from flaring of the residual gas stream in year y
Measured/Calculated /Default	Calculated
Source of data	Calculated as per the *“Tool to determine project emissions from flaring gases containing methane”*.
Value(s) of monitored parameter	As an illustrative representation of the values of this parameter, in the monitoring period, data were aggregated monthly as shown in the table below: **Month** – $\mathbf{PE_{flare,y}}$ **(tCO_2e)** 04/06/2011 – 30/06/2011 – 23 01/07/2011 – 31/07/2011 – 49 01/08/2011 – 31/08/2011 – 31 01/09/2011 – 3009/2011 – 22 Please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour, which is used to calculate the emission reductions of project.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Calculated for each hour using hourly aggregated data. Aggregated also daily and monthly for reporting purposes.
Calculation method (if applicable)	Please refer to the Section E.1 of this document.
QA/QC procedures	Internal audits are going to be performed in order to ensure correct monitoring of this parameter.
Purpose of data	Baseline emission calculations.
Additional comment	-

Month	$\mathbf{PE_{flare,y}}$ **(tCO_2e)**
04/06/2011 – 30/06/2011	23
01/07/2011 – 31/07/2011	49
01/08/2011 – 31/08/2011	31
01/09/2011 – 3009/2011	22

Data/Parameter	$\mathbf{fv_{CH4,RG,h}}$
Unit	$m^3CH_4/\ m^3LFG$
Description	Methane fraction in the landfill gas
Measured/Calculated /Default	Measured
Source of data	Gas analyzer
Value(s) of monitored parameter	See parameter $w_{CH4,y}$.
Monitoring equipment	See parameter $w_{CH4,y}$.
Measuring/Reading/ Recording frequency	See parameter $w_{CH4,y}$.
Calculation method (if applicable)	See parameter $w_{CH4,y}$.
QA/QC procedures	See parameter $w_{CH4,y}$.
Purpose of data	Baseline emission calculations.
Additional comment	-

Data/Parameter	**$FV_{RG,h}$**
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h
Measured/Calculated /Default	See parameter LFG_{Flare}.
Source of data	See parameter LFG_{Flare}.
Value(s) of monitored parameter	See parameter LFG_{Flare}.
Monitoring equipment	See parameter LFG_{Flare}.
Measuring/Reading/ Recording frequency	See parameter LFG_{Flare}.
Calculation method (if applicable)	See parameter LFG_{Flare}.
QA/QC procedures	See parameter LFG_{Flare}.
Purpose of data	Baseline emission calculations.
Additional comment	-

D.3. Implementation of sampling plan

>>
Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>
According to ACM0001 version 11 baseline emissions were calculated with the following formula:

$$BE_y=(MD_{project,y} - MD_{BL,y}) \times GWP_{CH4} + EL_{LFG,y} \times CEF_{elec,BL,y} + ET_{LFG,y} \times CEF_{ther,BL,y} \qquad \textbf{(1)}$$

Where:

BE_y = Baseline emissions in year y (tCO_2e)
$MD_{project,y}$ = The amount of methane that would have been destroyed/combusted during the year, in tones of methane (tCH_4) in project scenario
$MD_{BL,y}$ = The amount of methane that would have been destroyed/combusted during the year in the absence of the project due to regulatory and/or contractual requirement, in tones of methane (tCH_4)
GWP_{CH4} = Global Warming Potential value for methane for the first commitment period is 21 tCO_2e/tCH_4
$EL_{LFG,y}$ = Net quantity of electricity produced using LFG, which in the absence of the project activity would have been produced by power plants connected to the grid or by an onsite/off-site fossil fuel based captive power generation, during year y, in megawatt hours (MWh)
$CEF_{elecy,BL,y}$ = CO_2 emissions intensity of the baseline source of electricity displaced, in tCO_2e/MWh

$ET_{LFG,y}$ = The quantity of thermal energy produced utilizing the landfill gas, which in the absence of the project activity would have been produced from onsite/offsite fossil fuel fired boiler, during the year y in TJ, for this Project is equal to 0 since no thermal energy will be produced

$CEF_{ther,BL,y}$ = CO_2 emissions intensity of the fuel used by boiler to generate thermal energy which is displaced by LFG based thermal energy generation, in tCO_2e/TJ; for this Project is equal to 0 since no thermal energy will be produced

For this Project, since regulatory or contractual requirements do not specify $MD_{BL,y}$ and no historic data exists for LFG captured and destroyed, an "Adjustment Factor" (AF) was used and justified, taking into account the project context

$$MD_{BL,\ y} = MD_{project,\ y} \times AF \tag{2}$$

Calculation of AF

Baseline scenario consisted in a passive LFG venting system with partial LFG destruction by flaring since some of the wells were on occasion manually lighted on.

Therefore a specific system for collection and destruction of methane existed and according to ACM0001 requirements, the ratio of the destruction efficiency of the baseline system to the destruction efficiency of the system used in the project has been used and the following procedure followed.

The procedure to calculate the "Adjustment Factor" AF involves the following three steps:

Step 1: The calculation of the destruction efficiency of the system (ε_{BL});
Step 2: The calculation of the destruction efficiency of the system used in the project activity (ε_{PR});
Step 3: The calculation of the adjustment factor ($AF=\varepsilon_{BL} / \varepsilon_{PR}$).

Step 1: Calculating the destruction efficiency of the system (ε_{BL})

$$\varepsilon_{BL} = \frac{MD_{Hist}}{MG_{Hist}}; \tag{3}$$

Where:

ε_{BL} = Destruction efficiency of the baseline system (fraction)

MD_{Hist} = Amount of methane destroyed historically measured for the previous year before the start of project activity (tCH_4)

MG_{Hist} = Amount of methane generated historically for the previous year before the start of project activity, estimated using the actual amount of waste disposed in the landfill as per Version 05 of the *Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site* (tCH_4)

Since no measured data are available for the estimation of MD_{Hist}, the following approach was applied to determine this parameter as, per option b) of the cited methodology.

As there were no historical records of the amount of LFG collected and destroyed in the landfill's wells, a procedure for estimating the amount of landfill gas that would be captured in absence of the project activity was provided:

1. MD_{Hist} was a fraction of MG_{Hist} by the formula:

$$MD_{Hist} = \eta_{BL} \times MG_{Hist} \tag{3.1}$$

Where MG_{Hist} is the amount of methane generated historically for the previous year before the start of project activity; and:

2. The abovementioned η_{BL} is the overall destruction efficiency in the baseline and has been calculated with the following formula:

$$\eta_{BL} = \eta_{PV} \times \eta_{LFGF} \times \frac{N_{fw}}{N_{vwl}} \tag{3.2}$$

Where:

η_{PV} = Collection efficiency of passive venting systems in closed landfills. CTRS / BR.040 landfill has a passive venting system, which was way less efficient than the active systems because of the pressure: in the passive system landfill gas is emitted to the atmosphere due to variation of the barometric pressure. As per measurements made in 11 Dutch landfills, an average collection efficiency value of passive system is equal to 37%[1]

η_{LFGF} = Efficiency of methane destruction in open flares. It can be considered that lighted wells can burn methane less efficiently than an open flare, in the "*Tool to determine project emissions from flaring gases containing methane*" open flares are defined as devices where the residual gas is burned in an open air tip with or without any auxiliary fluid assistance, therefore it is conservative to adopt for these wells the open flare efficiency value which is equal to 50%

$N_{fw=}$ = Number of vertical wells actually burning the landfill gas collected in the passive system as from survey *"Baseline information"*, the average was 23, in this calculation we considered 25 wells lighted to be conservative. Moreover the ignited wells were conservatively considered to remain lighted all day long, for the whole year, not taking into account seasonal rains, windy days and the frequent quenching attested from the survey

N_{vw} = Number of wells that could be ignited. As shown in *"Baseline information"* survey the total number of wells that could be lighted on was 123

The calculation is therefore as follows:

$$\eta_{BL} = 37\% \times 50\% \times \frac{25}{123} = 3.8\%$$

As per formula (3.1)

$$MD_{Hist} = 3.8 \times MG_{Hist}$$

Therefore, according to the formula (3) the final baseline efficiency (ε_{BL}) value is:

---

[1] http://www.mnp.nl/ipcc/Archive/AR4FOD/ExpRevFOD/FODrev/FOD_AChapter10.doc

$$\varepsilon_{BL} = \frac{MD_{Hist}}{MG_{Hist}} = 3.8 \times \frac{MG_{Hist}}{MG_{Hist}} = 3.8\%$$

Step 2: Calculation of the destruction efficiency of the system used in the project activity (*ε_{PR}*)

According to the ACM0001, it has been selected the following:

Option-2:
The destruction efficiency of the system used in the project activity was estimated every year as follows:

$$\varepsilon_{PR,y} = \frac{MD_{project,y}}{MG_{PR,y}} \qquad \textbf{(4)}$$

Where:
$\varepsilon_{PR,y}$ = Destruction efficiency of the system used in the project activity for year y (fraction)
$MD_{project,y}$ = Amount of methane destroyed by the project activity during the year y of the project activity (tCH_4)
$MG_{PR,y}$ = Amount of methane generated during year y of the project activity

$MD_{project,y}$ was determined *ex post* by metering the actual quantity of methane captured and destroyed once the project activity was operational. The methane destroyed by the project activity ($MD_{project,y}$) during a year was determined by monitoring the quantity of methane actually flared/ destroyed on the energy generation sets and the total quantity of methane captured.

The measured quantities fed to the flare and/or to the generation set were compared annually with the total quantity of methane collected from the Project wells. The lowest value of the two was adopted as $MD_{project,y}$.

$MG_{PR,y}$ was considered as the highest value, comparing measured quantities of methane going to the flares and/or to the generation sets with the total quantity of methane collected from the Project wells. Thus, the calculation of the destruction efficiency was more conservative.

Based on the information of MG_{PR} and $MD_{project,y}$ described above, the destruction efficiency of the system was calculated in the Hourly Report data sheets, attached as a document, into the formula of calculation of the adjustment factor.

Step 3: Calculation of the adjustment factor (AF)

Since Option 2 has been used in Step 2 and the destruction efficiency of the system used in the Project (ε_{PR}) was estimated every year, then the *'Adjustment Factor'* (AF) also was calculated every year with the following formula:

$$AF_y = \frac{\varepsilon_{BL}}{\varepsilon_{PRy}} \qquad \textbf{(5)}$$

Where:

AF_y = Adjustment factor for year *y*, this factor was then used in equation **(2)** in place of AF

No emissions reductions were claimed for methane destruction during non operational hours and $MD_{project}$ was calculated as:

- In case the measured quantities of methane fed to the flare and/or to the generation set is higher than the total quantity of methane captured from the project wells

$$MD_{project,y} = LFG_{total,y} \times W_{CH4,y} \times D_{CH4} \qquad \textbf{(6.1)}$$

$LFG_{total,y}$ = Total quantity of landfill gas captured from the Project wells during the year measured in cubic meters (m^3)

$W_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m^3 CH_4 / m^3 LFG)

D_{CH4} = Methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3CH_4)

- In case the measured quantities of methane fed to the flares and/or to the generation set is lower than the total quantity of methane captured from the project wells.

$$MD_{project,\ y} = MD_{flare,\ y} + MD_{electricit\ y,y} + MD_{thermal,\ y} + MD_{PL,\ y} \qquad \textbf{(6.2)}$$

Where:

$MD_{flared,y}$ = Quantity of methane destroyed by flaring (tCH_4)

$MD_{electricity,y}$ = Quantity of methane destroyed by generation of electricity (tCH_4).

$MD_{thermal,y}$ = Quantity of methane destroyed for the generation of thermal energy (tCH_4), for the proposed Project this is equal to 0

$MD_{PL,y}$ = Quantity of methane sent to the pipeline for feeding to the natural gas distribution network (tCH_4), for the proposed Project this is equal to 0

And

$$MDflared,y = LFG_{flared,\ y} \times W_{CH4,\ y} \times D_{CH4} - \left(\frac{PE_{flare,\ y}}{GWP_{CH4}}\right) \qquad \textbf{(7)}$$

Where:

$LFG_{flare,y}$ = Quantity of landfill gas fed to the flare(s) during the year measured in cubic meters (m^3)

$W_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m^3 CH_4 / m^3 LFG)

D_{CH4} = Methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3CH_4)

$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y (tCO_2e)

Application of "Tool to determine project emissions from flaring gases containing methane"

For the Project enclosed flares are installed and continuous monitoring of the flare efficiency is made.

This tool involves the following seven steps:

STEP 1: Determination of the mass flow rate of the residual gas that is flared
STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas
STEP 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis
STEP 4: Determination of methane mass flow rate of the exhaust gas on a dry basis
STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis
STEP 6: Determination of the hourly flare efficiency
STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies

STEP 1
This step calculates the residual gas mass flow rate in each hour *h*, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

$$FM_{RG,h} = \rho_{RG,n,h} \bullet FV_{RD,h} \qquad \textbf{(7.1)}$$

Where:

Variable	SI Unit	Description
$FM_{RG,h}$	kg/h	Mass flow rate of the residual gas in hour *h*
$\rho_{RG,n,h}$	kg/m^3	Density of the residual gas at normal conditions in hour *h*
$FV_{RG,h}$	m^3/h	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*

Where:

$$\rho_{RG,n,h} = \frac{P_n}{\dfrac{R_u}{MM_{RG,h}} \bullet T_n} \qquad \textbf{(7.2)}$$

Where:

Variable	SI Unit	Description
$\rho_{RG,n,h}$	kg/m^3	Density of the residual gas at normal conditions in hour *h*
P_n	Pa	Atmospheric pressure at normal conditions (101,325)
R_u	$Pa.m^3/kmol.K$	Universal ideal gas constant (8,314)
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour *h*
T_n	K	Temperature at normal conditions (273.15)

and:

$$MM_{RG,h} = \sum_i (f_{vi,h} \bullet MM_i) \qquad \textbf{(7.3)}$$

Where:

Variable	SI Unit	Description
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour *h*
$fv_{i,h}$	-	Volumetric fraction of component *i* in the residual gas in the hour *h*
MM_i	kg/kmol	Molecular mass of residual gas component *i*

i		The components CH_4, CO, CO_2, O_2, H_2, N_2

For this Project it has been chosen, as a simplified approach, to measure only the volumetric fraction of methane and consider the difference to 100% as being nitrogen (N_2).

STEP 2
Determine the mass fractions of carbon, hydrogen, oxygen and nitrogen in the residual gas, calculated from the volumetric fraction of each component *i* in the residual gas, as follows:

$$fm_{j,h} = \frac{\sum_i fv_{i,h} \bullet AM_j \bullet NA_{j,i}}{MM_{RG,h}} \qquad \textbf{(7.4)}$$

Where:

Variable	SI Unit	Description
$fm_{j,h}$	-	Mass fraction of element *j* in the residual gas in hour *h*
$fv_{i,h}$	-	Volumetric fraction of component *i* in the residual gas in the hour *h*
AM_j	kg/kmol	Atomic mass of element *j*
$NA_{j,i}$	-	Number of atoms of element *j* in component *i*
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour *h*
j		The elements carbon, hydrogen, oxygen and nitrogen
i		The components CH_4, CO, CO_2, O_2, H_2, N_2

STEP 3
This step was applied in the Project since the methane combustion efficiency of the flare(s) has been continuously monitored.

Determine the average volumetric flow rate of the exhaust gas in each hour *h* based on a stoichiometric calculation of the combustion process, which depends on the chemical composition of the residual gas, the amount of air supplied to combust it and the composition of the exhaust gas, as follows:

$$TV_{n,FG,h} = V_{n,FG,h} \bullet FM_{RG,h} \qquad \textbf{(7.5)}$$

Where:

Variable	SI Unit	Description
$TV_{n,FG,h}$	m^3/h	Volumetric flow rate of the exhaust gas in dry basis at normal conditions in hour *h*
$V_{n,FG,h}$	m^3/kg residual gas	Volume of the exhaust gas of the flare in dry basis at normal conditions per kg of residual gas in hour *h*
$FM_{RG,h}$	kg residual gas/h	Mass flow rate of the residual gas in the hour *h*

$$V_{n,FG,h} = V_{n,CO2,h} + V_{n,O2,h} + V_{n,N2,h} \qquad \textbf{(7.6)}$$

Where:

Variable	SI Unit	Description
$V_{n,FG,h}$	m^3/kg residual gas	Volume of the exhaust gas of the flare in dry basis at normal conditions per kg of residual gas in the hour *h*
$V_{n,CO2,h}$	m^3/kg	Quantity of CO_2 volume free in the exhaust gas of the flare at

	residual gas	normal conditions per kg of residual gas in the hour *h*
$V_{n,N2,h}$	m^3/kg residual gas	Quantity of N_2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour *h*
$V_{n,O2,h}$	m^3/kg residual gas	Quantity of O_2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour *h*

$$V_{n,O2,h} = n_{O2,h} \bullet MV_n \qquad \textbf{(7.7)}$$

Where:

Variable	SI Unit	Description
$V_{n,O2,h}$	m^3/kg residual gas	Quantity of O_2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour *h*
$n_{O2,h}$	kmol/kg residual gas	Quantity of moles O_2 in the exhaust gas of the flare per kg residual gas flared in hour *h h*
MV_n	m^3/kmol	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 L/mol)

$$V_{n,N2,h} = MV_n \bullet \left\{ \frac{fm_{N,h}}{200AM_N} + \left(\frac{1-MF_{O2}}{MF_{O2}} \right) \bullet \left[F_h + n_{O2,h} \right] \right\} \qquad \textbf{(7.8)}$$

Where:

Variable	SI Unit	Description
$V_{n,N2,h}$	m^3/kg residual gas	Quantity of N_2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour *h*
MV_n	m^3/kmol	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 m^3/Kmol)
$fm_{N,h}$	-	Mass fraction of nitrogen in the residual gas in the hour *h*
AM_n	kg/kmol	Atomic mass of nitrogen
MF_{O2}	-	O_2 volumetric fraction of air
F_h	kmol/kg residual gas	Stoichiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in hour *h*
$n_{O2,h}$	kmol/kg residual gas	Quantity of moles O_2 in the exhaust gas of the flare per kg residual gas flared in hour *h*

$$V_{n,CO2,h} = \frac{fm_{C,h}}{AM_C} \bullet MV_n \qquad \textbf{(7.9)}$$

Where:

Variable	SI Unit	Description
$V_{n,CO2,h}$	m^3/kg residual gas	Quantity of CO_2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour *h*
$fm_{C,h}$	-	Mass fraction of carbon in the residual gas in the hour *h*
AM_C	kg/kmol	Atomic mass of carbon
MV_n	m^3/kmol	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 m^3/Kmol)

$$n_{O2,h} = \frac{t_{O2,h}}{[1-(t_{O2,h}/MF_{O2})]} \bullet \left[\frac{fm_{C,h}}{AM_C} + \frac{fm_{N,h}}{2AM_N} + \left(\frac{1-MF_{O2}}{MF_{O2}} \right) \bullet F_h \right] \qquad \textbf{(7.10)}$$

Where:

Variable	SI Unit	Description
$n_{O2,h}$	kmol/kg residual gas	Quantity of moles O_2 in the exhaust gas of the flare per kg residual gas flared in hour *h*
$t_{O2,h}$	-	Volumetric fraction of O2 in the exhaust gas in the hour *h*
MF_{O2}	-	Volumetric fraction of O_2 in the air (0.21)
F_h	kmol/kg residual gas	Stoichiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in hour *h*
$fm_{j,h}$	-	Mass fraction of element *j* in the residual gas in hour *h* (from equation 7.4)
AM_j	kg/kmol	Atomic mass of element *j*
j		The elements carbon (index C) and nitrogen (index N)

$$F_h = \frac{fm_{C,h}}{AM_C} + \frac{fm_{H,h}}{4AM_H} - \frac{fm_{O,h}}{2AM_O} \qquad \textbf{(7.11)}$$

Where:

Variable	SI Unit	Description
F_h	kmol O_2/kg residual gas	Stoichiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in hour *h*
$fm_{j,h}$	-	Mass fraction of element *j* in the residual gas in hour *h* (from equation 7.4)
AM_j	kg/kmol	Atomic mass of element *j*
j		The elements carbon (index C), hydrogen (index H) and oxygen (index O)

STEP 4

This step was applied in the Project since the methane combustion efficiency of the flare(s) has been continuously monitored.

The mass flow of methane in the exhaust gas is based on the volumetric flow of the exhaust gas and the measured concentration of methane in the exhaust gas, as follows:

$$TM_{FG,h} = \frac{TV_{n,FG,h} \bullet fv_{CH4,FG,h}}{1000000} \qquad \textbf{(7.12)}$$

Where:

Variable	SI Unit	Description
$TM_{FG,h}$	kg/h	Mass flow rate of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour *h*
$TV_{n,FG,h}$	m^3/h exhaust gas	Volumetric flow rate of the exhaust gas in dry basis at normal conditions in hour *h*
$fv_{CH4,FG,h}$	mg/m^3	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in hour *h*

STEP 5

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

The residual gas moisture is not significant in the Project because several treatment units were foreseen in order to reduce significantly the landfill gas moisture content; therefore the measured flow rate of the

residual gas do not need to be corrected to dry basis to be comparable with the measurement of methane that is undertaken on a dry basis.

$$TM_{RG,h} = FV_{RG,h} \bullet fv_{CH4,RG,h} \bullet \rho_{CH4,n} \tag{7.13}$$

Where:

Variable	SI Unit	Description
$TM_{RG,h}$	kg/h	Mass flow rate of methane in the residual gas in the hour *h*
$FV_{RG,h}$	m^3/h	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h*
$fv_{CH4,RG,h}$	-	Volumetric fraction of methane in the residual gas on dry basis in hour *h* (NB: this corresponds to $fv_{i,RG,h}$ where *i* refers to methane).
$\rho_{CH4,n}$	kg/m^3	Density of methane at normal conditions (0.716)

STEP 6
Since this Project installed enclosed flares and does a continuous monitoring, the flare efficiency in the hour *h* ($\eta_{flare,h}$) is:

- 0% if the temperature of the exhaust gas of the flare (T_{flare}) is below 500°C during more than 20 minutes during the hour *h*.
- determined as follows in cases where the temperature of the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* :

$$\eta_{flare,h} = 1 - \frac{TM_{FG,h}}{TM_{RG,h}} \tag{7.14}$$

Where:

Variable	SI Unit	Description
$\eta_{flare,h}$	-	Flare efficiency in the hour *h*
$TM_{FG,h}$	kg/h	Methane mass flow rate in exhaust gas averaged in a period of time t (hour, two months or year)
$TM_{RG,h}$	kg/h	Mass flow rate of methane in the residual gas in the hour *h*

STEP 7
Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\eta_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \bullet (1-\eta_{flare,h}) \bullet \frac{GWP_{CH4}}{1000} \tag{7.15}$$

Where:

$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream (tCO_2e/y)
$TM_{RG,h}$ = Mass flow rate of methane in the residual gas in the hour *h* (kg/h)
$\eta_{flare,h}$ = Flare efficiency in hour *h*
GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$$MD_{electricity,y} = LFG_{electricity} \bullet W_{CH4,y} \bullet D_{CH4} \tag{8}$$

Where:

$MD_{electricity,y}$ = Quantity of methane destroyed by generation of electricity, for this monitoring period is equal to 0

$LFG_{electricity,y}$ = Quantity of landfill gas fed into electricity generator, for this monitoring period is equal to 0

Determination of $CEF_{elec,BL,y}$ *in equation (1) and (13) - Application of "Tool to calculate the emission factor for an electricity system"*

Since the baseline was electricity generated by plants connected to the grid the emission factor have been calculated according to "*Tool to calculate the emission factor for an electricity system*" version 2.

The emission factor is calculated as the *Combined Margin (CM)*, comprised by two components: the *Built Margin (BM)* and the *Operation Margin (OM)*. The OM is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The BM is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the CDM project activity.

The CM calculation must be based in data from an official source, preferable the dispatch authority. The capacity additions and the values generated from the power plants registered as CDM project activities must be excluded from the calculation.

This tool involves the following six steps:

STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3. Select a method to determine the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emissions factor.

STEP 1. Identify the relevant electricity systems
For determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

According to the tool, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. The Brazilian DNA, Comissão Interministerial de Mudança Global do Clima – CIMGC, defined through its Resolução n° 8[2] the use a single interconnected electric system for CDM project activities applying the tool.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
This step is applied by the Brazilian DNA, CIMGC. As Option I is chosen, the CIMGC includes only the grid power plants in the calculation.

STEP 3. Select a method to determine the operating margin (OM)
This step is applied by the Brazilian DNA, CIMGC. The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

---

[2] CIMGC – Comissão Interministerial de Mudança Global do Clima; "Resolução n° 8, de 26 de maio de 2009, que adota, para fins de atividade de projeto de MDL, um único sistema como definição de sistema elétrico do projeto no Sistema Interligado Nacional", available at <http://www.mct.gov.br/> , acessed on 02/09/2011.

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The CIMGC calculates the OM based on method c) Dispatched data analysis OM.

For the dispatch data analysis OM, it is necessary to use the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring.

STEP 4. Calculate the operating margin emission factor according to the selected method
This step is applied by the Brazilian DNA, CIMGC.

The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the grid power units that are actually dispatched at the margin during each hour *h* where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$.

The emission factor is calculated as follows:

$$EF_{grid,OM-DD,h} = \frac{\sum_h EG_{PJ,h} \times EF_{EL,DD,h}}{EG_{PJ,y}} \qquad \textbf{(9)}$$

Where:

$EF_{grid,OM\text{-}DD,h}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of year *y* (MWh)
$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)
$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh)
h = Hours in year *y* in which the project activity is displacing grid electricity
y = Year in which the project activity is displacing grid electricity

STEP 5. Calculate the build margin (BM) emission factor
The BM emission factor is calculated by the Brazilian DNA, CIMGC.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The **Option 2** has been chosen for this Project.

STEP 6. Calculate the combined margin (CM) emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option and has been chosen for this Project.

The combined margin emissions factor will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(10)}$$

Where:

$EF_{grid,\,CM,\,y}$ = Emission factor for the Brazilian electric grid in year *y* (tCO_2/MWh)
$EF_{grid,\,OM,\,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,\,BM,\,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

According with the tool, values adopted for w_{OM} and w_{BM} were equal to 0.5 for each one.

The data used to calculate the grid emission factor was taken from publicly available information available in the Brazilian DNA's website[3]. The most recent complete data refers to 2011, which was applied for the whole monitoring period, as demonstrated in the Table 2 below.

Table 2: Combined emission factor calculations for 2011

$EF_{CM} = (EF_{OM} \times W_{OM}) + (EF_{BM} \times W_{BM})$					
EMISSION FACTOR (tCO_2/MWh)					
MONTH	EF_{OM}	EF_{BM}	W_{OM}	W_{BM}	EF_{CM}
Jan	0.2621	0.1056	0.50	0.50	0.1839
Feb	0.2876	0.1056	0.50	0.50	0.1966
Mar	0.2076	0.1056	0.50	0.50	0.1566
Apr	0.1977	0.1056	0.50	0.50	0.1517
May	0.2698	0.1056	0.50	0.50	0.1877
Jun	0.3410	0.1056	0.50	0.50	0.2233
Jul	0.3076	0.1056	0.50	0.50	0.2066
Aug	0.3009	0.1056	0.50	0.50	0.2033
Sep	0.2734	0.1056	0.50	0.50	0.1895
Oct	0.3498	0.1056	0.50	0.50	0.2277
Nov	0.3565	0.1056	0.50	0.50	0.2311

---

[3] http://www.mct.gov.br/index.php/content/view/333605.html#ancora

Dec	0.3495	0.1056	0.50	0.50	0.2276
FINAL	0.2920	0.1056	0.50	0.50	**0.1988**

* Using the last EF_{BM} available (2011)

For other calculations applying actual values, please refer to the Hourly Report data sheet, attached as a document, to see the values aggregated every one hour.

The values for the monitoring period, as an illustrative representation, are presented in the tables below, aggregated monthly.

Table 3: Project emissions from flaring gases containing methane.

Month	$PE_{flare,y}$ (tCO_2e)
04/06/2011 – 30/06/2011	23
01/07/2011 – 31/07/2011	49
01/08/2011 – 31/08/2011	31
01/09/2011 – 30/09/2011	22

Table 4: Adjustment Factor.

Month	AF (%)
04/06/2011 – 30/06/2011	0.07
01/07/2011 – 31/07/2011	0.04
01/08/2011 – 31/08/2011	0.05
01/09/2011 – 30/09/2011	0.05

Since,

$CEF_{elec,BL,y} = EF_{EL,j,y} = CM_{2011} = (OM_{2011} \text{ x } 0.5) + (BM_{2011} \text{ x } 0.5) = \mathbf{0.1988\ tCO_2/MWh}$ **(11)**

Table 5: Methane destroyed by the project, Methane that would have been destroyed in the absence of the project due to regulatory and/or contractual requirement and Baseline emissions.

Period	$MD_{project,y}$	$MD_{BL,y}$	GWP_{CH4}	$EL_{LFG,y}$	$CEF_{elec,BL,y}$	BE_y
	(tCO_2e)	(tCO_2e)	-	MWh	(tCO_2/MWh)	(tCO_2e)
04/06/2011 – 30/06/2011	845	37	21	2,477.976	0.1988	18,148
01/07/2011 – 31/07/2011	1029	42	21	2,523.769	0.1988	21,239
01/08/2011 – 31/08/2011	1030	41	21	2,602.653	0.1988	22,279
01/09/2011 – 30/09/2011	1016	40	21	2,793.885	0.1988	21,044

E.2. Calculation of project emissions or actual net GHG removals by sinks

\>>

As per the ACM0001 version 11 Project Emissions was evaluated with the following formula:

$PE_y = PE_{EC,y} + PE_{FC,y}$ **(12)**

Where:

$PE_{EC,y}$	=	Emissions from consumption of electricity in the Project. The project emissions from electricity consumption ($PE_{EC,y}$) have been calculated following the version 01 of “*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*”.

$PE_{FC,y}$ = Emissions from consumption of heat in the Project. For this Project is equal to 0 since no heat will be consumed.

Determination of $PE_{EC,y}$ *in equation (12) - Application of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"*

The tool is applicable because the "Scenario A: Electricity consumption from the grid." applies to the sources of electricity for this Project and no baseline or leakage emissions have to be evaluated for this Project since no electricity is consumed in the baseline and no leakage have to be taken into account. The general formula is:

$$PE_{EC,y} = \sum_{y} EC_{PJ,j,y} \bullet EF_{EL,j,y} \bullet \left(1 + TDL_{y}\right) \quad \textbf{(13)}$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in year *y* (tCO_2/y)

$EC_{PJ,j,y}$ = Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/y)

$EF_{EL,j,y}$ = Emission factor for electricity generation for source *j* in year *y* (tCO_2/MWh)

$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source *j* in year *y,* for the Project the 20% default value has been used

j = Sources of electricity consumption in the project, in this case is only the National grid

For the calculation of the $EF_{EL,j,y,}$ the Scenario A applies to the Project as a grid energy consumer. Proceeding, the methodology Option A1 has been selected to "Calculate the combined margin emission factor of the applicable electricity system using the procedures in the approved version 2 of the "*Tool to calculate the emission factor for an electricity system*" ($EF_{EL,j,y} = CEF_{elec,BL,y}$)"

Therefore, Project emission for electricity consumption was calculated in the Table 6 below.

Table 6: Project emissions for electricity consumption from the national grid

Project emission for electricity consumption from the national grid					
Bill emission date	**Period**	**$EC_{PJ,j,y}$**	**$EF_{EL,j,y}$**	**$TDL_{j,y}$**	**$PE_{EC,y}$**
	(from-to)	**MWh**	**tCO_2/MWh**	**-**	**tCO_{2e}**
7/7/2011	01/06/2011 - 30/06/2011	0.631$^{(4)}$	0.1988	0.2	0.151
10/8/2011	01/07/2011 - 31/07/2011	0.277	0.1988	0.2	0.066
5/9/2011	01/08/2011 - 31/08/2011	0.258	0.1988	0.2	0.062
19/10/2011	01/09/2011 - 30/09/2011	0.685	0.1988	0.2	0.163
	Total				**0.441**

(4) Value calculated for 27 days of June.

Project emissions were conservatively considered to be 1 tCO_2e.

E.3. Calculation of leakage

>>

No leakage effects need to be accounted under ACM0001 methodology.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	81,710	1	0	81,709

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	68,336	81,709

The emission reductions estimated in PDD for the year 2011 (7 months or 211 days) was 121,168 tCO_2e, which would correspond to 68,336 tCO_2e in 119 days (current monitoring period, from 04/06/2011 to 30/09/2011).

E.6. Remarks on difference from estimated value in registered PDD

>>

The value of the emission reductions reached during the monitoring period (from 04/06/2011 to 30/09/2011) is different from the estimated value in the PDD, which correspond to 68,336 tCO_2e (119 days). The actual value is increased of 13,373 tCO_2e.

The main reasons of the underestimation of the ER are, as follows:

1) The efficiency of disposal and removal of the leachate from the wells was improved, increasing the productivity of the biogas in the site.
2) The electrical efficiency of engines considered in the ex-ante estimation referred to the performance of equipment in the controlled environment of the manufacturer and could not be achieved during the operation, mainly because of the low and instable quality of the landfill gas.

- - - - -

History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Issuance		