Monitoring report form for CDM project activity

(Version06.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the project activity	Bandeirantes Landfill Gas to Energy Project (BLFGE)	
UNFCCC reference number of the project activity	0164	
Version number of the PDD applicable to this monitoring report	03, dated 01/03/2012	
Version number of this monitoring report	05	
Completion date of this monitoring report	22/05/2018	
Monitoring period number	2nd monitoring period	
Duration of this monitoring period	01/09/2012 – 22/12/2017	
Monitoring report number for this monitoring report	Not applicable. The project is a large scale project type.	
Project participants	Prefeitura Municipal de São Paulo (Municipality of São Paulo) Biogás Energia Ambiental S.A. KfW Fortis Bank N.V./S.A. Mercuria Energy Trading SA	
Host Party	Brazil	
Sectoral scopes	13 - Waste handling and disposal	
Applied methodologies and standardized baselines	ACM0001 – Consolidated baseline and monitoring methodology for landfill gas project activities (version 11)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	63,183tCO_2e	763,844tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring periodin the PDD	1,175,518 tCO_2e	

SECTION A. Description of project activity

A.1. General description of project activity

Bandeirantes Landfill Gas to Energy Project (BLFGE) is a project designed to explore the landfill gas (LFG) produced in Bandeirantes landfill, one of the biggest landfills in Brazil. The Bandeirantes LFG is used for electricity generation for the Brazilian Interconnected System ("SIN" from the Portuguese *Sistema Interligado Nacional*).

The project is located in the metropolitan region of São Paulo, Brazil's biggest city and financial center of the country. Aiming to avoid environmental problems related to methane emissions, including also global warming, BLFGE created by Biogás Energia Ambiental S/A – the winner company of a public bid from the municipality of São Paulo. Its goal has been not only to generate renewable energy through 24 engines with 925kW capacity (total installed capacity equals to 22.2MW), but also find an environmental, social and financial solution to avoid landfill greenhouse gases (GHG) release into the atmosphere. Such solution is very replicable in a country like Brazil, where there was no landfill capturing methane under the three bottom-lines (social, environmental and financial).

The project started construction in 2003; the flaring system was installed in November 2003 and the first gas engine was installed in December 2003. The project commissioning started on December23rd 2003, when the final environmental license – working license – was issued. Officially, the project activity started, with the implementation of the degassing station – on January 1st, 2004 – and with the power plant – on February 16th, 2004.

During this monitoring period– from01/09/2012 to 22/12/2017 –, the project reduced 827,027tCO_2e.

A.2. Location of project activity

Bandeirantes landfill is located between km 25 and km 26 at Bandeirantes highway, which connects the city of São Paulo with Campinas Metropolitan Region. The landfill covers an area of approximately 1.35 million m^2, having Perus urban area (a São Paulo district) as North border; São Paulo – Jundiai old road as East border; in South lies the connection between this road and Bandeirantes highway and finally in West there is Bandeirantes highway. The geographic coordinates of project site are as follows:

Latitude: 23° 25' 11.13" S

Longitude: 45°45' 21.69" W

Figure 1– São Paulo location (Source: http://pt.wikipedia.org)

Figure 2 – BLFGE Landfilllocation (Source: adapted from Google Earth)

A.3. Parties and project participants

Parties involved	Project participants	Indicate ifthe Party involved wishes to be considered as project participant (Yes/No)
Brazil(host)	Public entity - Prefeitura Municipal de São Paulo (Municipality of São Paulo)	No
	Private entity - Biogás Energia Ambiental S.A.	
Germany	Private entity - KfW	No
Switzerland	Private entity - Mercuria Energy Trading SA	No
Netherlands	Private entitiy - Fortis Bank N.V./S.A.	No

A.4. Reference toapplied methodologies and standardized baselines

BLFGEapplies the ACM0001 – “*Consolidated baseline and monitoring methodology for landfill gas project activities*” (version 11.0). ACM0001 refers to the following methodological tools:

- Tool for the demonstration and assessment of additionality (version 6.0.0);
- Emissions from solid waste disposal site (version 6.0.0);
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1);

- Tool to determine project emissions from flaring gases containing methane (version 1);
- Tool for calculation of emission factor for electricity systems (version 2.2.1);
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2);
- Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period (version 3).

A.5. Crediting period type and duration

2nd renewable crediting period: 7 years, 0 month.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

Bandeirantes landfill is divided into 5 cells, named AS-1, AS-2, AS-3, AS-4 and AS-5. The landfill received waste from 1979 to 2007, when it was closed. More than 37 million tons of waste were disposed in the landfill's area. The collection system encompasses mostly cells AS-4 and AS-5.

The LFG is extracted from the landfill through the gas wells and is transported to the gas plant by the pipelines for treatment before use as fuel or flaring. During the transportation there might occur the formation of condensates due to temperature gradients requiring drainage of the pipeline to condensate shafts placed along the pipeline. Once in the gas plant, the LFG is cooled again to remove moisture up to a minimum level. The removal of condensates from the LFG flow is a critical step in the gas treatment process should the LFG be used as fuel. LFG condensates contain silica components that can block the gas pipes or damage the gas engines ultimately. Once the condensates are removed, the LFG is heated again by passing through a second heat exchanger, or economizer, to a temperature of around 25 °C, far enough from the dew point of 4 °C to avoid further condensation.

As additional precaution, as per the reasons mentioned in the previous paragraph, a demister was also installed as an extra-guarantee of the LFG quality as fuel for gas engines. The demister is a stainless steel high density filter which separates liquid particles (small amounts of condensate) from the LFG. All liquid removed off the LFG is drained to a condensate shaft.

Blowers are used to provide correct suction pressure into the pipeline system for transportation of the LFG extracted from the landfill up to the gas plant. Flow capacity and pressure are adjusted by electrical motors with frequency control. In addition to that, the blowers are also equipped with necessary safety equipment as well as noise reducing housing.

Sophisticated gas analysing and gas measuring instruments are used on the pressure side of the gas plant to ensure safety, process and operating best controls. Once analysed and properly controlled and measured, the LFG can be used as a fuel for the gas engines which drive electrical generators. Any occasional surplus of the LFG might continue being burned off by the flares.BLFGE has 2 units “High temperature flare HOFGAS – Efficiency 2500” (manufactured by Hofstetter) installed at the site, with the following characteristics:

Table 1– Technical description of project's equipment

	Blower*	Flare	El. Generator	Diesel Generator
Manufacturer	Aerzen	Hofstetter	Caterpillar	Cummins Brasil Ltda.
Model	GM 130 L / DN 300	Hofgas Efficiency 2500	G3516A	125DGEB-1297
Quantity	4	2	24	1

	Blower*	Flare	El. Generator	Diesel Generator
Capacity per unit	4,250 Nm^3	Min: 500Nm^3/hr Max: 2,500 Nm^3/h	925kW	125kW

*A mini-blower is also installed at the plant with 2,500 Nm^3 capacity.

Figure 3–Compressors (blue) and dryers (metal)

Figure 4– Backup diesel generator for emergency purposes

Figure 5– Enclosed flares for destruction of LFG surplus

Figure 6– Electricity generators

The whole LFG collecting process and gas plant are controlled by an electrical control system which is provided with a PLC (Programmable Logical Controller) and a SCADA system (visualization of the process on a personal computer), making possible to control and monitor the installation at distance, including through the internet. All the measured process signals are processed by the PLC to feed input signals for the gas-coolers, blowers, flares and gas-engines.

Given the project magnitude in terms of power generation using exclusively LFG as fuel, it would not have happened without technology transfer. Among Biogás shareholders are Van der Wiel – worldwide known Dutch firm acting in the transport, infrastructure and environmental technique – and Arcadis, engineering, project management and consultancy Netherlands-based firm with a branch in Brazil (Arcadis Logos), responsible for landfill gas capture engineering design. In the case of BLFGE, the former has contributed

largely for the design of the LFG system, while the latter has used its broad experience in energy projects leading the project implementation and operation. Most of the equipment was imported, such as engines for energy generation, flow meters, gas analyser and flares, as the Brazilian industry was not prepared yet to supply this kind of equipment, at least with the size and characteristics demanded for the BLFGE project. Both project's implementation and operation have happened under strict environmental regulations, ensuring that technology transference could be made in safe and proper environmental conditions at BLFGE.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

Not applicable. No temporary deviations were made during this crediting period.

B.2.2. Corrections

Not applicable. No corrections were made during this crediting period.

B.2.3. Changes to the start date of the crediting period

Not applicable. No changes in the starting date of the crediting period were made.

B.2.4. Inclusion of monitoring plan

Not applicable. No revisions in the monitoring plan were made during this crediting period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

Not applicable. No permanent changes were made in the PDD during this crediting period.

B.2.6. Changes to project design

Not applicable. No changes in the project design were made during this crediting period.

SECTION C. Description of monitoring system

Section B.7.1. above describes the parameters that are to be monitored during the crediting period, as well as, the methods and procedures to be applied. The location of the instruments installed in the degassing and electricity generation plants is presented in the following diagram.

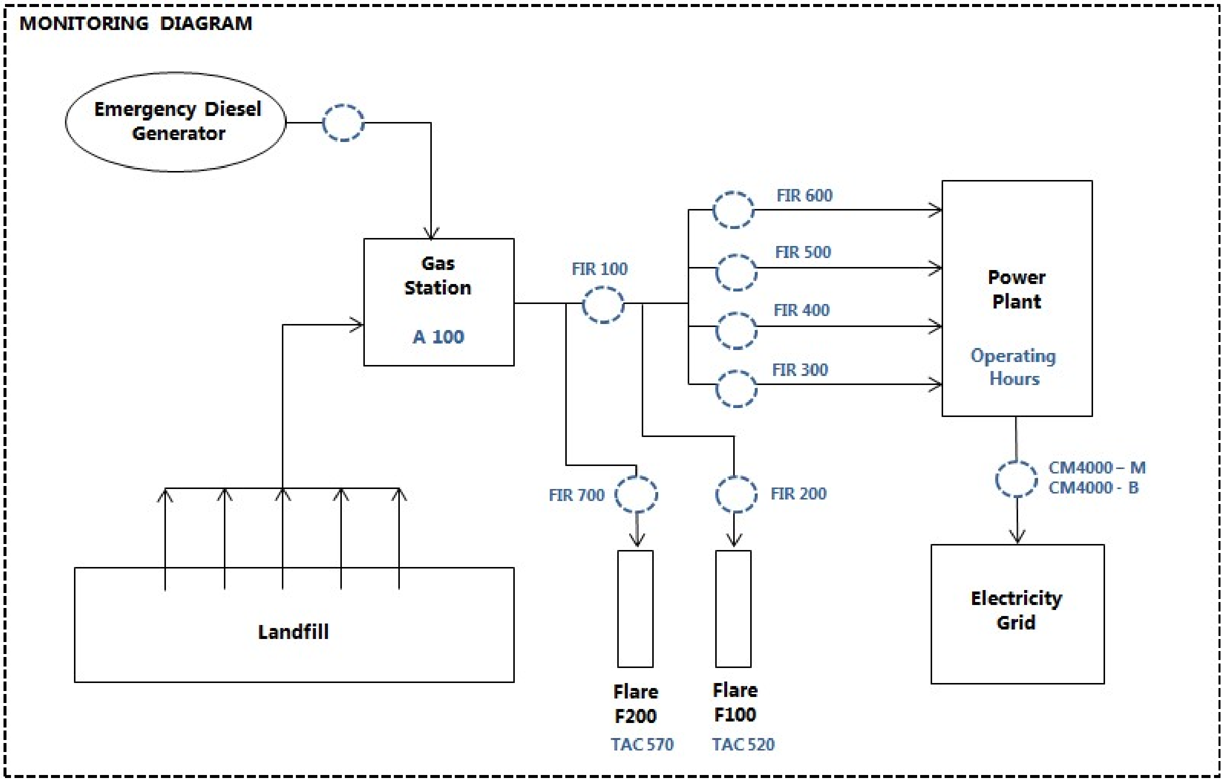

Figure 7– Simplified diagram of monitoring equipment.

- FIR 700, FIR 200, FIR 300, FIR 400, FIR 500, FIR 600: Flow meter - Register the total amount of landfill gas captured;
- FIR200 and FIR700: include flow meter, pressure and temperature transmitters - Register the amount of landfill gas flared;
- FIR300, FIR400, FIR500 and FIR600: include flow meter, pressure and temperature transmitters - Register the total amount of landfill gas combusted in the power plant to generate electricity;
- TAC520 and TAC 570: Thermocouples of the exhaust gas - Flares: F100 and F200, respectively;
- A100: methane fraction from the LFG;
- CM4000-M and CM4000-B: Electricity meter – Register electricity generation to the grid;
- Electricity meter - Diesel generator.

The detailed layout of degassing plants is as follows:

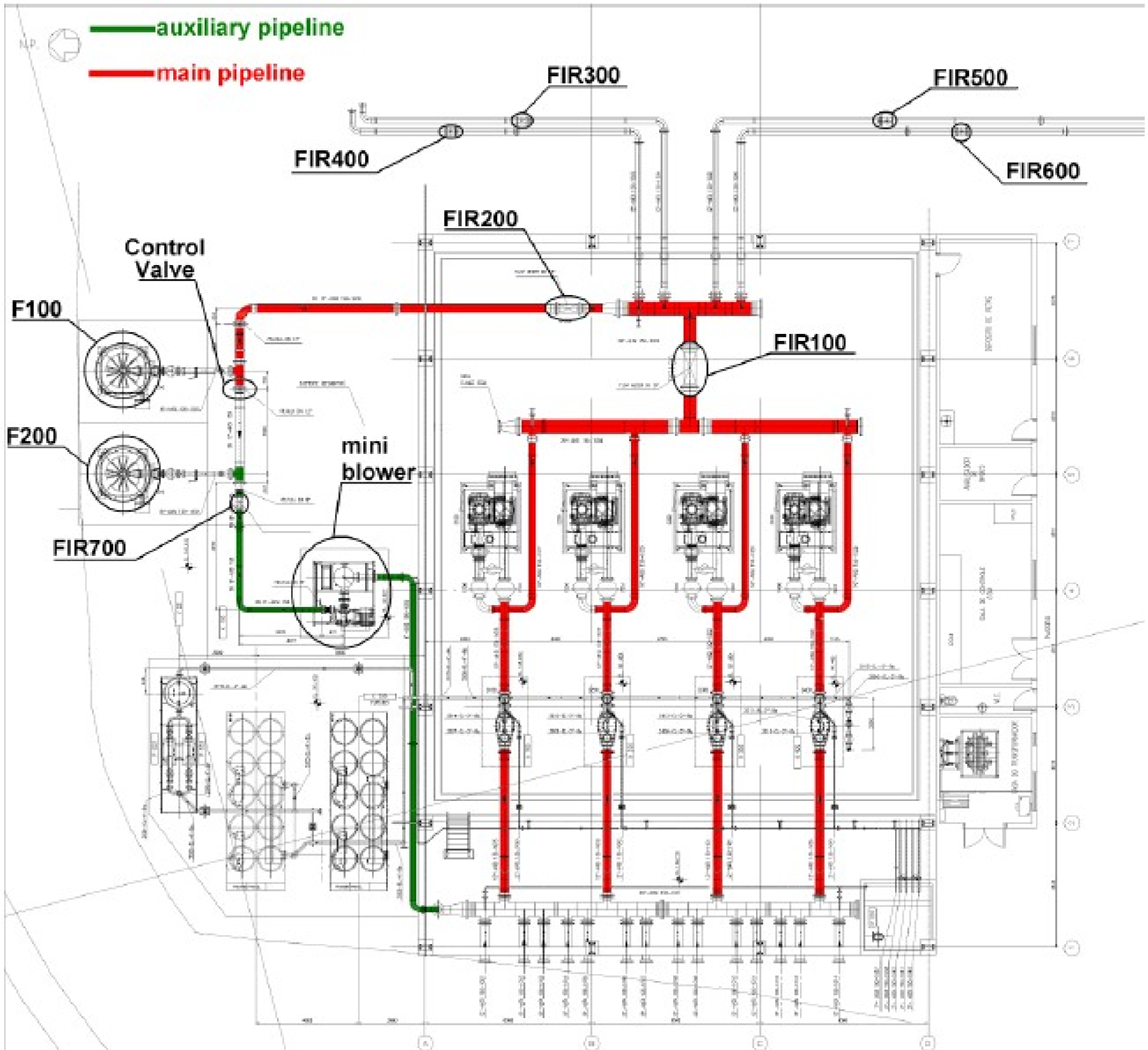

Figure 8– Lay-out of the degassing plant.

Procedures described below are also to be taken into account while performing monitoring activities related to the proposed project activity.

a) Data transmission, processing and storage

The variables described in item B.7.1 are automatically registered in a supervisory computer system. Since all the registered data in the Supervisory System's hard disk is subjected to sabotage and technical failure, Biogás has developed the following actions to protect the monitoring system:

- The PLC is not connected to the Internet, thus the risk of virus is minimized;
- Only authorized persons have access to the data base of the system;
- Antivirus programs are installed at the system;
- Data backup:
  - A weekly CD backup of the Supervisory System in external hard disk;
  - A weekly backup of the Supervisory System's hard disk is made by the server of Biogás;

- Biogás Operational Environment Unit downloads regularly the primary data for the elaboration of the monitoring report.

During the crediting period, data was collected in a 5-minute interval, but since March 2018, the system was updated to consider 1-minute interval. This update was made since the project is under renewal of the crediting period and 1-minute interval is required by updated version of the project emission from flaring tool.

All monitored data and required for verification and issuance be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

b) Responsibilities

From the point of view of the plant operation, positions and roles for this CDM project activity are well defined. Duties, personnel replacement in the case of non-availability of the supervisor of monitoring and/or the electrical supervisor and hiring requirements for job positions are determined in documented procedures presented in the functional organogram ad responsibility matrix.

c) Quality Assurance & Quality control

Biogás counts with the internal procedure PO-005 which objective is to specify the monitoring procedures made inside the Degassing Station, as gas flows, temperature, pressure, electricity generation and methane concentration.

As presented above all parameters monitored inside the Degassing Station has the same reading / transmitting / registration routine and all routines have one person responsible: the plant supervisor.

Every week, the plant supervisor downloads all data registered from the PLC and makes a complete check to identify unconformities, such as unread registrations or troubles with the PLC (this unconformities happens mainly due to electricity black-outs). All unconformities raised are promptly compared with operational events, registered by the operators in the Operation Diary.

In order to avoid data loss, the operators are oriented to perform a “Print-Screen” of the PLC Controlling System Panel every three hours. The picture printed presents all monitoring parameters and is saved in the computer’s hard disk.

Other procedures developed at BLFGE are:

PO-001: Procedure about re-starting the plant after an electricity breakdown

PO-002: Calibration of methane analyser

PO-003: Calibration of valve (flare)

PO-004: Service orders and maintenance

PO-005: Procedure of monitoring parameters (including calibration plan)

PO-006: Procedure about internal monitoring of Bandeirantes

PO-007: Procedure about workers control

PO-008: Procedure for the elaboration of the monthly operational report

PO-009: Procedure in emergency situations

PO-010: Procedure for data back-up of the supervisory system

PO-011: Procedure for manual data collection

PO-012: Instruction for Refuelling the Diesel Device

PO-013: Identification of legal and other requirements

PO-014: Administrative Procedure

d) Training

All training was supplied to operators and technical assistants before the project’s implementation. Before performing its activities, every new operator has performed a training consisting of the following:

- How to operate and start the plant;
- Reading instruments and recording of reports;
- Verification and calibration of gas analyser;
- Maintenance of equipment.
- Data Protection Measures.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	Regulatory requirements relating to landfill gas project
Unit	% or m^3
Description	Regulatory requirements relating to landfill gas projects
Source of data	Publicly available information of regulatory requirements of the Host Country related to landfill gas. In Brazil, there are neither regulatory requirements nor legal obligations to destroy the LFG.
Value(s) applied	There are neither regulatory requirements nor legal obligations to destroy the LFG.
Choice of data or measurement methods and procedures	Official source of data.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	The information though recorded annually, is used for changes to the adjustment factor (AF) or directly $MD_{reg,y}$ at renewal of the credit period – variable updated at renewal of each credit period.The DNA was contacted and informed that there are no federal laws/regulations requiring destruction of methane in landfills. A conservative value of 20% was adopted as the AF.

Data/Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global Warming Potential value for methane
Source of data	IPCC
Value(s) applied	21
Choice of data or measurement methods and procedures	GWP applicable for the first commitment period of the Kyoto Protocol.
Purpose of data/parameter	Calculation of baseline and project emissions.
Additional comments	The GWP was applied to emission reductions achieved during the first commitment period of the Kyoto Protocol, i.e. up to December 31th, 2012.

Data/Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global Warming Potential value for methane
Source of data	IPCC
Value(s) applied	25
Choice of data or measurement methods and procedures	GWP applicable for the second commitment period of the Kyoto Protocol.
Purpose of data/parameter	Calculation of baseline and project emissions
Additional comments	The GWP was applied to emission reductions achieved during the second commitment period of the Kyoto Protocol, i.e. January 1st, 2013 onwards.

Data/Parameter	D_{CH4}
Unit	tCH_4/m^3CH_4
Description	Methane Density

Source of data	ACM0001 (version 11)
Value(s) applied	0.0007168
Choice of data or measurement methods and procedures	At standard temperature and pressure (0 degree Celsius and 1,013 bar).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$BE_{CH4,SWDS,y}$
Unit	tCO_2e
Description	Methane generation from the landfill in the absence of the project activity at year y
Source of data	Registered PDD
Value(s) applied	See table below
Choice of data or measurement methods and procedures	Calculated as per the “Version 06.0.0 of the Emissions from solid waste disposal site”
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Used for ex-ante estimation of the amount of methane that would have been destroyed/combusted during the year.

Year	**$BE_{CH4, SWDS}$ (tCO_2e/year)**	**Year**	**$BE_{CH4, SWDS}$ (tCO_2e/year)**
1979	7,415	**2004**	1,548,802
1980	50,577	**2005**	1,483,213
1981	81,528	**2006**	1,515,863
1982	119,999	**2007**	1,247,523
1983	149,329	**2008**	964,088
1984	171,511	**2009**	764,685
1985	204,563	**2010**	622,383
1986	306,561	**2011**	519,058
1987	422,459	**2012**	442,492
1988	558,594	**2013**	384,440
1989	596,418	**2014**	339,319
1990	671,642	**2015**	303,344
1991	731,366	**2016**	273,934
1992	833,033	**2017**	249,322
1993	882,080	**2018**	228,290
1994	967,927	**2019**	209,992
1995	1,073,122	**2020**	193,833
1996	1,180,714	**2021**	179,389
1997	1,265,061	**2022**	166,355
1998	1,358,943	**2023**	154,505
1999	1,462,288	**2024**	143,669
2000	1,472,667	**2025**	133,716
2001	1,500,954	**2026**	124,545
2002	1,533,475	**2027**	116,071
2003	1,543,202	**2028**	108,225

Data/Parameter	MD_{Hist}
Unit	t_{CH4}
Description	Amount of methane destroyed historically for the previous year before the start of project activity.
Source of data	Project Proponent

Value(s) applied	8.07% of MG_{HIST}
Choice of data or measurement methods and procedures	Calculated according with equation (6), based on the Collection efficiency of passive systems in closed landfills (37%), Efficiency of methane destruction in open flares (50%), Number of PDR which were burning the landfill gas collected in the passive system by the time of validation (143 wells) and Total number of PDR actually installed in the Bandeirantes Landfill by the time of the validation (328 wells)
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$\mathbf{MG_{Hist}}$
Unit	t_{CH4}
Description	Amount of methane generated historically for the previous year before the start of project activity
Source of data	Project Proponent
Value(s) applied	N/A
Choice of data or measurement methods and procedures	The value of MD_{Hist} is irrelevant to estimate the adjustment factor because the parameter "Destruction efficiency of the baseline system" was calculated according with equation (6), based on the Collection efficiency of passive systems in closed landfills (37%), Efficiency of methane destruction in open flares (50%), Number of PDR which were burning the landfill gas collected in the passive system by the time of validation (143 wells) and Total number of PDR actually installed in the Bandeirantes Landfill by the time of the validation (328 wells)
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$\mathbf{MD_{Project,\ 1}}$
Unit	Nm^3CH_4
Description	Amount of methane destroyed by the project activity during the first year of the project activity
Source of data	Project Proponent
Value(s) applied	43,417,990
Choice of data or measurement methods and procedures	Value sourced from the data logger of BLFGE, for the year 2004.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$\mathbf{MG_{PR,\ 1}}$
Unit	Nm^3CH_4
Description	Amount of methane generated during the first year of the project activity (Nm^3CH4)
Source of data	Project Proponent
Value(s) applied	102,891,281
Choice of data or measurement methods and procedures	Estimated using the actual amount of waste disposed in the landfill as per the "Version 06.0.0 of the Emissions from solid waste disposal site"
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Value calculated for the year 2004

Version 06.0.0 of the Emissions from solid waste disposal site

Data/Parameter	**φ**
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.9
Choice of data or measurement methods and procedures	As per the "Version 06.0.0 of the Emissions from solid waste disposal site"
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.

Data/Parameter	**OX**
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.1
Choice of data or measurement methods and procedures	Value applied as the Bandeirantes landfill is a managed solid waste disposal site which uses soil as cover material.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**F**
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**DOCf**
Unit	-
Description	Fraction of degradable organic carbon (DOC) that can decompose
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or measurement methods and procedures	Standard value applied by IPCC
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**MCF**
Unit	-
Description	Methane correction factor
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	1.0
Choice of data or measurement methods and procedures	According with the 2006 IPCC Guidelines, the Bandeirantes Landfill does meet the criteria of managed SWDS and have depths of greater than or equal to 5 meters (50 meters) and/or high water table at near ground level.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data/Parameter	**DOCj**
Unit	-
Description	Fraction of degradable organic carbon (by weight) in the waste type j
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	(see table below)
Choice of data or measurement methods and procedures	According with the version of the Version 06.0.0 of the Emissions from solid waste disposal siteapplied for the project.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

DOCj (%wet waste)	**Waste type j**
43	Wood and wood products
40	Pulp, paper and cardboard
15	Food, food waste, beverages and tobacco
24	Textiles
20	Garden, yard and park waste
0	Glass, plastic, metal, other inert waste

Data/Parameter	$p_{n,j,x}$
Unit	-
Description	Weight fraction of the waste type j in the sample n collected during the year x
Source of data	FRAL CONSULTORIA LTDA., Caracterização dos Resíduos Sólidos Domiciliares do Município de São Paulo – Agrupamento Noroeste – Quadrimestre nov/dez/2008/jan/fev/2009 – 2009
Value(s) applied	(see table below)
Choice of data or measurement methods and procedures	The study was based on a local standard for the characterization of municipal solid waste (Stech, P.J., Resíduos Sólidos: Caracterização, Resíduos Sólidos Domésticos: Tratamento e Disposição Final, 1 São Paulo, CETESB, 1990;)
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Type of Waste	**% (wet basis)**
Wood and wood products	0.66%
Pulp, paper and cardboard	12.32%
Food, food waste, beverages and tobacco	60.62%
Textiles	3.14%
Garden, yard and park waste	3.21%
Glass, plastic, metal, other inert waste	18.79%

Data/Parameter	**Wx**
Unit	Tons
Description	Total amount of organic waste prevented from disposal in year x (tons)
Source of data	Landfill's weight bridge
Value(s) applied	see table below
Choice of data or measurement methods and procedures	Values taken from the weight bridge, located in the entrance of the landfill. The bridge measures the truck weight before and after the waste unload. The difference is equal to the amount of waste.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Year	Waste disposed (tons)	Year	Waste disposed (tons)
1979	37,450	1994	1,616,710
1980	229,040	1995	1,823,170
1981	231,408	1996	1,971,651
1982	313,633	1997	1,992,386
1983	321,956	1998	2,142,325
1984	325,585	1999	2,305,464
1985	408,887	2000	1,964,424
1986	801,366	2001	2,043,617
1987	1,017,866	2002	2,082,855
1988	1,283,852	2003	1,993,371
1989	977,852	2004	1,965,347
1990	1,206,964	2005	1,594,350
1991	1,224,954	2006	1,974,799
1992	1,508,817	2007	489,627
1993	1,377,148		

Data/Parameter	**Kj**
Unit	-
Description	Decay rate for the waste type j
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	see table below
Choice of data or measurement methods and procedures	Those values were adopted considering the climate of the São Paulo: - $MAT_{historical}$ = 20.7 oC (data from Centro de Pesquisas Meteorológicas e Climáticas Aplicadas a Agricultura – CEPAGRI); - $MAP_{historical}$ = 1,376.2 mm (Centro de Pesquisas Meteorológicas e Climáticas Aplicadas a Agricultura – CEPAGRI);
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Data for PET was not sourced as it was not applied to estimate the value of ki.

Waste Type	kj
Pulp, paper, cardboard and textiles	0.070
Wood, wood products and straw	0.035
Other (non-food) organic putrescible garden and park waste	0.170
Food, food waste, sewage sludge, beverages and tobacco	0.400

Version 01 of the Tool to determine project emissions from flaring gases containing methane

Parameter	Description	Value
MM_{CH4}	Molecular mass of carbon methane	16.04 kg/kmol
MM_{CO}	Molecular mass of carbon monoxide	28.01 kg/kmol
MM_{CO2}	Molecular mass of carbon dioxide	44.01 kg/kmol
MM_{O2}	Molecular mass of oxygen	32.00 kg/kmol
MM_{H2}	Molecular mass of hydrogen	2.02 kg/kmol

Parameter	Description	Value
MM_{N2}	Molecular mass of nitrogen	28.02 kg/kmol
AM_C	Atomic mass of carbon	12.00 kg/kmol
AM_H	Atomic mass of hydrogen	1.01 kg/kmol
AM_O	Atomic mass of oxygen	16.00 kg/kmol
AM_N	Atomic mass of nitrogen	14.01 kg/kmol

D.2. Data and parameters monitored

Data/Parameter	$LFG_{Total,y}$
Unit	Nm³
Description	Total amount of landfill gas captured in normal cubic meters at standardtemperature and pressure
Measured/calculated/ default	Measured
Source of data	PLC data records (flow meters FIR 700, FIR 200, FIR 300, FIR 400, FIR 500, FIR 600)
Value(s) of monitored parameter	See values monitored presented in $LFG_{Flare,y}$ and$LFG_{Electricity,\ y}$parameters
Monitoring equipment	See monitoring equipment in $LFG_{Flare,y}$ and$LFG_{Electricity,\ y}$parameters
Measuring/reading/recording frequency	Continuous readings from the installed flow-meters FIR 700, FIR 200, FIR 300, FIR 400, FIR 500, FIR 600.Equipment is connected to a supervisory computer system, which registers continuously the LFG measured. The supervisory system makes records of instant gas-flow every 5 minutes and the accumulated gas-flow every hour. Data aggregated daily, monthly and yearly. The counter is reseted at 00:00.
Calculation method (if applicable)	Values presented above consider the equipment error discount due to the uncovered calibration period following the CDM Validation and Verification Standard.
QA/QC procedures	Flow meters are subjected to a regular maintenance and testing regime to ensure accuracy. Regular maintenance is made following general guidelines from the manufacturer. Regarding the calibration of the instrument, the PPs decided to conservatively adopt a 5-years frequency since: - It is in compliance with national laws (example in Germany the Netherlands, for turbine meters of this size, calibration is never required; - In Brazil there are no requirements on how often flow-meters must be calibrated; - In Germany, a calibration every 10-years is enforce by law; - The manufacturer states that it’s up to the clients to determine the calibration frequency. The procedure SGA IT 4.4.6-29 explains that the operator must check operational conditions for this kind of instrument, at least once a day. In the flow meters case, if the operator identifies some problem, instrument must be replaced or calibrated.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	- Monitoring under responsibility of the BLFGE Manager - Automatic readings of temperature and pressure are made by sensors connected to the flow-meter –data is used to convert the gas-flow to Nm^3, thus no separate monitoring of pressure and temperature is necessary.

Data/Parameter	$LFG_{Flare,y}$
Unit	Nm³
Description	Amount of landfill gas to flares from the landfill site in normal cubic meters at standard temperature and pressure
Measured/calculated/ default	Measured
Source of data	PLC data records (flow meters FIR 200 and FIR 700)

<table>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>Period</th><th>FIR200 (Nm^3)</th><th>FIR700 (Nm^3)</th></tr>
<tr><td>From 01/09/2012</td><td>244,564</td><td>6,290</td></tr>
<tr><td>2013</td><td>864,858</td><td>0</td></tr>
<tr><td>2014</td><td>15,710,759</td><td>4,005,455</td></tr>
<tr><td>2015</td><td>9,887,154</td><td>8,557,175</td></tr>
<tr><td>2016</td><td>673,439</td><td>322,610</td></tr>
<tr><td>Up to 22/12/2017</td><td>0</td><td>138,023</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><th>Equipment</th><th>TAG</th><th>Manufact.</th><th>Model</th><th>Serial Nr.</th><th>Accuracy(%)</th></tr>
<tr><td rowspan="2">Flow meter</td><td>FIR200</td><td>Incontrol</td><td>VTGE X-200</td><td>VG15239</td><td>1.0</td></tr>
<tr><td>FIR700</td><td>FCI</td><td>ST51</td><td>328849</td><td>2.5</td></tr>
<tr><td rowspan="2">Pressure transmitter</td><td>FIR200</td><td>SMAR</td><td>LD291</td><td>L454793</td><td>0.2</td></tr>
<tr><td>FIR700</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="2">Temperature transmitter</td><td>FIR200</td><td>ASTA</td><td>PT-100</td><td>S377815</td><td>0.6471</td></tr>
<tr><td>FIR700</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Continuous readings from the flow-meters FIR200 and FIR700 installed. Equipment is connected to a supervisory computer system, which registers continuously the LFG measured. The supervisory system makes records of instant gas-flow every 5 minutes and the accumulated gas-flow every hour. Data aggregated daily, monthly and yearly. The counter is reseted at 00:00.</td></tr>
<tr><td>Calculation method
(if applicable)</td><td>Values presented above consider the equipment error discount due to the uncovered calibration period following the CDM Validation and Verification Standard.</td></tr>
<tr><td>QA/QC procedures</td><td>Flow meters are subjected to a regular maintenance and testing regime to ensure accuracy in compliance with national laws. Regular maintenance is made following general guidelines from the manufacturer.

Regarding the calibration of the instrument, the PPs decided to conservatively adopt a 5-years frequency since:
- In the Netherlands, for turbine meters of this size of FIR200 and FIR700, calibration is never required;
- In Brazil there are no requirements on how often flow-meters must be calibrated;
- In Germany, a calibration every 10-years is enforce by law;
- The manufacturer states that it’s up to the clients to determine the calibration frequency.

The procedure SGA IT 4.4.6-29 explains that the operator must check operational conditions for this kind of instrument, at least once a day. In the flow meters case, if the operator identifies some problem, instrument must be replaced or calibrated.</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comments</td><td>- Monitoring under responsibility of the BLFGE Manager
- Automatic readings of temperature and pressure will be made by sensors connected to the flow-meter – these data is used to convert the gas-flow to Nm^3, thus no separate monitoring of pressure and temperature is necessary;</td></tr>
</table>

Data/Parameter	**$LFG_{Electricity, y}$**
Unit	Nm³
Description	Amount of landfill gas to powerhouse from the landfill site in normal cubic meters at standard temperature and pressure
Measured/calculated/ default	Measured by four flow meters (FIR300, FIR400, FIR500 and FIR600)
Source of data	PLC data records

<table>
<tr><td>Value(s) of monitored parameter</td><td>

Period	FIR300 (Nm^3)	FIR400 (Nm^3)	FIR500 (Nm^3)	FIR600 (Nm^3)
From 01/09/2012	48,176	2,685,887	2,979,668	4,591,171
2013	3,446,382	4,976,184	12,900,404	7,588,926
2014	233,251	229,692	699,877	293,901
2015	2	2	2,643,105	1,544,345
2016	2	2	13,183,294	6,329,268
Up to 22/12/2017	0	0	15,129,348	5,672,759

</td></tr>
<tr><td>Monitoring equipment</td><td>

TAG	Equipment	Manufacturer	Model	Serial Nr.	Accuracy (%)
FIR300	Flow meter	Incontrol	VTGEX200	VG083B6	1.0
	Pressure transmitter	SMAR	LD291	33007-06	0.2
	Temperature transmitter	ASTA	PT- 100	S502986	0.5993
FIR400	Flow meter	Incontrol	VTGEX200	VG084B6	1.0
	Pressure transmitter	SMAR	LD291	L42237	0.2
	Temperature transmitter	ASTA	PT- 100	S502987	0.1775
FIR500	Flow meter	Incontrol	VTGEX200	VG086B6	1.0
	Pressure transmitter	SMAR	LD291	33006-06	0.2
	Temperature transmitter	ASTA	PT- 100	S502988	0.8717
FIR600	Flow meter	Incontrol	VTGEX200	VG085B6	1.0
	Pressure transmitter	SMAR	LD291	33005-06	0.2
	Temperature transmitter	ASTA	PT- 100	S502989	0.1998

</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Continuous readings from the 4 flow-meters installed (tags FIR300, FIR400, FIR500 and FIR600). Equipments are connected to a supervisory computer system, which registers continuously the LFG measured. Data aggregated daily, monthly and yearly. For each flow-meter, the supervisory system makes records of instant gas-flow every 5 minutes and the accumulated gas-flow every hour. The counter is reseted at 00:00hs.</td></tr>
<tr><td>Calculation method
(if applicable)</td><td>Values presented above consider the equipment error discount due to the uncovered calibration period following the CDM Validation and Verification Standard.</td></tr>
</table>

QA/QC procedures	Flow meters are subjected to a regular maintenance and testing regime to ensure accuracy, in compliance with national laws. Regular maintenance is made following general guidelines from the manufacturer. Regarding the calibration of the instrument, the PPs decided to conservatively adopt a 5-years frequency since: - In the Netherlands, for turbine meters of this size of FIR300, FIR400, FIR500 and FIR600, calibration is never required; - In Brazil there are no requirements on how often flow-meters must be calibrated; - In Germany, a calibration every 10-years is enforce by law; - The manufacturer states that it's up to the clients to determine the calibration frequency. The procedure SGA IT 4.4.6-29 explains that the operator must check operational conditions for this kind of instrument, at least once a day. In the flow meters case, if the operator identifies some problem, instrument must be replaced or calibrated.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Since Biogas has four lines that send gas to engines, one per meter (FIR300, FIR 400, FIR 500 and FIR 600), during the period of re-calibration of each meter, the respective line of the meter in calibration was closed until its return.

Data/Parameter	$PE_{Flares,y}$
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	(see table below)
Monitoring equipment	N/A
Measuring/reading/recording frequency	Calculated as per the "Tool to determine project emissions from flaring gases containing methane".
Calculation method (if applicable)	Calculated as per the "Tool to determine project emissions from flaring gases containing methane".
QA/QC procedures	Calculated as per the "Tool to determine project emissions from flaring gases containing methane".
Purpose of data/parameter	Calculation of project emissions
Additional comments	-

Period	$PE_{flare\ F100,y}$ (tCO_2e)	$PE_{flare\ F200,y}$ (tCO_2e)
From 01/09/2012	157	4
2013	677	0
2014	12,174	3,009
2015	7,635	6,586
2016	547	251
Up to 22/12/2017	0	107

Data/Parameter	$w_{CH4,y}$
Unit	m^3CH_4/m^3LFG
Description	Methane fraction in the landfill gas
Measured/calculated/ default	Measured
Source of data	PLC data records.
Value(s) of monitored parameter	Daily average for the monitoring period (see table below)

Period	m^3CH_4/m^3LFG
From 01/09/2012	47.12
2013	48.14
2014	47.94
2015	48.13
2016	48.19
Up to 22/12/2017	41.38

Monitoring equipment	Manufacturer: Rosemount - NUK Type: Binos 100M TAG: A100 Accuracy: 1.0% Serial number: 99965398 Calibration frequency: weekly at the plant and yearly with a third-party company
Measuring/reading/recording frequency	The data is continuously measured by the gas analyser and recorded electronically by PLC at least each five minutes and once per hour, instantaneously. The reading frequency is continuously and recorded by the PLC.
Calculation method (if applicable)	N/A
QA/QC procedures	- The gas analyser is subjected to a regular maintenance and testing regime to ensure accuracy; - The operation team is responsible for the testing/maintenance according to procedure SGA IT 4.4.6-10; - The operation team performs a daily check list of the instrument to detect leaks and other defects; - The filter replacement is performed when the team deems necessary.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$EL_{LFG,y}$
Unit	MWh
Description	Net amount of electricity generated using LFG.
Measured/calculated/ default	Measured
Source of data	PLC data records
Value(s) of monitored parameter	**Period** / **MWh**: From 01/09/2012: 12,828 2013: 35,951 2014: 1,576 2015: 5,302 2016: 25,575 Up to 22/12/2017: 23,321
Monitoring equipment	AES Eletropaulo substation: Manufacturer: Landis gyr Type: Saga 1000 Accuracy: 0.2% Serial number: 1168593/1168594 Calibration frequency: 2-5 years
Measuring/reading/recording frequency	Continuous readings from the electricity-meters located in the substation connected to the SIN. The substation has 2 measurement points: one belongs to Biogeração (manager of the power plant) and the other belongs to Eletropaulo (Electric Utility). Each set of meter has 2 meters installed and both of them are connected to the responsible supervisory system, which registers continuously the electricity exported. For conservativeness reasons, both records can be compared in a monthly basis and the lowest one will be applied to calculate ERs.
Calculation method (if applicable)	N/A
QA/QC procedures	Electricity meters are subject to regular maintenance following the ONS procedures. The meter´s supplier (Merlin Gerin) manual mentions that regular maintenance for the Power Logic CM4000 electricity meters is not necessary.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	There are two more CM4000Power Logic energy meters located at the landfill exit from Schneider Eletronic,however, the energy official data is from energy meters located at the local utility substation, which is used for invoice purposes and, therefore,for baseline emissions purposes.

Data/Parameter	$EF_{OM,y}$
Unit	tCO_2e/MWh
Description	Emission factor of the operating margin

Measured/calculated/ default	Calculated
Source of data	The Brazilian DNA
Value(s) of monitored parameter	<table><tr><th>Period</th><th>CO_2OM EF</th></tr><tr><td>From 01/09/2012</td><td>0.5176</td></tr><tr><td>2013</td><td>0.5932</td></tr><tr><td>2014</td><td>0.5837</td></tr><tr><td>2015</td><td>0.5597</td></tr><tr><td>2016</td><td>0.6228</td></tr><tr><td>Up to 22/12/2017</td><td>0.5882</td></tr></table>
Monitoring equipment	N/A
Measuring/reading/recording frequency	Data available by the Brazilian DNA in hourly, monthly and yearly basis
Calculation method (if applicable)	Following the “Tool to calculate the emission factor for an electricity system”
QA/QC procedures	Official source of data
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	The project applies the *ex-post* data vintage

Data/Parameter	**$EF_{BM,y}$**
Unit	tCO_2e/MWh
Description	Emission factor of the build margin
Measured/calculated/ default	Calculated
Source of data	The Brazilian DNA
Value(s) of monitored parameter	<table><tr><th>Period</th><th>CO_2 BM EF</th></tr><tr><td>From 01/09/2012</td><td>0.2010</td></tr><tr><td>2013</td><td>0.2713</td></tr><tr><td>2014</td><td>0.2963</td></tr><tr><td>2015</td><td>0.2553</td></tr><tr><td>2016</td><td>0.1581</td></tr><tr><td>Up to 22/12/2017</td><td>0.1581*</td></tr></table>CO_2 BM EF is not public available for 2017 year and, therefore, data used for this year is based on 2016 year (the latest data available). Also, it is the most conservative value during the monitored period and, therefore, emission reductions are not over estimated.
Monitoring equipment	N/A
Measuring/reading/recording frequency	Data available by the Brazilian DNA in yearly basis
Calculation method (if applicable)	Following the “Tool to calculate the emission factor for an electricity system”
QA/QC procedures	Official source of data
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	The project applies the *ex-post* data vintage

Data/Parameter	**$CEF_{elecy,BL,y}$**
Unit	tCO_2e/MWh
Description	Carbon emission factor of electricity
Measured/calculated/ default	Calculated
Source of data	The Brazilian DNA

<table>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>Period</th><th>CO_2 CM EF</th></tr>
<tr><td>From 01/09/2012</td><td>0.2802</td></tr>
<tr><td>2013</td><td>0.3518</td></tr>
<tr><td>2014</td><td>0.3681</td></tr>
<tr><td>2015</td><td>0.3314</td></tr>
<tr><td>2016</td><td>0.2743</td></tr>
<tr><td>Up to 22/12/2017</td><td>0.2656</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>N/A</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Data available by the Brazilian DNA in hourly, monthly and yearly basis</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Following the “Tool to calculate the emission factor for an electricity system”</td></tr>
<tr><td>QA/QC procedures</td><td>Official source of data</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comments</td><td>The project applies the ex-post data vintage</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>$PE_{EC,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/year</td></tr>
<tr><td>Description</td><td>Project emissions from electricity consumption by the project activity during the year y</td></tr>
<tr><td>Measured/calculated/ default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>PLC data records and calculated according to the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>Period</th><th>PE from electricity consumption (tCO_2e)</th></tr>
<tr><td>From 01/09/2012</td><td>5.6</td></tr>
<tr><td>2013</td><td>3.3</td></tr>
<tr><td>2014</td><td>21.8</td></tr>
<tr><td>2015</td><td>465.1</td></tr>
<tr><td>2016</td><td>725.2</td></tr>
<tr><td>Up to 22/12/2017</td><td>2.0</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>PLC system</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Continuous measurement and daily recording</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Electricity consumed was generated by fossil fuel. As there is no diesel volume meter, 1.3tCO_2e/MWh default value is used to calculate PE emissions. Calculated as per the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.</td></tr>
<tr><td>QA/QC procedures</td><td>A conservative default value is used from the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of project emissions</td></tr>
<tr><td>Additional comments</td><td>The project has one backup diesel generator in case of power supply interruption located at the landfill. Generator is not used for electricity generation to the grid.</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>$PE_{FC,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/year</td></tr>
<tr><td>Description</td><td>Project emissions from fossil fuel consumption by the project activity during the year y</td></tr>
<tr><td>Measured/calculated/ default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>PLC data records and calculated according to the “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>0

Project emissions from fossil fuel combustion are due to the consumption of electricity from fossil fuels sources (diesel generator turned-on for emergency purposes), already accounted in $PE_{EC,y}$.</td></tr>
</table>

Monitoring equipment	PLC system
Measuring/reading/recording frequency	Continuous measurement and daily recording
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	Calculation of project emissions
Additional comments	-

Data/Parameter	**$fv_{i,h}$**
Unit	-
Description	Volumetric fraction of component i in the residual gas in the hour h where i= CH_4
Measured/calculated/ default	Measured
Source of data	Continuous measurement using a certified gas analyser.
Value(s) of monitored parameter	Large amount of data. Please, refer to ER spreadsheet
Monitoring equipment	Please refer to parameter $w_{CH4,y}$
Measuring/reading/recording frequency	As the residual gas temperature does not exceed 60°C, the requirement that flow rate and methane content measurements have to be carried out with the same basis (dry or wet) is not applicable.
Calculation method (if applicable)	N/A
QA/QC procedures	The gas analyser is recalibrated every week against a standard certified gas cylinder, according with an internal procedure.
Purpose of data/parameter	Calculation of baseline and project emissions
Additional comments	As a simplified approach, only the methane content of the residual gas is measured and the remaining part is considered as N_2.

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	Measured
Source of data	Continuous measurements from the flow-meters FIR200 and FIR700.
Value(s) of monitored parameter	Large amount of data. Please, refer to ER spreadsheet
Monitoring equipment	FIR200 and FIR700. Please refer to $LFG_{flare,y}$
Measuring/reading/recording frequency	As the residual gas temperature does not exceed 60°C, the requirement that flow rate and methane content measurements have to be carried out with the same basis (dry or wet) is not applicable.
Calculation method (if applicable)	N/A
QA/QC procedures	Flow meters are periodically calibrated (5-years frequency). Please refer to $LFG_{flare,y}$.
Purpose of data/parameter	Calculation of baseline and project emissions
Additional comments	-

Data/Parameter	**T_{flare}**
Unit	°C
Description	Temperature in the exhaust gas of the flare
Measured/calculated/ default	Measured
Source of data	Continuous measurements using thermocouples
Value(s) of monitored parameter	Large amount of data. Daily sheets from PLC system.

Monitoring equipment	Continuous readings from the thermocouples installed in each flare. The instruments are connected to a supervisory computer system, which registers continuously the combustion temperature measured. <table><tr><th>TAG</th><th>Manufacturer</th><th>Model</th><th>Serial Nr.</th><th>Accuracy(%)</th></tr><tr><td>FIR200</td><td rowspan="2">Thermoshaw</td><td>“S”</td><td>N/A</td><td>0.25 or 1.5°C</td></tr><tr><td>FIR700</td><td>“S”</td><td>N/A</td><td>0.25 or 1.5°C</td></tr></table>
Measuring/reading/recording frequency	For each flare, the supervisory system makes records of instant temperature every 5 minutes and every hour
Calculation method (if applicable)	N/A
QA/QC procedures	Thermocouples are yearly calibrated.
Purpose of data/parameter	Calculation of baseline and project emissions
Additional comments	For hours in each temperature is lower than 900°C, it is assumed that during that hour the flare efficiency is zero and gas is not accounted for emission reductions purposes. Therefore, instead of considering 50% efficiency as required by the “Tool to determine project emissions from flaring gases containing methane” (version 1), the Project Participants are being more conservative while considering 0% efficiency.

Data/Parameter	**Other flare operation parameters**
Unit	-
Description	Data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer’s specifications
Measured/calculated/ default	Measured
Source of data	PLC data records
Value(s) of monitored parameter	N/A
Monitoring equipment	Please refer to T_{flare}
Measuring/reading/recording frequency	Continuous readings from the thermocouples installed in each flare. Instruments are connected to a supervisory computer system, which registers continuously the combustion temperature measured. For each flare, the supervisory system makes records of instant temperature every 5 minutes and every hour.
Calculation method (if applicable)	N/A
QA/QC procedures	Thermocouples are replaced or calibrated every year.
Purpose of data/parameter	Baseline
Additional comments	According to the manufacturer, if the temperature of the flare is higher than 1,350°C, the flare will stop automatically and an alarm is activated if the temperature is below 900°C.

Data/Parameter	**$EC_{PJ,j,y}$**
Unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y(MWh/yr)
Measured/calculated/ default	Measured
Source of data	PLC data records
Value(s) of monitored parameter	<table><tr><th>Period</th><th>$EC_{PJ,j,y}$ (MWh/yr)</th></tr><tr><td>From 01/09/2012</td><td>4</td></tr><tr><td>2013</td><td>3</td></tr><tr><td>2014</td><td>17</td></tr><tr><td>2015</td><td>358</td></tr><tr><td>2016</td><td>558</td></tr><tr><td>Up to 22/12/2017</td><td>2</td></tr></table>
Monitoring equipment	PLC system
Measuring/reading/recording frequency	Recorded electronically by PLC at least each five minutes and once per hour, instantaneously.

Calculation method (if applicable)	The electricity consumed by the plant is monitored through hours of operation from generator while applying the maximum output capacity of the generator 125kW, as a volume meter is not usual given the little consumption and capacity of generator. While adopting the maximum oil consumption capacity (44l/h) from manufacturer's specification, and applying diesel oil NCV and EF, it results in lower project emissions. Therefore, the approach considered by the PP is very conservative.
QA/QC procedures	A conservative default value is used for calculation of project emission from the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".
Purpose of data/parameter	Calculation of project emissions
Additional comments	The project has one backup diesel generator in case of power supply interruption located at the landfill. Generator is not used for electricity generation to the grid.

D.3. Implementation of sampling plan

Not applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

According to ACM0001 (version 11.0), baseline emissions are calculated as follows:

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

Where,

BE_y = Baseline emissions in year y (tCO_2e/yr);

$MD_{project,y}$ = The amount of methane that would have been destroyed/combusted during the year in tonnes 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 tonnes of methane (tCH_4);

GWP_{CH4} = Global Warming Potential value for methane;

$EL_{LFG,y}$ = 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 a non-site/off-site fossil fuel based captive power generation, during year y, in megawatt hours (MWh);

$CEF_{elec,BL,y}$ = CO_2 emissions intensity of the baseline source of electricity displaced, intCO_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/air heater, during the year y in TJ;

$CEF_{ther,BL,y}$ CO_2 emissions intensity of the fuel used by boiler/air heater to generate thermal energy which is displaced by LFG based thermal energy generation, in tCO_2e/TJ.

In cases where regulatory or contractual requirements do not specify $MD_{BL,y}$ or no historic data exists for LFG captured and destroyed an "Adjustment Factor" (AF) shall be used and justified, taking into account the project context. Then:

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

Regarding the GWP_{CH4}, the CDM Project Standard for Project Activities establishes that:

"The project participants shall use the global warming potentials (GWPs) adopted by the CMP at its seventh session, in accordance with decision 4/CMP.7, to calculate the GHG emission reductions or net anthropogenic GHG removals achieved by the CDM project activity in the second commitment period of the Kyoto Protocol. This requirement shall apply from 1 January 2013, notwithstanding any GWPs stated to be applicable in the relevant procedures, standards, guidelines, methodologies, methodological tools and other rules being used in relation to that project activity".

Therefore, the GWP applied up to 31/12/2012 is $21tCO_2/tCH_4$and $25tCO_2/tCH_4$was applied from 01/01/2013 onwards.

Calculation of baseline emissions is presented in the table below while applying equation 1. Since thermal energy is not produced in the project activity (but electricity only), $ET_{LFG,y}$*and* $CEF_{ther,BL,y}$ *are zero.*

Table 2– Calculation of baseline emissions

Year	***$MD_{project,y}$ (tCH_4)***	***$MD_{BL,y}$ (tCH_4)***	***$EL_{LFG,y}$ (MWh)***	***$CEF_{elec,BL,y}$ (tCO_2/MWh)***	***BE_y (tCO_2)***
From 01/09/2012	3,547	709	12,828	0.2802	63,189
2013	10,211	2,042	35,951	0.3518	216,860
2014	6,096	1,219	1,576	0.3681	122,503
2015	6,871	1,374	5,302	0.3314	139,174
2016	6,930	1,386	25,575	0.2743	145,607
Up to 22/12/2017	6,736	1,347	23,321	0.2656	140,919
TOTAL	***40,391***	***8,078***	***104,553***	***-***	***828,252***

Detailed description of the calculation of baseline emissions are presented in the ER spreadsheet attached to this Monitoring Report. It is important mentioning that data presented in the ER spreadsheet presents total of biogas measured and average of methane concentration in the month as there is massive amount of data (5-minute recording frequency). However, the quantity of methane considered for emission reduction calculation is based on biogas and methane concentration continuously monitored from the PLC system, both measured at the same time and, therefore, data is correct and accurate.

During verification, DOE has required to consider equations according to ACM0001 in the ER spreadsheet in order to determine emission reductions. However, as the PLC system calculates the quantity of methane based on biogas generation and methane concentration for the same instant, calculations are not required in the ER spreadsheet.

In addition, while multiplying the amount of biogas by the monthly average of methane concentration, it results in a higher amount of methane than the one considered in the PLC system. Therefore, the amount of methane considered for emission reduction purposes is correct as it considers the biogas generation and the methane concentration for the same instant and it is more conservative.

While comparing data instantaneously generated to data from the PLC system (used for emission reduction purposes), calculation of emission reductions do not considered decimal places, but values rounded down. Therefore, hourly data from the system is always little higher than data considered for the ER calculation. See for example the day 1, 4 and 6/09/2015 below:

Table 3– Calculation of baseline emissions

Equipment	***Date***	***Hourly data***	***ER calculation***
Source		*REL_OVW_1Hor 09_15*	*09 BLFGE_-_Data_19th – Setembro.xls*
FIR100	*01/09/2015*	*33,474.05859375*	*33,474*
FIR100	*04/09/2015*	*38,471.66015625*	*38,471*
FIR100	*06/09/2015*	*35,845.72265625*	*35,845*

a) Methane that would have been destroyed/combusted ($MD_{project,y}$)

In order to be conservative, the 20% AF considered in the 1st crediting period[1] was applied in this verification.

$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y} + MD_{PL,y}$ **Equation 3**

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);

$MD_{PL,y}$ = Quantity of methane sent to the pipeline for feeding to the natural gas distribution network (tCH_4).

$MD_{thermal,y}$ and $MD_{PL,y}$ are not applied to the project activity and, therefore, their sum is zero. In the case of the project, $MD_{project,y}$can be calculated as follows:

$MD_{project,y} = MD_{main\ line,y} + MD_{secondary\ line,y}$ **Equation 4**

$MD_{main\ line,y}$ is the sum of the amount of LFG destroyed in the flare F100(measured by the flow-meter FIR200) and the sum of the amount of LFG destroyed in the power plant(measured by the flow-meters FIR300, FIR400, FIR500 and FIR600). $MD_{secondary\ line,y}$ is the amount of LFG destroyed in the flare F200 (measured by the flow-meter FIR700). Therefore:

— **Main line:**

$MD_{main\ line,y} = MD_{flareF100,y} + MD_{electricity,y}$ **Equation 5**

$MD_{flareF100,y} = (LFG_{FIR200,y} \times w_{CH4} \times D_{CH4}) – (PE_{flareF100,y} / GWP_{CH4})$ **Equation 6**

$MD_{electricity,y} = LFG_{electricity,y} \times w_{CH4} \times D_{CH4}$ **Equation 7**

— **Secondary line:**

$MD_{secondary\ line,y} = MD_{flareF200,y}$ **Equation 8**

$MD_{flareF200,y} = (LFG_{FIR700,y} \times w_{CH4} \times D_{CH4}) – (PE_{flareF200,y} / GWP_{CH4})$ **Equation 9**

Where,

w_{CH4} = 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).

[1] The value calculated to the Adjustment Factor for the 2nd crediting period is equal to 19.11%. In order to be conservative, the 20% AF value was applied during the 1st crediting period.

Project emissions from flaring are calculated as established in the registered PDD and according to the “Tool to determine project emissions from flaring gases containing methane”.

The amount of methane flared and used to generate electricity is presented in the table below following equations 3 to 9.

Table 4– Calculation of methane flared and used to generate electricity

Year	$MD_{main\ line,y}$		$MD_{secondary\ line,\ y}$	$MD_{project,y}$ (tCH_4)
	$MD_{FLARE\ F100,y}$ (tCH_4)	$MD_{electricity,y}$ (tCH_4)	$MD_{FLARE\ 200,y}$ (tCH_4)	
From 01/09/2012	67	3,478	2	3,547
2013	244	9,967	0	10,211
2014	4,383	510	1,203	6,096
2015	2,749	1,478	2,645	6,871
2016	197	6,632	101	6,930
Up to 22/12/2017	0	6,694	43	6,736
TOTAL	***7,639***	***28,759***	***3,993***	***40,391***

It is important mentioning that during the monitored period, it was verified uncovered periods by calibration. According to the §369 of the CDM Validation and Verification Standard for Project Activities:

(a) Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or

(b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment.

Therefore, discounts were applied in accordance with the Standard above. The equivalent error among flow meters, analysers, pressure and temperature transmitters was applied based on equipment accuracy and test results, whichever is higher according to the Standard. While adopting a conservative approach on calculation of emission reductions, the equivalent error for the gas was calculated considering each desegregated errors as follows:

$$\varepsilon_{FIRn} = \sqrt{(\varepsilon_{flow,FIRn})^2 + (\varepsilon_{temperature,FIRn})^2 + (\varepsilon_{pressure,FIRn})^2 + (\varepsilon_{CH4})^2}$$ **Equation 10**

Where,

ε_{FIRn}	=	Equivalent error of gas applied to uncovered calibration period for FIR *n*;
$\varepsilon_{flow,FIRn}$	=	Error of gas flow meter for FIR *n*;
$\varepsilon_{temperature,FIRn}$	=	Error of temperature transmitter for FIR *n*;
$\varepsilon_{pressure,FIRn}$	=	Error of pressure transmitter for FIR *n*;
ε_{CH4}	=	Error of methane analyser;
FIR_n	=	Monitoring equipment type (FIR100, FIR200, FIR300, FIR400, FIR500, FIR600, FIR700).

Conservatively, discounts were applied to the whole month not covered by calibration. For example, FIR300 temperature transmitter was not calibrated from 26/03/2014 to 01/04/2014, then discount was applied from 01/03/2014 to 30/04/2014 (the whole month of March and April, 2014). Also, when the delay in calibration occurred for only one parameter and not to the others, as it was the case of the example above, discount was applied for all parameters in order to reach the equivalent error for the referred FIR. Therefore,

the temperature transmitter of FIR300 was 7 days delayed(up to 02/04/2014), however, the pressure transmitter, the flow meter and methane analyser were already calibrated. In spite of this, accumulated errors from flow, pressure, temperature and methane analyser were considered in order to apply the discount.

Detailed description of the calculation is presented in the ER spreadsheet attached to this Monitoring Report.

b) CO_2 emissions intensity of the baseline source of electricity displaced ($CEF_{elec,BL,y}$)

In case the baseline is electricity generated by plants connected to the grid, the emission factor shall be calculated according to "Tool to calculate the emission factor for an electricity system". It is calculated as the combined margin (CM), comprised by two components: (i) the built margin (BM) and (ii) the operation margin (OM). As determined in the registered PDD, the BM and OM shall be monitored during the crediting period of the project (*ex-post*) and shall be based on data published by the Brazilian DNA ("CIMGC" from the Portuguese Comissão Interministerial de Mudança Global do Clima).

Values published by the Brazilian DNA follows the "Tool to calculate the emission factor for an electricity system" and consider option c) dispatch data analysis OM of the Tool. This option does not permit the ex-ante data vintage shall be updated at every verification.

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$ **Equation 11**

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh);

$EF_{grid,OM,y}$ = Operating 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 0.25 and 0.75, respectively, for the 2ndcrediting period.

Results of the CO_2 emission factor of the grid is presented in the table below based on data from the Brazilian DNA and following equation 16 above.

Table 5– Calculation of the CO_2 emission factor of the grid

Year	$EF_{grid,OM,y}$	$EF_{grid,BM,y}$	$EF_{grid,CM,y}$
2012	0.5176	0.2010	0.2802
2013	0.5932	0.2713	0.3518
2014	0.5837	0.2963	0.3681
2015	0.5597	0.2553	0.3314
2016	0.6228	0.1581	0.2743
2017	0.5882	0.1581*	0.2656

*The $EF_{grid,BM,y}$ parameter is calculated in the beginning of the subsequent year and, therefore, 2017 data will be available in the beginning of 2018 only. In order to calculate the $EF_{grid,CM,2017}$, data from 2016 is used.

Data presented above is public available at the Brazilian DNA website: <http://www.mctic.gov.br/portal>.

c) Project emissions from flaring ($PE_{flare,y}$)

Project emissions from flaringare calculated as established in the registered PDD and according to the "Tool to determine project emissions fromflaring gases containing methane":

$$PE_{flare\ F200,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,k}) \times (\frac{GWP_{CH4}}{1000})$$

Equation 12

Where,

$TM_{RG,h}$ = Mass flow rate of methane in the residual gas in the hour h;

$\eta_{flare,k}$ = Flare efficiency in hour h.

As described in the registered PDD, flare efficiency considered in the project activity is 90% (default value of the tool for enclosed flares).

Project emissions from flaring are presented in the table below following equation 9. Since $TM_{RG,h}$ parameter considered in calculation is in tCH_4, the value is not divided by 1,000 as presented in equation 9.

Table 6– Calculation of project emissions from flaring

Year	$TM_{flare\ F100,RG,y}$ (tCH_4)	$TM_{flare\ F200,RG,y}$ (tCH_4)	$PE_{flare\ F100,y}$ (tCO_2e)	$PE_{flare\ F200,y}$ (tCO_2e)	$PE_{flare,y}$ (tCO_2e)
From 01/09/2012	75	2	157	4	161
2013	271	0	677	0	677
2014	4,869	1,203	12,174	3,009	15,182
2015	3,054	2,645	7,635	6,612	14,246
2016	219	101	547	251	799
Up to 22/12/2017	0	43	0	107	107
TOTAL	***8,488***	***3,993***	***21,190***	***9,982***	***31,172***

Detailed calculation of project emissions from flaring is presented in the ER spreadsheet attached to this Monitoring Report.

According to "Tool to determine project emissions from flaring gases containing methane" (version 1) considered in the registered PDD, while applying the 90% default value for enclosed flares:

> *"Continuous monitoring of compliance with manufacturer's specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit of manufacturer's specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour".*

According to the registered PDD, the operation of the flare is out of the specified conditions if the temperature drops below 900°C or above 1,350°C. Then, for hours in each temperature is lower than 900°C, it is assumed that during that hour the flare efficiency is zero and gas is not accounted for emission reductions purposes. Therefore, instead of considering 50% efficiency as required by the tool, the Project Participants are being more conservative while considering 0% efficiency. For this reason, data considered for emission reductions purposes is correct and more conservative.

E.2. Calculation of project emissions or actual net removals

According to ACM0001 (version 11.0), project emissions are calculated as follows:

$PE_y = PE_{EC,y} + PE_{FC,j,y}$ **Equation 13**

Where,

$PE_{EC,y}$ = Emissions from consumption of electricity in the project case;

$PE_{FC,j,y}$ = Emissions from consumption of heat in the project case.

Project emissions from electricity consumption ($PE_{EC,y}$) are calculated following the procedures set out by the methodological tool *"Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"*.

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$ **Equation 14**

Where,

$PE_{EC,y}$ = Project emissions from electricity consumption by the project activity during the year *y* (tCO_2/year);

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

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

$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source *j* in year *y*

j = Sources of electricity consumption in the project

According to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1), 1.3 tCO_2e/MWh default value can be applied if consumption source is a project electricity consumption source. The electricity consumed by the plant is monitored through hours of operation from generator while applying the maximum output capacity of the generator 125kW, as a volume meter is not usual given the little consumption and capacity of generator. While adopting the maximum oil consumption capacity (44l/h) from manufacturer's specification, and applying diesel oil NCV and EF, it results in lower project emissions. Therefore, the approach considered by the PP avoids typing errors (since data is from the PLC system and not from handwriting bulletins) and. is very conservative.

According to IPCC (2006), the diesel oil emission factor is 0.0748 tCO_2/GJ, while considering the upper limit value (more conservative value for project emissions calculation). This approach resulted in around 253 tCO_2e during the monitored period. However, according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", while applying the conservative factor of the tool (1.3 tCO_2e/MWh), it resulted in 1,223 tCO_2e during the monitored period. Therefore, the use of 1.3 tCO_2e/MWh default value is more conservative and was used to calculate the project emissions. Since the diesel generator is located inside BLFGE, there are no transmission loses and, therefore, $TDL_{j,y}$ is zero.

Table 7– Calculation of project emissions from diesel oil electricity generation

Year	***$EC_{PJ,j,y}$ (MWh)***	***$PE_{EC,scenarioB,y}$ (tCO_2/yr)***
From 01/09/2012	4	5.6
2013	3	3.3
2014	17	21.8
2015	358	465.1
2016	558	725.2
Up to 22/12/2017	2	2.0
TOTAL	***941***	***1,223.0***

As described in the registered PDD, the diesel generator is not connected to the grid and, therefore, it cannot dispatch electricity to the grid.

Project emissions from flaring are presented in section E.1, since it is used to calculate $MD_{project,y}$ *and* $MD_{BL,y}$ following equations from 3 to 9.

E.3. Calculation of leakage emissions

According to ACM0001 (version 11.0), no leakage effects need to be accounted under this methodology.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissionsor baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	828,252	1,223	0	63,183	763,844	827,027

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
827,027	1,175,518

E.6. Remarks on increase in achieved emission reductions

Not applicable since there was a reduction in the monitored emission reductions in relation to the ones calculated ex-ante in the registered PDD.

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
4.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from F-CDM-MR to CDM-MR-FORM; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
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