



Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	CTR Candeias Landfill Gas Project
Reference number of the project activity	3958
Version number of the monitoring report	1
Completion date of the monitoring report	26/02/2014
Registration date of the project activity	29/09/2011
Monitoring period number and duration of this monitoring period	1 st Monitoring Period 29/09/2011 – 31/12/2013 (both days included)
Project participant(s)	Brazil: Haztec Tecnologia e Planejamento Ambiental SA Spain: International Bank for Reconstruction and Development, as Trustee of the Spanish Carbon Fund (SCF) ; Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness
Host Party(ies)	Brazil
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope 13 : Waste handling and disposal Methodology ACM0001 " <i>Consolidated baseline and monitoring methodology for landfill gas project activities</i> ", Version 11.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	170,845
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	104,957
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	1,181
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	103,776

SECTION A. Description of project activity

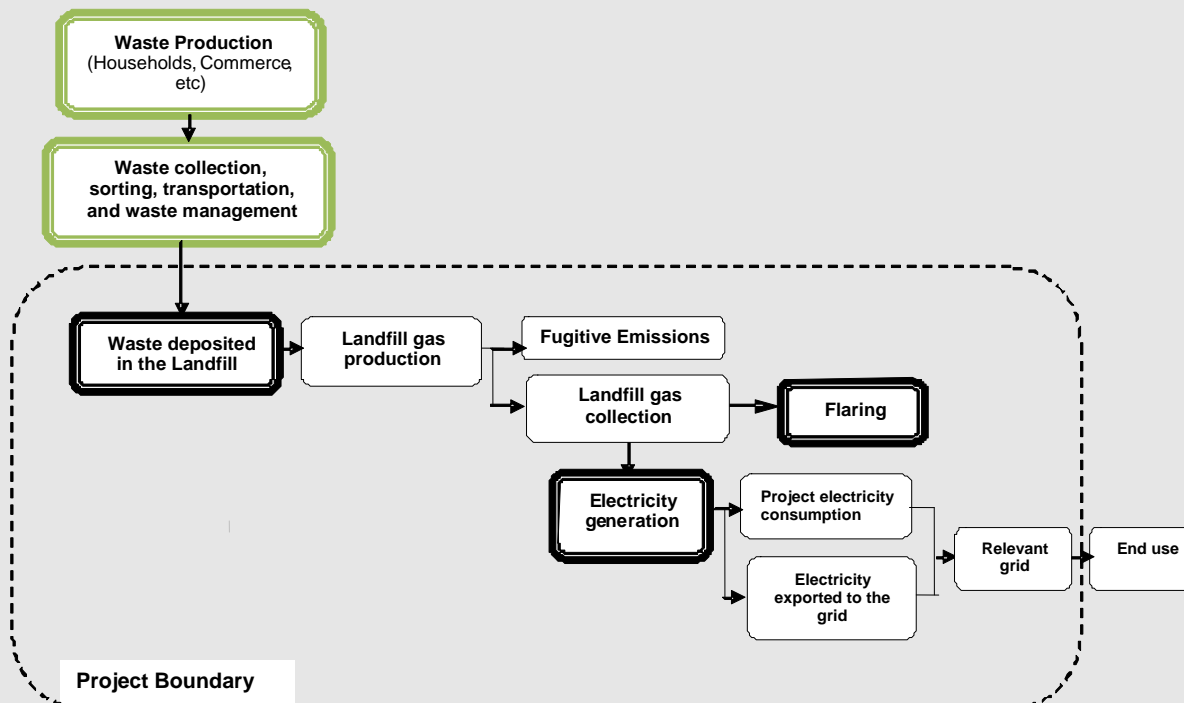
A.1. Purpose and general description of project activity

The objective of the CTR Candeias Landfill Gas Project is to capture and burn the methane (CH_4) emissions generated by the decay of organic waste from the CTR Candeias Sanitary landfill located in the municipality of Jaboatão dos Guararapes, in the Recife Metropolitan Area. The project also intends to generate electricity from the combustion of methane and sale it to the national electricity grid and thus reduce CO_2 emissions by displacing electricity generated from fossil fuels.

The landfill of CTR Candeias, built and operated by Haztec Tecnologia e Planejamento Ambiental SA (Haztec), is strategically located close to major cities in the Recife Metropolitan Area and is the first sanitary landfill in the State of Pernambuco. The landfill started operations in August 2007 and received all necessary environmental licenses for operations. The landfill was designed to operate over a 16 years-period and will thus be closed by the end of 2022. The municipal landfill covers an area of over 170,000 m^2 and will receive about 11 million tons of solid waste during the period 2007-2022.

Landfill gas (LFG) extraction and flaring started in December 14, 2012, while electricity production is scheduled to begin later in 2014 after testing the LFG quality. Electricity will be delivered to the national grid, displacing electricity from the Brazilian national grid. Installed capacity will go from 4.245 MW in 2014 to 8.490 MW in 2017. The LFG extracted that will not be used to generate electricity will be flared (enclosed system). The scenario existing prior the start of the project activity is the same as the baseline scenario (i.e., atmospheric release of the LFG).

The component for generating electricity from LFG has not yet been implemented. The conception, specifications and design are in process and are the new component is expected to be implemented in the future. Therefore, during this monitoring period, not electricity was generated using LFG.

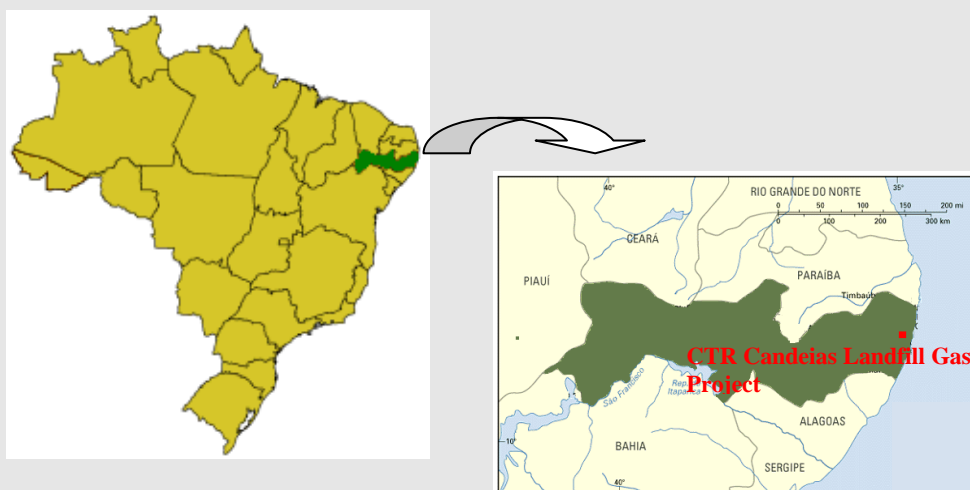


The total volume of emission reductions achieved in this monitoring period was 104,957 tCO₂e

A.2. Location of project activity

The project site is located in the Municipality of Jaboatão dos Guararapes in the Recife Metropolitan Area. Several poor communities are located in the vicinity of the project. The landfill is strategically situated close to three major cities in the state of Pernambuco: Recife, Jaboatão dos Guararapes, and Cabo de Santo Agostinho. Due to its central location, the landfill will potentially provide services to a metropolitan area of 3.8 million inhabitants. The site, which is located at coordinates Latitude -8.164258; Longitude:-34.985286, is shown on Map 1.

Map 1 – Location of the CTR Candeias Landfill Gas Project (Source: IBGE)



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)	Haztec Tecnologia e Planejamento Ambiental SA	No
Spain	International Bank for Reconstruction and Development, as Trustee of the Spanish Carbon Fund (SCF) ; Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness	Yes

A.4. Reference of applied methodology

The Project applies ACM0001 – version 11: “*Consolidated baseline and monitoring methodology for landfill gas project activities.*”
(<http://cdm.unfccc.int/methodologies/DB/EYUD9R1ZAUZ2XNZXD3HQB18OK3VWIV>).

Tools to which the methodology refers to are the following¹:

- Version 05.2 – “Tool for the demonstration and assessment of additonality”
- “Tool to determine project emissions from flaring gases containing methane”. EB28, Annex 13
- Version 01- “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.
- Version 02- “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”.
- Version 05- “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”.
- Version 02 - “Tool to calculate the emission factor for an electricity system”.

A.5. Crediting period of project activity

The project activity has a crediting period that can be renewed two times. The current crediting period of the project activity, to which this monitored period applies, is the first which began on 29/09/2011 and runs for 7 years until 28/09/2018.

¹ Please refer to <<http://cdm.unfccc.int/goto/MPappmeth>>

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

Candeias landfill site started receiving waste in 2007. The landfill is expected to receive waste for 15 years. Waste received over 16 years will reach about 11 million tons. This estimate is based on the volume received and monitored between 2007-2009 and expected waste to be disposed from 2010 until closure 2022.

The LFG collection and flaring system has a capacity for 2,500 m³/h. The system is designed to allow for expansion with new component, such as an electricity generation or an additional flare. The process in which the LFG is collected and flared has 3 main stages:

1. LFG is collected in the wells and transported in the landfill pipeline system with the use a blower;
2. LFG enters in the pre-treatment system which removes excess moisture and impurities;
3. LFG is send to the flare system for its combustion.

Landfill gas collection system: State-of-the-art gas collection technology includes the items listed below.

- Vertical wells used to extract gas and leachate;
- Horizontal wells used to extract gas;
- Optimal well spacing for maximum gas collection whilst minimizing costs;
- Wellheads designed for gas measurements;
- Blowers;
- Condensate extraction and storage systems designed at strategic low points throughout the gas system; and
- Pipeline collection system to connect the LFG collected with the electricity generation and flaring systems.

The landfill is covered by clay to prevent the biogas to come out through the landfill surface.

Landfill gas pre-treatment system: Once the landfill gas is collected and transported through pipes, the landfill gas will reach pre-treatment system (demister), in which the moisture of landfill gas will be removed.

Enclosed flaring system:

The enclosed flare selected is designed to operate continuously with automatic temperature control to safely destroy the biogas generated by solid waste. The flare system includes the items listed below.

- Enclosed flare with controlled combustion system;
- Blower system used to direct gas for flaring;
- Equipment to ensure continuous monitoring of the LFG composition (methane, oxygen, dioxide of carbon and balance), flow and burn temperature; and
- Security restarts system, in cases the system shuts down.

The flare system, with a capacity to process 2,500 Nm³/h of LFG, will achieve destruction efficiency greater than 99% of total organic compounds and greater than 98% of total non-methane volatile organic compounds (NMVOC) throughout the entire flare operating range.

The main incidents that occurred during the period of this monitoring report are listed in the table below.

Variables	Start	End	Incidence	Corrective action	Remarks
All Raw Data	5/7/2013 16:11	5/8/2013 16:44	Power Service Interruption		No ERs claimed during this period
	5/10/2013 5:30	5/11/2013 6:04			
	5/19/2013 12:18	5/20/2013 13:04			
	5/30/2013 6:24	5/31/2013 13:37			
All Raw Data	5/30/2013 13:37	6/11/2013 13:24	Electronic failure of flow meter component	Replacement	No ERs claimed during this period
fv _{CH₄} , FG, h; t _{O₂}	5/15/2013 5:00	5/15/2013 11:26:00	Several periods of malfunctioning of the exhaust gas analyzer due to damages to its components.	Maintenance / component replacement.	Use of Default efficiency values for the ER calculation.
	7/24/2013 18:40	7/29/2013 18:09			

The system was also turned off in some occasions for preventive maintenance, inspection, cleaning or to replace a part.

B.2. Post registration changes

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

Not applicable

B.2.2. Corrections

A Request for Post Registration Changes was submitted to the UNFCCC on 05/12/2013. The request included corrections on the section where the parameter TDL needs to be reported within the MR as it is constant; reference to specific technologies has been deleted; clarification on the use of the simplified approach where only methane content is monitored and the rest is considered to be Nitrogen; and definition of the basis for the measurements for the residual gas.

The request was approved on 14/02/2014.

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

A Request for Post Registration Changes was submitted to the UNFCCC on 05/12/2013. The request included the following permanent changes to the monitoring plan:

- An option has been included to account for project emissions that might occur in case that diesel consumption from an eventual black start diesel generator is required under the scenario of electricity generation from LFG.
- Use of default values for the flare efficiency in case the continuous monitoring system is unavailable for maintenance, or failure.
- Volumetric flow rate of the residual (FVRG), concentration of methane in the exhaust gas (fv_{CH₄}, FG, h) and volumetric fraction of O₂ in the exhaust gas (t_{O₂}, h) measured on wet basis, not dry basis.
- References to specific calibration frequency for the parameters under section B.7.1 have been deleted, as the calibration frequency will be done in according to the methodology and in line with the manufacturer's recommendation.
- Inclusion of "Other flare operation parameters" under B.7.1 for the use of default values for the flare efficiency in case the continuous monitoring system is unavailable for maintenance, or failure.

The request was approved on 14/02/2014

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

Not applicable.

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

The following equipment is used to monitor the operation of the project and the emission reductions.

The control of maintenance and inspection schedules was defined considering the equipment manufacture's specifications and orientations.

Field Analytical Unit (FAU)

The Field Analytical Unit (FAU) or gas analyser, is used to measure the biogas composition before the gas enters the flaring system. The manufacturer of the gas analyser is Siemens.

Flow Meter

The flow meter is used to measure the gas flow entering the flare system. The Project uses a thermal mass flow meter manufactured by ABB that operates with a measurement control system of the biogas temperature and pressure in the pipeline to calculate the flow in normal conditions (Nm^3/h – normal cubic meter per hour).

Thermocouples

High performance equipment to control the flare temperature is installed in the flare tower. The manufacturer of the thermocouples used is ELSI S.R.L..

Flare Emissions Analyser (FEA)

The Flare Emissions Analyser (FEA) provides continuous monitoring of methane and oxygen in the exhaust gas of the flare to calculate the biogas flaring efficiency. The manufacturer of the gas analyser is Siemens.

Energy Meter

The Energy Meter of the Project Site operates in order to measure electricity consumption of the Flare System. The equipment manufacturer is IME S.p.A.

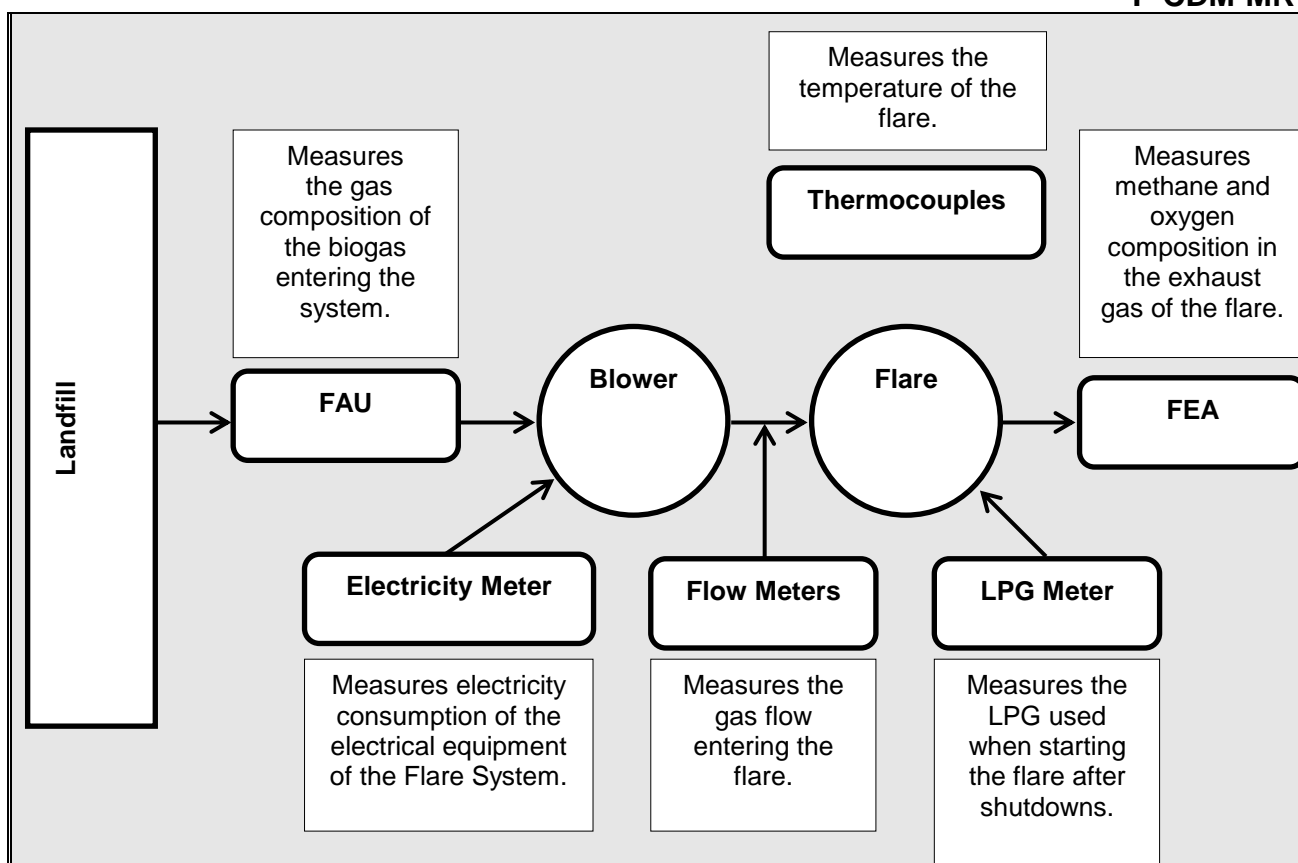


Diagram of the monitoring equipment

Project management responsibility.

Information on the Monitoring Manager, the project team, and internal inspection of the LFG capture and internal inspection program are addressed below.

Monitoring Manager. Responsible for the monitoring plan and supervision on the collected data. The manager reports monthly about project performance and data. Additionally, the manager will report immediately to senior company management if non-conformance in the performance is detected such as flow meters not working. The Monitoring Manager is the main contact person for the verifiers, Brazilian DNA and any other designated entity, during the crediting period.

Project Team. The LFG project team discusses the performance of the LFG capture and flaring project. Members of the project team include the Monitoring Manager and the General Manager of the Candeias landfill.

Internal inspection. The monitoring plan including all defined procedures, reports, data, and personnel are inspected internally to ensure the monitoring activities are in-compliance and to define new procedures in case of need.

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

The following parameters, listed in the registered PDD, will not be used during the current monitoring period:

- (1) $BE_{CH_4,SWDS,v}$, (2) ϕ , (3) OX, (4) F, (5) f, (6) z, (7) DOC_f , (8) MCF, (9) DOC_i ; (10) K_i ; (11) E_{DS} ; (12) W_X ; (13) $p_{n,j,x}$;

Data / Parameter:	Regulatory requirements relating to landfill gas
Unit:	Norms
Description:	Regulatory requirements relating to landfill gas from ABNT NBR (<i>Associação Brasileira de Normas Técnicas / Brazilian Association of Technical Norms</i>) and (<i>Norma Brasileira / Brazilian Norm</i>), including: ABNT NBR 8419:1992 Versão Corrigida: 1996. <i>Apresentação de projetos de aterros sanitários de resíduos sólidos urbanos / Introduction of Projects for Sanitary Landfills of Municipal Solid Waste</i> .
Source of data:	Publicly available information
Value(s) applied:	-
Purpose of data:	Calculation of baseline emissions
Additional comment:	There have been no changes in the regulations. The information will be recorded, to use it for changes in the adjustment factor (AF) or directly to $MD_{BL,y}$ at renewal of the credit period.

Data / Parameter:	GWP_{CH_4}
Unit:	tCO_2/tCH_4
Description:	Global Warming Potential of CH_4
Source of data:	IPCC Guidelines
Value(s) applied:	21 up to December 2012 and 25 from January 2012 onwards
Purpose of data:	Calculation of baseline emissions
Additional comment:	Shall be updated accordingly to any future COP/MOP decisions

Data / Parameter:	D_{CH_4}
Unit:	$t_{CH_4}/m^3_{CH_4}$
Description:	Methane density
Source of data:	ACM0001, Version 11
Value(s) applied:	0.0007168
Purpose of data:	Calculation of baseline emissions
Additional comment:	At standard T and P (0 degrees C and 1.013 bar)

Data / Parameter:	MM_{CH_4}
Unit:	kg/kmol
Description:	Molecular mass of methane
Source of data:	Constant. As per the "Tool to determine project emissions from flaring gases containing methane", Version1
Value(s) applied:	16.04
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MM_{CO}
Unit:	kg/kmol
Description:	Molecular mass of carbon monoxide
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	28.01
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MM_{CO2}
Unit:	kg/kmol
Description:	Molecular mass of carbon dioxide
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	44.01
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MM_{O2}
Unit:	kg/kmol
Description:	Molecular mass of oxygen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	32.00
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MM_{H2}
Unit:	kg/kmol
Description:	Molecular mass of hydrogen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	2.02
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MM_{N2}
Unit:	kg/kmol
Description:	Molecular mass of nitrogen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	28.02
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	AM_c
Unit:	kg/kmol
Description:	Atomic mass of carbon
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	12.00
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	AM_H
Unit:	kg/kmol
Description:	Atomic mass of hydrogen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	1.01
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	AM_O
Unit:	kg/kmol
Description:	Atomic mass of oxygen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	16.00
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	AM_N
Unit:	kg/kmol
Description:	Molecular mass of nitrogen
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	14.01
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	P_n
Unit:	Pa
Description:	Atmospheric pressure at normal conditions
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	101,325
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	R_u
Unit:	Pa.m ³ /kmol.K
Description:	Universal ideal gas constant
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	8,314.472
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	T_n
Unit:	K
Description:	Temperature at normal conditions
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	273.15
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MF_{O_2}
Unit:	Dimensionless
Description:	O ₂ volumetric fraction of air
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	0.21
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	MV_n
Unit:	m ³ /Kmol
Description:	Volume of one mole of any ideal gas at normal
Source of data:	Constant. As per the <i>"Tool to determine project emissions from flaring gases containing methane"</i> , Version1
Value(s) applied:	22.414
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	$TDL_{i,y}$
Unit:	%
Description:	Average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site.
Source of data:	Default value according to the <i>"Tool to calculate project emissions from electricity consumption"</i> version 01.
Value(s) applied:	20%
Purpose of data:	Calculation of project emissions
Additional comment:	-

D.2. Data and parameters monitored

Data / Parameter:	LFG_{total,y}												
Unit:	Nm ³												
Description:	Total amount of landfill gas captured at normal temperature and pressure on a wet basis.												
Measured/ Calculated / Default:	Measured on site with a flow meter.												
Source of data:	Project developer												
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet												
Monitoring equipment:	<table border="1"> <tr> <td></td><td>Type: Swirl flow meter</td></tr> <tr> <td>Accuracy class:</td><td>± 0.5% off full scale</td></tr> <tr> <td>Serial number:</td><td>241488749/X002</td></tr> <tr> <td>Calibration frequency:</td><td>3 years</td></tr> <tr> <td>Installation Date:</td><td>12/12/2012</td></tr> <tr> <td>Manufacturer Calibration:</td><td>21/06/2012</td></tr> </table>		Type: Swirl flow meter	Accuracy class:	± 0.5% off full scale	Serial number:	241488749/X002	Calibration frequency:	3 years	Installation Date:	12/12/2012	Manufacturer Calibration:	21/06/2012
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Calibration frequency:	3 years												
Installation Date:	12/12/2012												
Manufacturer Calibration:	21/06/2012												
Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated monthly and yearly. The flow meter includes automatic measure of the Temperature and Pressure so the measure is expressed in normalized cubic meter.												
Calculation method (if applicable):	N/A												
QA/QC procedures:	The flow meter was calibrated by the factory and has been subject to regular maintenance. The calibration frequency is every 3 years as per manufacturer recommendations.												
Purpose of data:	Calculation of baseline emissions												
Additional comment:	-												

Data / Parameter:	LFG_{flare,y}												
Unit:	Nm ³												
Description:	Amount of landfill gas flared at normal temperature and pressure on a wet basis.												
Measured/ Calculated / Default:	Measured on site with a flowmeter												
Source of data:	Project developer												
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet												
Monitoring equipment:	<table border="1"> <tr> <td></td><td>Type: Swirl flow meter</td></tr> <tr> <td>Accuracy class:</td><td>± 0.5% off full scale</td></tr> <tr> <td>Serial number:</td><td>241488749/X002</td></tr> <tr> <td>Calibration frequency:</td><td>3 years</td></tr> <tr> <td>Installation Date:</td><td>12/12/2012</td></tr> <tr> <td>Manufacturer Calibration:</td><td>21/06/2012</td></tr> </table>		Type: Swirl flow meter	Accuracy class:	± 0.5% off full scale	Serial number:	241488749/X002	Calibration frequency:	3 years	Installation Date:	12/12/2012	Manufacturer Calibration:	21/06/2012
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Installation Date:	12/12/2012												
Manufacturer Calibration:	21/06/2012												

Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated, monthly and yearly. The flow meter includes automatic measure of the Temperature and Pressure so the measure is expressed in normalized cubic meter.
Calculation method (if applicable):	N/A
QA/QC procedures:	The flow meter was calibrated by the factory and has been subject to regular maintenance. The calibration frequency is every 3 years as per manufacturer recommendations.
Purpose of data:	Calculation of baseline emissions
Additional comment:	$LFG_{flare,y}$ is considered to be equivalent to the variable $FV_{RG,h}$ (volumetric flow rate of the residual gas) as described in the “ <i>Tool to determine Project emissions from flaring gases containing methane</i> ” EB 28 Annex 13 used to determine project emissions from flaring. Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity

Data / Parameter:	$LFG_{electricity,y}$
Unit:	Nm^3
Description:	Amount of landfill gas combusted in power plant at Normal Temperature and Pressure
Measured/ Calculated / Default:	Measured
Source of data:	Project developer
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A
Purpose of data:	Calculation of project emissions
Additional comment:	This phase of the project activity (which involves the generation of electricity from LFG, reducing CO ₂ emissions associated to the use of grid electricity) has not yet been implemented during this monitoring period. Thus not landfill gas was combusted in power plant during this monitoring period.

Data / Parameter:	$w_{CH_4,y}$
Unit:	$m^3 CH_4/m^3 LFG$
Description:	Methane fraction in the landfill gas on a wet basis
Measured/ Calculated / Default:	Measured
Source of data:	Gas Analyzer
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet.

Monitoring equipment:	<table border="1"> <tr> <th colspan="2">Type: Siemens ULTRAMAT 23 (Gas Analyzer)</th></tr> <tr> <td>Accuracy class:</td><td>± 1%</td></tr> <tr> <td>Serial number:</td><td>N1C7778</td></tr> <tr> <td>Calibration frequency:</td><td>12 months</td></tr> <tr> <td>Operation Period</td><td>14/12/2012 up to now</td></tr> <tr> <td>Manufacturer Calibration:</td><td>11/08/2012</td></tr> <tr> <td>Valid up to</td><td>10/08/2013</td></tr> <tr> <td>Calibration Date</td><td>28/07/2013</td></tr> <tr> <td>Valid up to</td><td>27/07/2014</td></tr> </table>	Type: Siemens ULTRAMAT 23 (Gas Analyzer)		Accuracy class:	± 1%	Serial number:	N1C7778	Calibration frequency:	12 months	Operation Period	14/12/2012 up to now	Manufacturer Calibration:	11/08/2012	Valid up to	10/08/2013	Calibration Date	28/07/2013	Valid up to	27/07/2014
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Accuracy class:	± 1%																		
Serial number:	N1C7778																		
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Valid up to	10/08/2013																		
Calibration Date	28/07/2013																		
Valid up to	27/07/2014																		
Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated, monthly and yearly.																		
Calculation method (if applicable):	N/A																		
QA/QC procedures:	The gas analyzer is subject to regular maintenance and testing. The calibration regime is regular, in accordance with manufacturer specifications to ensure its accuracy.																		
Purpose of data:	Calculation of baseline emissions.																		
Additional comment:	w_{CH_4} is considered to be equivalent to the variable $fv_{CH_4,h}$ (volumetric fraction of the component CH_4 in the residual gas in the hour h) as described in the “Tool to determine Project emissions from flaring gases containing methane”, EB 28 Annex 13. Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity.																		

Data / Parameter:	$PE_{flare,y}$
Unit:	tCO ₂ e
Description:	Project emissions from flaring of the residual gas stream in year y
Measured/ Calculated / Default:	Calculated
Source of data:	Project Developer
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet.
Monitoring equipment:	See parameters $fv_{i,h}$, $FV_{RG,h}$, $t_{O_2,h}$, $fv_{CH_4,FG,h}$ and T_{flare}
Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated, monthly and yearly.
Calculation method (if applicable):	Calculated as per the “Tool to determine project emissions from flaring gases containing methane”, EB 28 Annex 13
QA/QC procedures:	As per the “Tool to determine project emissions from flaring gases containing methane”, EB 28 Annex 13
Purpose of data:	Calculation of baseline emissions
Additional comment:	Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity

Data / Parameter:	T_{flare}																																																																
Unit:	°C																																																																
Description:	Temperature in the exhaust gas of the flare																																																																
Measured/ Calculated / Default:	Measured																																																																
Source of data:	Project Developer																																																																
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet																																																																
Monitoring equipment:	<table border="1"> <tr><td colspan="2">ELSI Thermocouples, Model M1</td></tr> <tr><td>Accuracy class:</td><td>±2.5 °C or ±0.0075 x temperature</td></tr> <tr><td>Serial number:</td><td>06-12/64190</td></tr> <tr><td>Calibration frequency:</td><td>Annual</td></tr> <tr><td>Installation date:</td><td>12/12/2012</td></tr> <tr><td>Date of calibrations</td><td>05/09/2012 and 17/09/2013</td></tr> <tr><td>Validity:</td><td>16/09/2014</td></tr> <tr><td>Operation Period:</td><td>14/12/2012 – 24/05/2013</td></tr> <tr><td colspan="2">Second Thermocouple used</td></tr> <tr><td colspan="2">ELSI Thermocouples, Model M1</td></tr> <tr><td>Accuracy class:</td><td>±2.5 °C or ±0.0075 x temperature</td></tr> <tr><td>Serial number:</td><td>06-12/64187</td></tr> <tr><td>Calibration frequency:</td><td>Annual</td></tr> <tr><td>Installation date:</td><td>12/12/2012</td></tr> <tr><td>Date of last calibration</td><td>05/09/2012</td></tr> <tr><td>Validity:</td><td>11/12/2013</td></tr> <tr><td>Operation Period:</td><td>14/12/2012 – 24/05/2013</td></tr> <tr><td colspan="2">Second Thermocouple replaced by:</td></tr> <tr><td colspan="2">ELSI Thermocouples, Model M1</td></tr> <tr><td>Accuracy class:</td><td>±2.5 °C or ±0.0075 x temperature</td></tr> <tr><td>Serial number:</td><td>06-12/64091</td></tr> <tr><td>Calibration frequency:</td><td>Annual</td></tr> <tr><td>Installation date:</td><td>24/05/2013</td></tr> <tr><td>Date of last calibration</td><td>26/06/2012 and 17/09/2013</td></tr> <tr><td>Validity:</td><td>16/09/2014</td></tr> <tr><td>Operation Period:</td><td>24/05/2013 up to now</td></tr> </table> <p>The validity of the calibration period starts at the moment the equipment initiates operation in the Flare System.</p> <p>The information for the back-up thermocouple is as follows</p> <table border="1"> <tr><td colspan="2">Back-up Thermocouple</td></tr> <tr><td colspan="2">ELSI Thermocouples, Model M1</td></tr> <tr><td>Accuracy class:</td><td>±2.5 °C or ±0.0075 x temperature</td></tr> <tr><td>Serial number:</td><td>10-13/65896</td></tr> <tr><td>Calibration frequency:</td><td>Annual</td></tr> <tr><td>Date of last calibration</td><td>21/10/2013</td></tr> </table>	ELSI Thermocouples, Model M1		Accuracy class:	±2.5 °C or ±0.0075 x temperature	Serial number:	06-12/64190	Calibration frequency:	Annual	Installation date:	12/12/2012	Date of calibrations	05/09/2012 and 17/09/2013	Validity:	16/09/2014	Operation Period:	14/12/2012 – 24/05/2013	Second Thermocouple used		ELSI Thermocouples, Model M1		Accuracy class:	±2.5 °C or ±0.0075 x temperature	Serial number:	06-12/64187	Calibration frequency:	Annual	Installation date:	12/12/2012	Date of last calibration	05/09/2012	Validity:	11/12/2013	Operation Period:	14/12/2012 – 24/05/2013	Second Thermocouple replaced by:		ELSI Thermocouples, Model M1		Accuracy class:	±2.5 °C or ±0.0075 x temperature	Serial number:	06-12/64091	Calibration frequency:	Annual	Installation date:	24/05/2013	Date of last calibration	26/06/2012 and 17/09/2013	Validity:	16/09/2014	Operation Period:	24/05/2013 up to now	Back-up Thermocouple		ELSI Thermocouples, Model M1		Accuracy class:	±2.5 °C or ±0.0075 x temperature	Serial number:	10-13/65896	Calibration frequency:	Annual	Date of last calibration	21/10/2013
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Date of last calibration	21/10/2013																																																																

Measuring/ Reading/ Recording frequency:	Data is measured continuously. Data aggregated monthly and yearly.
Calculation method (if applicable):	N/A
QA/QC procedures:	Measuring instruments are subject to regular maintenance and testing regime, based on the manufacturer's recommended schedule and procedures
Purpose of data:	Calculation of baseline emissions
Additional comment:	Required to determine adequate operation and operating hours of the flare. Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity.

Data / Parameter:	t _{O2,h}																																		
Unit:	--																																		
Description:	Volumetric fraction of O ₂ in the exhaust gas of the flare on wet basis in the hour <i>h</i>																																		
Measured/ Calculated / Default:	Measured																																		
Source of data:	Project Developer																																		
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet																																		
Monitoring equipment:	<div>The gas analyser is used to measure the exhaust gas composition. The manufacturer of the gas analyser is Siemens.</div> <table><tr><th colspan="3">Type: Siemens ULTRAMAT 23 (Flare Emissions Analyzer)</th></tr><tr><td>Serial number:</td><td colspan="2">N1C7779</td></tr><tr><td rowspan="2">Accuracy class:</td><td>CH4</td><td>O2</td></tr><tr><td>25 ppm + 0.25%</td><td>25 ppm + 0.25%</td></tr><tr><td>Operation Period:</td><td colspan="2">14/12/2012 up to now</td></tr><tr><td>Calibration frequency:</td><td colspan="2">12 months</td></tr><tr><td>Factory Calibration:</td><td colspan="2">11/08/2012</td></tr><tr><td>Start of operations</td><td colspan="2">14/12/2012</td></tr><tr><td>Valid up to:</td><td colspan="2">10/08/2013</td></tr><tr><td>Calibration Date:</td><td colspan="2">28/07/2013</td></tr><tr><td>Valid up to:</td><td colspan="2">27/07/2014</td></tr></table>			Type: Siemens ULTRAMAT 23 (Flare Emissions Analyzer)			Serial number:	N1C7779		Accuracy class:	CH4	O2	25 ppm + 0.25%	25 ppm + 0.25%	Operation Period:	14/12/2012 up to now		Calibration frequency:	12 months		Factory Calibration:	11/08/2012		Start of operations	14/12/2012		Valid up to:	10/08/2013		Calibration Date:	28/07/2013		Valid up to:	27/07/2014	
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Valid up to:	27/07/2014																																		
Measuring/ Reading/ Recording frequency:	Data is measured continuously and aggregated monthly and yearly																																		
Calculation method (if applicable):	N/A																																		
QA/QC procedures:	Analyzers will be calibrated according to the manufacturer's recommendation and in accordance with appropriate national/international standards to ensure its accuracy. A zero check and a typical value check will be performed by comparison with a standard certified gas.																																		
Purpose of data:	Calculation of baseline emissions																																		
Additional comment:	Monitoring of this parameter is due to continuous monitoring of the flare efficiency. Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity.																																		

Data / Parameter:	fv _{CH4,h}																																	
Unit:	-																																	
Description:	Volumetric fraction of methane in the residual gas on wet basis in the hour h																																	
Measured/ Calculated / Default:	Measured																																	
Source of data:	Project developer																																	
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet																																	
Monitoring equipment:	<div>The gas analyser is used to measure the exhaust gas composition. The manufacturer of the gas analyser is Siemens.</div> <table><tr><th colspan="3">Type: Siemens ULTRAMAT 23 (Flare Emissions Analyzer)</th></tr><tr><td>Serial number:</td><td colspan="2">N1C7779</td></tr><tr><td rowspan="2">Accuracy class:</td><td>CH4</td><td>O2</td></tr><tr><td>25 ppm + 0.25%</td><td>25 ppm + 0.25%</td></tr><tr><td>Operation Period:</td><td colspan="2">14/12/2012 up to now</td></tr><tr><td>Calibration frequency:</td><td colspan="2">12 months</td></tr><tr><td>Factory Calibration:</td><td colspan="2">11/08/2012</td></tr><tr><td>Start of operations</td><td colspan="2">14/12/2012</td></tr><tr><td>Valid up to:</td><td colspan="2">10/08/2013</td></tr><tr><td>Calibration Date:</td><td colspan="2">28/07/2013</td></tr><tr><td>Valid up to:</td><td colspan="2">27/07/2014</td></tr></table>		Type: Siemens ULTRAMAT 23 (Flare Emissions Analyzer)			Serial number:	N1C7779		Accuracy class:	CH4	O2	25 ppm + 0.25%	25 ppm + 0.25%	Operation Period:	14/12/2012 up to now		Calibration frequency:	12 months		Factory Calibration:	11/08/2012		Start of operations	14/12/2012		Valid up to:	10/08/2013		Calibration Date:	28/07/2013		Valid up to:	27/07/2014	
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Calibration Date:	28/07/2013																																	
Valid up to:	27/07/2014																																	
Measuring/ Reading/ Recording frequency:	Measured continuously and aggregated monthly and yearly. The flow meter includes automatic measure of the Temperature and Pressure so the measure is expressed in normalized cubic meter.																																	
Calculation method (if applicable):	N/A																																	
QA/QC procedures:	Gas analyzer will be periodically calibrated according to the manufacturer's recommendation and in accordance with appropriate national/international standards to ensure its accuracy. A zero check and a typical value check will be performed by comparison with a standard certified gas.																																	
Purpose of data:	Calculation of baseline emissions																																	
Additional comment:	fv _{CH4,h} is considered to be equivalent to the variable w _{CH4} (methane fraction in the landfill gas on a wet basis). Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity																																	

Data / Parameter:	$Fv_{RG,h}$												
Unit:	m^3/h												
Description:	Volumetric flow rate of the residual gas on wet basis at normal (NTP) conditions in the hour h												
Measured/ Calculated / Default:	Measured												
Source of data:	Project developer												
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet.												
Monitoring equipment:	<table border="1"> <tr> <td></td><td>Type: Swirl Flow Meter</td></tr> <tr> <td>Accuracy class:</td><td>$\pm 0.5\%$ off full scale</td></tr> <tr> <td>Serial number:</td><td>241488749/X002</td></tr> <tr> <td>Calibration frequency:</td><td>3 years</td></tr> <tr> <td>Installation Date:</td><td>12/12/2012</td></tr> <tr> <td>Manufacturer Calibration:</td><td>21/06/2012</td></tr> </table>		Type: Swirl Flow Meter	Accuracy class:	$\pm 0.5\%$ off full scale	Serial number:	241488749/X002	Calibration frequency:	3 years	Installation Date:	12/12/2012	Manufacturer Calibration:	21/06/2012
	Type: Swirl Flow Meter												
Accuracy class:	$\pm 0.5\%$ off full scale												
Serial number:	241488749/X002												
Calibration frequency:	3 years												
Installation Date:	12/12/2012												
Manufacturer Calibration:	21/06/2012												
Measuring/ Reading/ Recording frequency:	<p>Measured continuously.</p> <p>Data to be aggregated, monthly and yearly.</p> <p>The flow meter includes automatic measure of the Temperature and Pressure so the measure is expressed in normalized cubic meter.</p>												
Calculation method (if applicable):	N/A												
QA/QC procedures:	Flow meters are to be periodically calibrated according to the manufacturer's recommendations. It will be subject to a regular maintenance, testing and calibration regime in accordance with manufacturer specifications and appropriate national/international standards to ensure its accuracy												
Purpose of data:	Calculation of baseline emissions												
Additional comment:	<p>$FV_{RG,h}$ is considered the equivalent of the variable $LFG_{flared,y}$ (Amount of landfill gas flared at normal temperature and pressure).</p> <p>Monitoring of this parameter is due to continuous monitoring of the flare efficiency.</p> <p>Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity</p>												

Data / Parameter:	$fv_{CH_4,FG,h}$																		
Unit:	m ³ CH ₄ /m ³ LFG																		
Description:	Methane fraction in the landfill gas on a wet basis																		
Measured/ Calculated / Default:	Measured																		
Source of data:	Gas Analyzer																		
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet.																		
Monitoring equipment:	<table border="1"> <tr> <th colspan="2">Type: Siemens ULTRAMAT 23 (Gas Analyzer)</th></tr> <tr> <td>Accuracy class:</td><td>± 1%</td></tr> <tr> <td>Serial number:</td><td>N1C7778</td></tr> <tr> <td>Calibration frequency:</td><td>12 months</td></tr> <tr> <td>Operation Period</td><td>14/12/2012 up to now</td></tr> <tr> <td>Manufacturer Calibration:</td><td>11/08/2012</td></tr> <tr> <td>Valid up to</td><td>10/08/2013</td></tr> <tr> <td>Calibration Date</td><td>28/07/2013</td></tr> <tr> <td>Valid up to</td><td>27/07/2014</td></tr> </table>	Type: Siemens ULTRAMAT 23 (Gas Analyzer)		Accuracy class:	± 1%	Serial number:	N1C7778	Calibration frequency:	12 months	Operation Period	14/12/2012 up to now	Manufacturer Calibration:	11/08/2012	Valid up to	10/08/2013	Calibration Date	28/07/2013	Valid up to	27/07/2014
Type: Siemens ULTRAMAT 23 (Gas Analyzer)																			
Accuracy class:	± 1%																		
Serial number:	N1C7778																		
Calibration frequency:	12 months																		
Operation Period	14/12/2012 up to now																		
Manufacturer Calibration:	11/08/2012																		
Valid up to	10/08/2013																		
Calibration Date	28/07/2013																		
Valid up to	27/07/2014																		
Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated, monthly and yearly.																		
Calculation method (if applicable):	N/A																		
QA/QC procedures:	The gas analyzer is subject to regular maintenance and testing. The calibration regime is regular, in accordance with manufacturer specifications to ensure its accuracy.																		
Purpose of data:	Calculation of baseline emissions.																		
Additional comment:	Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity																		

Data / Parameter:	EL_{LFG}
Unit:	MWh
Description:	Net amount of electricity generated using LFG.
Measured/ Calculated / Default:	Measured
Source of data:	Project Developer
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	N/A
QA/QC procedures:	-
Purpose of data:	Calculation of baseline emissions

Additional comment:	This phase of the project activity (which involves the generation of electricity from LFG, reducing CO ₂ emissions associated to the use of grid electricity) has not yet been implemented during this monitoring period. Thus not landfill gas was combusted in power plant during this monitoring period.
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Data / Parameter:	Operation of the energy plant
Unit:	Hours
Description:	Operation of the energy plant
Measured/ Calculated / Default:	Measured
Source of data:	Project Developer
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	N/A
QA/QC procedures:	-
Purpose of data:	Calculation of baseline emissions
Additional comment:	This phase of the project activity (which involves the generation of electricity from LFG, reducing CO ₂ emissions associated to the use of grid electricity) has not yet been implemented during this monitoring period. Thus not landfill gas was combusted in power plant during this monitoring period.

Data / Parameter:	PE _{EC,y}
Unit:	tCO ₂
Description:	Project emissions from electricity consumption by the project activity during the year y
Measured/ Calculated / Default:	Calculated as per the <i>"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"</i> , Version 01.
Source of data:	Project developer
Value(s) of monitored parameter:	Refer to tables of section E.2
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Measured continuously. Data to be aggregated, monthly and yearly.
Calculation method (if applicable):	As per the <i>"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"</i> , Version 01.
QA/QC procedures:	As per the <i>"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"</i> , Version 01.
Purpose of data:	Calculation of project emissions
Additional comment:	Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity

Data / Parameter:	EC_{PJ,y}																														
Unit:	MWh																														
Description:	Quantity of electricity consumed by the project activity during the year y																														
Measured/ Calculated / Default:	Measured																														
Source of data:	Project developer																														
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet																														
Monitoring equipment:	<p>Two electricity meters are available on the project site. Only one electricity meter is used in operation the other equipment is used for spare part (back-up).</p> <table border="1"> <thead> <tr> <th colspan="2">Type: IME Electricity Meter</th></tr> </thead> <tbody> <tr> <td>Serial number:</td><td>2397270032</td></tr> <tr> <td>Models:</td><td>Nemo 96HD</td></tr> <tr> <td>Accuracy:</td><td>Active energy class 0.5</td></tr> <tr> <td>Calibration frequency:</td><td>5 years as per Brazilian standard²</td></tr> <tr> <td>Calibration Date</td><td>31/08/2012</td></tr> <tr> <td>Operation Period</td><td>14/12/2012 up to now</td></tr> <tr> <th colspan="2">Back-up Electricity Meter</th></tr> <tr> <th colspan="2">Type: IME Electricity Meter</th></tr> <tr> <td>Serial number:</td><td>2701780188</td></tr> <tr> <td>Models:</td><td>Nemo 96HD</td></tr> <tr> <td>Accuracy:</td><td>Active energy class 0.5</td></tr> <tr> <td>Calibration frequency:</td><td>5 years as per Brazilian standard</td></tr> <tr> <td>Calibration Date</td><td>29/10/2013</td></tr> <tr> <td>Operation Period</td><td>-</td></tr> </tbody> </table>	Type: IME Electricity Meter		Serial number:	2397270032	Models:	Nemo 96HD	Accuracy:	Active energy class 0.5	Calibration frequency:	5 years as per Brazilian standard ²	Calibration Date	31/08/2012	Operation Period	14/12/2012 up to now	Back-up Electricity Meter		Type: IME Electricity Meter		Serial number:	2701780188	Models:	Nemo 96HD	Accuracy:	Active energy class 0.5	Calibration frequency:	5 years as per Brazilian standard	Calibration Date	29/10/2013	Operation Period	-
Type: IME Electricity Meter																															
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Accuracy:	Active energy class 0.5																														
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Serial number:	2701780188																														
Models:	Nemo 96HD																														
Accuracy:	Active energy class 0.5																														
Calibration frequency:	5 years as per Brazilian standard																														
Calibration Date	29/10/2013																														
Operation Period	-																														
Measuring/ Reading/ Recording frequency:	Electricity will be measured continuously using an electricity meter. Data will be aggregated at least annually as stated in the " <i>Tool to calculate Project emissions from electricity consumption</i> " version 01.																														
Calculation method (if applicable):	N/A																														
QA/QC procedures:	Electricity meter will be subject to regular maintenance and testing in accordance with stipulation of the meter supplier and in accordance with appropriate national/international standards to ensure accuracy																														
Purpose of data:	Calculation of project emissions.																														
Additional comment:	Data will be kept for 2 years after end of crediting period or last issuance of CERs for the project activity.																														

² <http://www.inmetro.gov.br/legislacao/rtac/pdf/RTAC001671.pdf>

Data / Parameter:	$EF_{grid, CM, y} = CEF_{elec, BL, y} = EF_{EL, i, y}$
Unit:	tCO ₂ /MWh
Description:	Combined margin emission factor
Measured/ Calculated / Default:	Calculated using the “ <i>Tool to calculate the emission factor for an electricity system</i> ”, Version 2.2.0
Source of data:	Published data by the Brazilian Ministry of Science and Technology for values for OM _{grid} and BM _{grid}
Value(s) of monitored parameter:	0.28015 for 2012 0.29905 for 2013
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	As per the “ <i>Tool to calculate the emission factor for an electricity system</i> ” version 2.2.0.
QA/QC procedures:	N/A
Purpose of data:	Calculation of project emissions
Additional comment:	The last available value for the Building Margin as of the date of this report is 0.2010 for year 2012.

Data / Parameter:	$PE_{FC, i, y}$
Unit:	tCO ₂
Description:	Project emissions from fossil fuel combustion
Measured/ Calculated / Default:	Calculated as per the “ <i>Tool to calculate project or leakage CO2 emissions from fossil fuel combustion</i> ”, Version 02
Source of data:	N/A
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	Calculated as per the “ <i>Tool to calculate project or leakage CO2 emissions from fossil fuel combustion</i> ”, Version 02.
QA/QC procedures:	N/A
Purpose of data:	Calculation of project emissions
Additional comment:	No LPG Consumption during this monitoring period.

Data / Parameter:	$FC_{i, i, y}$
Unit:	m ³ /yr
Description:	Onsite combustion of fossil fuels of type <i>i</i> (LPG or diesel) in process <i>j</i> (flare ignition system) during the year <i>y</i>
Measured/ Calculated / Default:	Calculated as per the “ <i>Tool to calculate project or leakage CO2 emissions from fossil fuel combustion</i> ”, Version 02
Source of data:	N/A
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A

Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	Calculated as per the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion", Version 02
QA/QC procedures:	N/A
Purpose of data:	Calculation of project emissions
Additional comment:	No LPG Consumption during this monitoring period.

Data / Parameter:	NCV_{i,y}
Unit:	GJ/m ³
Description:	Weighted average net calorific value of fuel type <i>i</i> (LPG or diesel) in year <i>y</i>
Measured/ Calculated / Default:	Measured
Source of data:	Fuel supplier
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Monthly or annual.
Calculation method (if applicable):	N/A
QA/QC procedures:	Values will be verified to check that they are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO17025 accreditation or justify that they can comply with similar quality standards
Purpose of data:	Calculation of project emissions
Additional comment:	No fuel consumption during this monitoring period.

Data / Parameter:	EF_{CO₂,i,y}
Unit:	tCO ₂ /GJ
Description:	Weighted average CO ₂ emission factor of fuel type <i>i</i> (LPG or diesel) in year <i>y</i>
Measured/ Calculated / Default:	Default
Source of data:	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories (there is no available data from the fuel supplier).
Value(s) of monitored parameter:	0.0656 for LPG
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Monthly or annual.
Calculation method (if applicable):	N/A

QA/QC procedures:	Will be checked against any future revision of IPCC Guidelines
Purpose of data:	Calculation of project emissions
Additional comment:	No fuel consumption during this monitoring period.

Data / Parameter:	Other flare operation parameters: T_{flare} and $LFG_{\text{flare},y}$
Unit:	-
Description:	The range of operating conditions is defined according to the methodology and the manufacturer's specifications based on the flow of LFG to the flare and the temperature of the exhaust gas.
Measured/ Calculated / Default:	Measured
Source of data:	Project developer
Value(s) of monitored parameter:	Please refer to ER calculation spreadsheet
Monitoring equipment:	Thermocouple and flow meter measurements
Measuring/ Reading/ Recording frequency:	Monitored continuously.
Calculation method (if applicable):	<p>Data will be continuously measured to ensure that the flare/s operate within the range specified by the methodology and the manufacturer in terms of the temperature of the exhaust gas and the LFG flow rate, as follows:</p> <p>Minimum temperature: 500°C Maximum temperature: 1,430°C Minimum flow rate: 500 Nm³/h Maximum flow rate: 2,500 Nm³/h</p> <p>The thermocouple and the flow meter will also follow the measurement methods and procedures described for T_{flare} and $LFG_{\text{flare},y}$</p>
QA/QC procedures:	As previously defined for T_{flare} and $LFG_{\text{flare},y}$
Purpose of data:	Calculation of baseline emissions
Additional comment:	Only applicable in case of use of a default value.

D.3. Implementation of sampling plan

Not applicable – sampling approach is not applied

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

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

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According to the baseline methodology ACM0001 - Version 11, Baseline Emissions are calculated as follows:

$$BE_y = (MD_{project,y} - MD_{BL,y}) \times GWP_{CH_4} + EL_{LFG,y} \cdot CEF_{elec,BL,y} + ET_{LFG,y} \times CEF_{ther,BL,y}$$

Where:

BE_y = Baseline emissions in year y (t CO₂e).

$MD_{project,y}$ = The amount of methane that would have been destroyed/combusted during the year, n tons of methane (t CH₄) 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 tons of methane (t CH₄)

GWP_{CH_4} = Global Warming Potential value for methane, 21 tCO₂e/t CH₄ for the first commitment period and 25 tCO₂e/t CH₄ thereafter.

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

$CEF_{elec,BL,y}$ = CO₂ emissions intensity of the baseline source of electricity displaced, in tCO₂e/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.

$CEF_{ther,BL,y}$ = CO₂ emissions intensity of the fuel used by boiler/air heater to generate thermal energy which is displaced by LFG based thermal energy generation, in tCO₂e/TJ.

The baseline emissions in a given year “y” (BE_y) is the difference between the amount of methane actually destroyed/combusted during the year ($MD_{project,y}$) and the amount of methane that would have been destroyed/combusted during the year in the absence of the project activity ($MD_{BL,y}$), times the approved Global Warming Potential value for methane (GWP_{CH_4}), plus the net quantity of electricity displaced during the year (EL_y) multiplied by the CO₂ emissions intensity of the electricity displaced ($CEF_{electricity,y}$).

The term $MD_{BL,y}$ is equal to zero due to absence of any regulation and contractual requirements relating to this landfill site. The last term of the equation $ET_{LFG,y} \times CEF_{ther,BL,y}$ is equal to zero since there is no thermal energy produced by the project activity. In addition considering that there was no energy generation during this monitored period, parameters $EL_{LFG,y}$ and $CEF_{elec,y}$ will not be considered further in the Baseline Emission Reduction calculation.

The methane destroyed by the project activity ($MD_{project,y}$) during a year is determined by monitoring the quantity of methane actually flared and gas used to generate electricity and the total quantity of methane captured.

The sum of the quantities fed to de flare(s), to the power plant(s), to the boiler(s)/air heater(s)/heat generating equipment(s) and to the natural gas distribution network must be compared annually with the total quantity of methane generated. The lowest value of the two must be adopted as $MD_{project,y}$.

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

Where:

- $MD_{flared,y}$ = Quantity of methane destroyed by flaring (tCH₄).
- $MD_{electricity,y}$ = Quantity of methane destroyed by generation of electricity (tCH₄).
- $MD_{thermal,y}$ = Quantity of methane destroyed for generation of thermal energy (tCH₄).
- $MD_{PL,y}$ = Quantity of methane sent to the pipeline for feeding to the natural gas distribution network (tCH₄).

As the project does not use the methane to generate thermal energy, neither to send to the pipeline for feeding the natural gas distribution network, $MD_{thermal,y} = 0$ and $MD_{PL,y} = 0$.

Therefore for the project activity the above equation is simplified to:

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y}$$

The quantity of methane destroyed by flaring (t CH₄) is calculated using the following equation:

$$MD_{flared,y} = (LFG_{flare,y} \times w_{CH_4,y} \times D_{CH_4,y}) - (PE_{flared,y} / GWP_{CH_4})$$

Where:

- $LFG_{flare,y}$ = Quantity of landfill gas fed to the flare(s) during the year measured in cubic meters (m³).
- $w_{CH_4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m³ CH₄/m³ LFG)
- D_{CH_4} = Methane density expressed in tons of methane per cubic meter of methane (tCH₄/m³ CH₄).
- $PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y (tCO₂e) determined following the procedure described in the "Tool to determine project emissions from flaring gases Containing Methane". If methane is flared through more than one flare, the $PE_{flare,y}$ shall be determined for each flare using the tool.

The flare efficiency is continuously monitored as described in the PDD. The data used to calculate the quantity of methane flared are uploaded every minute to the external data center to a management program. The results of the amount of methane flared are aggregated on a monthly basis.

As there is no electricity generation using landfill gas, the amount of aggregated monthly data of methane flared is adopted as $MD_{project}$.

The final formula used to calculate the Baseline Emission is:

$$BE_y = MD_{project,y} * GWP_{CH_4}$$

The following tables show the collected data, from the period 29/09/2011 to 31/12/2013 in the project site.

Parameter	LFG _{total,y}	LFG _{flare,y}	$w_{CH_4,y}$	PEEC _y	$PE_{flare,y}$	$MD_{flared,y}$	MD_{flared}	MD_{total}	$MD_{project,y}$	$MD_{project,y} * GWP_{CH_4}$	BE_y	PE_y	ER_y
Unit	Nm ³	Nm ³	% Vol.	tCO ₂ e	tCO ₂ e	tCH ₄	tCH ₄	tCH ₄	tCH ₄	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
2012_12	173,913	173,913	22	0	34	56	56	58	56	1,183	1,182	1	1,181
2013_01	349,326	349,326	49	1	7	121	121	121	121	3,028	3,027	2	3,025
2013_02	673,990	673,990	46	1	32	225	225	227	225	5,637	5,636	2	5,634
2013_03	782,669	782,669	49	1	24	277	277	278	277	6,916	6,915	2	6,913
2013_04	739,904	739,904	50	2	77	268	268	271	268	6,701	6,701	3	6,698
2013_05	747,565	747,565	52	3	125	280	280	285	280	6,993	6,993	3	6,990
2013_06	298,074	298,074	53	3	6	112	112	112	112	2,807	2,806	3	2,803
2013_07	917,982	917,982	54	4	81	358	358	362	358	8,958	8,958	4	8,954
2013_08	1,283,421	1,283,421	56	5	75	510	510	513	510	12,756	12,755	5	12,750
2013_09	1,449,799	1,449,799	55	6	107	566	566	570	566	14,146	14,145	6	14,139
2013_10	1,402,356	1,402,356	54	7	109	544	544	548	544	13,598	13,597	8	13,589
2013_11	1,178,998	1,178,998	55	6	67	465	465	468	465	11,637	11,636	7	11,629
2013_12	1,087,996	1,087,996	55	4	75	426	426	429	426	10,657	10,657	5	10,652

Table 1: Data Monitored in the Monitoring Period (29/09/2011 - 31/12/2013)

Determination of $PE_{flare,y}$

When applying the tool, the continuous monitoring of the efficiency is selected for the enclosed flare (option b). According to the tool, $PE_{flare,y}$ is determined as follows:

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.

1. STEP 1. Determination of the mass flow rate of the residual gas that is flared

As per the tool, using the simplified approach, the project developer measures the volumetric fraction of methane and consider the difference to 100% as being nitrogen (N₂).

$$FM_{RG,h} = \rho_{RG,n,h} \times FV_{RG,h}$$

Where:

- $FM_{RG,h}$ = Mass flow rate of the residual gas in hour h, kg/h.
- $\rho_{RG,n,h}$ = Density of the residual gas at normal conditions in hour h, kg/m³.
- $FV_{RG,h}$ = Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h, m³/h.

$$\rho_{RG,n,h} = \frac{P_n}{\frac{R_u}{MM_{RG,h}} \times T_n}$$

Where:

- P_n = Atmospheric pressure at normal conditions (101 325), Pa
- R_u = Universal ideal gas constant (8 314), Pa.m³/kmol.K
- $MM_{RG,h}$ = Molecular mass of the residual gas in hour h, kg/kmol
- T_n = Temperature at normal conditions (273.15), K

$$MM_{RG,h} = \sum_i (fv_{i,h} \times MM_i)$$

Where:

- $fv_{i,h}$ = Volumetric fraction of component i in the residual gas in the hour h
- MM_i = Molecular mass of residual gas component i, kg/kmol
- i = Limited to the two main components CH₄ and N₂.

As per the tool, the project participant only measures the volumetric fraction of methane and considers the difference as 100% nitrogen (N₂). Therefore, only elements C, H, N are included in the calculation of STEP 2.

2. STEP 2. Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas

Not applicable (refer to step 1), the simplified approach was selected, thus only the volumetric fraction of methane is to be measured and the difference to 100% is to be considered as being nitrogen (N₂).

3. STEP 3. Determination of the volumetric flow rate of the exhaust gas on a dry basis

This step is applicable to the project activity because the methane combustion efficiency of the flare will be continuously monitored.

The average volumetric flow rate of the exhaust gas in each hour h is determined 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:

$$TV_{n,FG,h} = V_{n,FG,h} \times FM_{RG,h}$$

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

$$V_{n,FG,h} = V_{n,CO_2,h} + V_{n,O_2,h} + V_{n,N_2,h}$$

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
$V_{n,CO_2,h}$	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
$V_{n,O_2,h}$	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
$V_{n,N_2,h}$	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

$$V_{n,O_2,h} = n_{O_2,h} \times MV_n$$

Where:

Variable	SI unit	Description
$V_{n,O_2,h}$	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
$n_{O_2,h}$	kmol/kg residual gas	Quantity of moles O ₂ in the exhaust gas of the flare per kg residual gas flared in hour h
MV_n	m ³ / kmol	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 L/mol)

$$V_{n,N_2,h} = MV_n * \left\{ \frac{fm_{N,h}}{2004M_N} + \left(\frac{1 - MF_{O_2}}{MF_{O_2}} \right) * [F_h + n_{O_2,h}] \right\}$$

Where:

Variable	SI unit	Description
$V_{n,N_2,h}$	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_{O_2}	-	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
$n_{O_2,h}$	kmol/kg residual gas	Quantity of moles O ₂ in the exhaust gas of the flare per kg residual gas flared in hour h

$$V_{n,CO_2,h} = \frac{fm_{C,h}}{AM_C} * MV_n$$

Where:

Variable	SI unit	Description
$V_{n,CO_2,h}$	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
MV_n	m ³ / kmol	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 m ³ /Kmol)
$fm_{C,h}$	-	Mass fraction of carbon in the residual gas in the hour h
AM_C	kg/ kmol	Atomic mass of carbon

$$n_{O_2,h} = \left[\frac{t_{O_2,h}}{1 - (t_{O_2,h}/MF_{O_2})} \right] * \left[\frac{fm_{C,h}}{AM_C} + \frac{fm_{N,h}}{2AM_N} + \left(\frac{1 - MF_{O_2}}{MF_{O_2}} \right) x F_h \right]$$

Where

Variable	SI unit	Description
$n_{O_2,h}$	kmol/kg residual gas	Quantity of moles O ₂ in the exhaust gas of the flare per kg residual gas flared in hour h
$t_{O_2,h}$	-	Volumetric fraction of O ₂ in the exhaust gas in the hour h
MF_{O_2}	-	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
AM_j	kg/kmol	Atomic mass of element j
j	-	The elements carbon (index C) and nitrogen (index N)

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

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
AM_j	kg/kmol	Atomic mass of element j
j	-	The elements carbon (index C) , hydrogen (index H) and oxygen (index O)

4. STEP 4. Determination of methane mass flow rate of the exhaust gas on a dry basis

This step is applicable to this project activity because the combustion efficiency of the flare will be 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:

$$TM_{FG,h} = \frac{TV_{n,FG,h} * fv_{CH_4,FG,h}}{1000000}$$

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
$fv_{CH_4,FG,h}$	mg/m ³	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in hour h

5. STEP 5. Determination of methane mass flow rate in the residual gas on a dry basis

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH_4,RG,h} \times \rho_{CH_4,n}$$

Where:

- $TM_{RG,h}$ = Mass flow rate of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour h, kg/h.
- $fv_{CH_4,RG,h}$ = Volumetric fraction of methane in the residual gas on dry basis in hour h.
- $\rho_{CH_4,n}$ = Density of methane at normal conditions (0.716), kg/m³.

6. STEP 6. Determination of the hourly flare efficiency

The approach used in the project is enclosed flare with continuous monitoring.

In this case the flare efficiency in the hour h ($\eta_{flare,h}$) is determined as follows in cases where the temperature of the exhaust gas of the flare (T_{flare}) is above 760 °C for more than 40 minutes during the hour h :

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

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

In case of the continuous monitoring system is unavailable for maintenance, or failure, the following methods will be used:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.

7. STEP 7. Calculation of annual project emissions from flaring

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH_4}}{1000}$$

Where:

- $PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y, tCO₂e.
- $\eta_{flare,h}$ = Flare efficiency in hour h
- GWP_{CH_4} = Global Warming Potential of methane valid for the commitment period, tCO₂e/tCH₄

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

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According to the baseline methodology ACM0001 - Version 11, Project Emissions are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,i,y}$$

Where:

- $PE_{EC,y}$ = Emissions from consumption of electricity in the project case.
- $PE_{FC,i,y}$ = Emissions from consumption of heat

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

Scenario A applies to this project activity (i.e., electricity from the grid). Furthermore, the option **A1** has been selected, i.e., the combined margin emission factor is calculated, using the procedures of the Tool to calculate the emission factor for an electricity system ($EF_{EL,i/k/l,y} = EF_{grid,CM,y}$).

The generic approach has been selected for this project activity:

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

Where:

$EC_{PJ,i,y}$	Quantity of electricity consumed by the project activity during the year y (MWh/y)
$EF_{EL,j,y}$	Emission factor for the electricity grid ($EF_{EL,i/k/l,y} = EF_{grid,CM,y}$) in year y (tCO ₂ /MWh)
$TDL_{i,y}$	Average technical transmission and distribution losses for providing the electricity source j in year y
j	sources of electricity consumption in the project

Project emissions from fossil fuel combustion ($PE_{FC,i,y}$) are calculated following version 02 of “*Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion*”. For this project, LPG (Liquefied Petroleum Gas) is used for the ignition of the flare system, and an option has been included to account for project emissions that might occur in case the backup diesel generator is used, thus these emissions are calculated as follows:

$$PE_{FC,i,y} = FC_{i,i,y} * COEF_{i,y}$$

Where

$FC_{i,i,y}$	is the quantity of fossil fuel i (LPG or diesel) combusted in process j (flare ignition) during year y (m ³)
$COEF_{i,y}$	is the CO ₂ emission coefficient of the fuel (tCO ₂ /m ³ fuel)

Due to data availability, $COEF_{i,y}$ is calculated following Option B of the tool:

$$COEF_{i,y} = NCV_{i,y} * EF_{CO2i,y}$$

Where

$NCV_{i,y}$ Is the weighted average net calorific value of the fuel type i in year y (GJ/ m³)

$EF_{CO2i,y}$ Is the weighted average CO₂ emission factor of fuel type i in year y (tCO₂/GJ)

Given that there was no fossil fuel consumption during this monitored period, project emissions are only those coming from electricity consumption. These are as follows:

Electrical Energy Emission $PE_{EC,y}$ (tCO ₂)			
Parameter:	$EC_{PJ,i,y}$ (MW.h)	$EF_{EL,i,y}$	$PE_{EC,y}$ (tCO ₂)
Reference Year and Month YYYY_MM	MWh used in the project	Emission factor from electricity consumption of the project activity (tCO ₂ /MWh)	Project emissions from electricity consumption
2012_12	1.48	0.28015	0.41
2013_01	4.91	0.29905	1.47
2013_02	3.99	0.29905	1.19
2013_03	4.21	0.29905	1.26
2013_04	7.58	0.29905	2.27
2013_05	9.70	0.29905	2.90
2013_06	8.44	0.29905	2.52
2013_07	12.97	0.29905	3.88
2013_08	15.81	0.29905	4.73
2013_09	19.33	0.29905	5.78
2013_10	23.45	0.29905	7.01
2013_11	20.92	0.29905	6.26
2013_12	15.04	0.29905	4.50

* To be conservative, the Project Emissions are rounded up.

E.3. Calculation of leakage

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According to the baseline methodology ACM0001 - Version 11, no leakage effects need to be accounted under that methodology.

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

According to the baseline methodology ACM0001 - Version 11, Emissions Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

- ER_y = Emission reductions in year y (tCO₂e/yr)
- BE_y = Baseline emissions in year y (tCO₂e/yr)
- PE_y = Project emissions in year y (tCO₂e/yr)

Emission Reductions ¹				
Description / Date	Baseline Emissions	Project Emissions	Leakage	Emission Reductions
Parameter	BE _y ²	PE _y ³	Leakage	ER _y
Unit	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
12/2012	1,182	1	-	1,181
01/2013	3,027	2	-	3,025
02/2013	5,636	2	-	5,634
03/2013	6,915	2	-	6,913
04/2013	6,701	3	-	6,698
05/2013	6,993	3	-	6,990
06/2013	2,806	3	-	2,803
07/2013	8,958	4	-	8,954
08/2013	12,755	5	-	12,750
09/2013	14,145	6	-	14,139
10/2013	13,597	8	-	13,589
11/2013	11,636	7	-	11,629
12/2013	10,657	5	-	10,652
Total	105,008	51		104,957

¹ To be conservative, the Baseline Emissions are rounded down.

² To be conservative, the Project Emissions are rounded up.

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO ₂ e)
Total	105,008	51	-	104,957

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 (t CO₂e)	170,845	104,957

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

Non applicable since the actual value is below the PDD value.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO ₂ e)	1,181	103,776

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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 anthropogenic 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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