



Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	Loma Los Colorados Landfill Gas Project
Reference number of the project activity	0822
Version number of the monitoring report	1
Completion date of the monitoring report	04/01/2013
Registration date of the project activity	17/03/2007
Monitoring period number and duration of this monitoring period	Monitoring period #8 from 01/09/2012 to 31/12/2012
Project participant(s)	KDM S.A. The Kansai Electric Power Co., Inc. Urbaser S.A.
Host Party(ies)	Chile
Sectoral scope(s) and applied methodology(ies)	Sectoral Scopes: 1: Energy industries (renewable/non-renewable sources); 13 : Waste handling and disposal; <u>Applied CDM baseline and monitoring methodologies:</u> ACM0001 - Consolidated methodology for landfill gas project activities (version 4); ACM0002 - Consolidated methodology for grid-connected electricity generation from renewable sources (version 6)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	232,898
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	201,238

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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The CDM project activity "Loma Los Colorados Landfill Gas Project" encompasses collection of landfill gas (LFG) at the Loma los Colorados landfill; its destruction through combustion in high temperature enclosed flares and its utilization as gaseous fuel for electricity generation in electricity generation facilities.

At the end of the considered monitoring period, as part of the project activity, there were 325 LFG collecting wells¹ built over a 55 Ha surface of the landfill.

During the considered monitoring period the following equipment/infrastructure additions occurred:

Installation of one additional high temperature enclosed flare:

As part of the earlier planned/forecasted expansion of the project activity, the installation of the third high temperature enclosed flare was finished on 02/12/2012. Continuous operation of this additional flare is expected to start in January 2013.

Addition in installed power generation capacity:

As part of the planned gradual implementation phase of the CLLC-2 electricity generation facility, two additional GE Jenbacher J420 engine-generator sets (with nameplate installed capacity of 1.4 MW each) were installed at the project site (with continuous operation of these additional power generation equipment fuelled by collected LFG starting on 13/11/2012). Thus, since this date, the CLLC-2 electricity generation facility became with 15.4 MW of total nameplate installed electricity generation capacity. This occurred capacity increase is in accordance to the project design details made available in the registered PDD.

It is important to note that as per the planned gradual implementation plan for the CLLC-2 electricity generation facility, further capacity additions are yet to occur:

- in year 2013, 2 additional engine-generator sets are also expected to be installed and further additional units are expected to be further implemented during the period from year 2014 until 2028. By 2028, the total combined nameplate installed capacity for CLLC-1 and CLLC-2 electricity generation facilities is expected to be 33.1 MW.

The table below summarizes the project's installed nameplate electricity generation capacity as well as the project's installed LFG flaring capacity available until the end of the considered monitoring period:

Period from the beginning of the monitoring period until 12/11/2012

LFG Flaring installed capacity	Flare 1	Flare 2:	Total LFG flaring capacity = 10,194 Nm³/h
	5,097 Nm ³ /h	5,097 Nm ³ /h	
Electricity generation installed capacity	CLLC-1	CLLC-2	Total nameplate installed power generation capacity = 14.6 MW
	2.0 MW	12.6 MW	

Period from 13/11/2012 until 01/12/2012

LFG Flaring installed capacity	Flare 1	Flare 2:	Total LFG flaring capacity = 10,194 Nm³/h
	5,097 Nm ³ /h	5,097 Nm ³ /h	
Electricity generation installed capacity	CLLC-1	CLLC-2	Total nameplate installed power generation capacity = 17.4 MW
	2.0 MW	15.4 MW	

¹ Until 30/12/2012, there were 295 LFG collecting wells built at the Loma Los Colorados landfill. On 31/12/2012, the construction of 30 additional LFG collection wells was finished.

Period from 02/12/2012 until the end of the monitoring period

LFG Flaring installed capacity	Flare 1	Flare 2:	Flare 3 ² :	Total = 15,291 Nm ³ /h
	5,097 Nm ³ /h	5,097 Nm ³ /h	5,097 Nm ³ /h	
Electricity generation installed capacity	CLLC-1	CLLC-2	-	Total = 17.4 MW
	2.0 MW	15.4 MW	-	

Emission Reductions (ER) achieved during the 8th monitoring period (from 01/09/2012 to 31/12/2012) are **201,238 tCO₂e**.

8 th Monitoring period	Achieved emission reductions (tCO ₂ e)
From 01/09/2012 to 31/12/2012	201,238

A.2. Location of project activity

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The project activity is implemented at the Loma Los Colorados landfill. This landfill site is located in the administrative district ("Comuna") of Til-Til, 63.5 km North of Santiago through the Route 5. Til-Til is located near a village named Montenegro and it is located 578 meters above the sea level. According to the latest demographic census (2002), Til-Til has a population of 18,000 inhabitants covering an area of 667.3 km².

The geographical coordinates of the project site (in decimal and in Degree, Minute, Second (DMS) formats) are as follows:

Format	Latitude	Longitude
Decimal	-32.9564	-70.8013
DMS	32° 57' 23.04" S	70° 48' 4.6794" W

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)
Chile (host)	KDM S.A	No
Japan	The Kansai Electric Power Co., Inc.	No
Spain	Urbaser S.A.	No

A.4. Reference of applied methodology

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The project activity applies the following baseline and monitoring methodologies:

- ACM0001 - "Consolidated baseline methodology for landfill gas project activities" (version 4);
- ACM0002 - "Consolidated Baseline Methodology for Grid- Connected Power Generation from Renewable Sources" (version 6);

² It is noteworthy that the third high temperature enclosed flare has not yet started its continuous operations.

As per the PDD, the following methodological tools are applied for the determination of project emissions:

- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1);
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" (version 2);

A.5. Crediting period of project activity

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From 17/03/2007 to 16/03/2014 (7-year renewable crediting period).

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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During the considered monitoring period, the project activity encompassed the installation and operation of the following equipment:

- Two (with one additional flare installed but not under operation until the present date) enclosed high temperature flares (supplied by LFG Specialties L.L.C.) with the following specifications and operational conditions³:
 - o Min. LFG flow: 800 Nm³/h (500 scfm)
 - o Max. LFG flow: 5,097 Nm³/h (3,000 scfm)
 - o Min. temperature of exhaust gas: 800 °C (in order to ensure acceptable combustion efficiency)
 - o Max. temperature of exhaust gas: 1,095 °C (in order to ensure acceptable combustion efficiency)

³ Design details of the installed two high temperature enclosed flares:

Details about the stacks: Carbon steel construction with ANSI 150 lb flanged inlet connection. The top portion of flare stack is made with 304 stainless steel. Carbon steel shell (10' diameter, 45' height) is internally insulated with ceramic fibber insulation (to resist operation temperatures, reaching values of 1095°C). Flare stacks are painted inside and outside with high temperature painting. As per manufacturer's specification, the flares have a flow range of 500 – 3,000 scfm (800 – 5,097 Nm³/h).

Details about the thermal insulation of the enclosed flares: The enclosed flare interior is insulated with a nominal 2 inches of ceramic fibber blanket insulation. This amount of insulation will result in a hot metal skin temperature which is useful in preventing acid gas condensation from occurring on the metal shell ID.

Details about the burner assembly for the enclosed flares: All 304 stainless steel construction. Burner is suitable for operation over a 6:1 turndown range. (Proper blower and drive selection is required to accomplish the full 6:1 turndown range)

Details about the igniter assembly for the enclosed flares: The igniter is a small burner used to light the main burner and it is fuelled by Liquefied Petroleum Gas (LPG). The igniter assembly consists of a 304 stainless steel burner tube with spark plug ignition and type K thermocouple for flame confirmation. The spark plug is supplied with high temperature leads and a transformer in a NEMA 4 enclosure.

Details about the flame supervision/monitoring for the enclosed flares: Ultraviolet flame detector in order to confirm flame integrity.

Details about temperature control for the enclosed flares: A dedicated closed loop temperature controller is used to maintain flare temperature set-point. Process temperature is selectable from among multiple thermocouples (Pyromation), and control is maintained by modulating combustion air dampers at the flare base.

Details about the system controller for the enclosed flares: The Flame-Trol IV PLC (programmable logic controller) based control system is used. This is a technically advanced, fully automatic flare system controller specifically designed for maximum operating flexibility and efficiency.

Details about the sample collecting ports for the enclosed flares: sample collection ports are made available in the upper section of the flare as specified by applicable requirements of US-EPA in order to allow for emissions compliance testing/monitoring.

Details about the flame arrestor for the enclosed flares: This device prevents flame flash back in the event of high oxygen concentrations in the landfill gas. The standard flame arrestor is equipped with an aluminium core assembly.



Figure 1 - View of the installed high temperature enclosed flares (Flare 1 and Flare 2 from left to right)

- Two condensate knock-out pot (KOP)⁴



Figure 2 - View of the installed knock-out pot (KOP)

⁴ Design details for the condensate knock-out pot:

The installed KOP unit has 60 inch diameter x 90 inch high (1.524 x 2.286 m) and it is supplied by OAH LFG Specialties L.L.C. It has 150# flanged 24 inch inlet (0.6096 m) and 18 inch (0.4572 m) outlet connections. The KOP has the following design characteristics:

- Internal coating of hi-build epoxy to resist acidic condensate
- External finish with rust resistant primer and industrial enamel color coat
- Stainless steel mist extraction pad with a 98% filtration efficiency of free liquids and solid particles of 20 microns or larger
- Removable lid to facilitate inspection and repair of coating if necessary
- Heavy duty gage glass liquid indicator
- Drain connection with manual ball valve and plug
- Liquid level switch for high condensate level alarm/shutdown

- 3 LFG blowers⁵



Figure 3 – View of the 3 LFG blowers



Figure 4 - View of the specification plates available in each LFG blower

- Automatic shut-off valves for the flares (used for safety conditions)⁶

LFG flow measurement

- During the considered monitoring period, 5 thermal mass LFG flow meters (with company internal Id. "F0", "F1", "F2", "F3" and "F4") were used for measuring the total flow of collected LFG and flows of LFG sent to Flare 1, Flare 2 as well as the flows of LFG sent to the CLLC-1 and CLLC-2 power plants. All utilized LFG flow meters are manufactured by Fluid Components International L.L.C. (FCI) and are of ST98 model. These LFG flow meters provide LFG flow measurements in normalized cubic meters per hours (Nm^3/h). Thus, no additional monitoring of LFG temperature and LFG pressure are required. All LFG flow data measurements are electronically recorded and reported with an every 1 minute frequency. As per the operational procedure for the project activity, besides of the 5 LFG flow meters in operation, 5 identical LFG flow meter units are kept stored in the project site in order to be installed and used during calibration events of LFG flow meters⁷.

⁵ Design details of the LFG blowers: Each LFG blower is powered by with 380 V, 3 phase, 50 Hz electricity required to power a 75 HP (56 kW) TEFC electrical motor. Each blower is of centrifugal type, spark proof, cast iron construction, cast aluminum impellers, The impellers, inlet & outlet heads, and blower casing are coated with resistant phenolic coating. Each blower delivers 3,000 SCFM (5,097 Nm^3/h) gas flow with 60 in. water column (14,944.92 Pa) inlet vacuum and 15 in. water column (3,736.23 Pa) discharge pressure.

⁶ Specification details for the automatic shut-off valves: The valves are 12 in. bubble-tight carbon steel wafer type butterfly valves, which includes Teflon seat materials and stainless steel shafts and discs with a Bettis CB Series or equal pneumatic actuator and 3 way solenoid valve with a spring operated "fail safe" closing in case of a power failure.

⁷ FCI ST98 flow meters available in the project site are sent to the calibration/testing workshop of Fluid Components International L.L.C. (which is located in the United States) every 18-months in order to be tested and calibrated. This is in accordance to the calibration and testing requirements established by this equipment manufacturer for the FCI ST98 units. Further information about performed calibration events valid for the considered monitoring periods are included in Section D.2.



Figure 5 - View of one of the installed FCI ST 98 LFG flow meters

- LFG pressure/vacuum transmitters & Variable frequency drives for the LFG blowers: 1 Yokogawa vacuum transmitter and 2 Yokogawa pressure transmitters are installed. The control panel for the high temperature enclosed flares receives signals from such transmitters and, based on the values of these signals, the variable frequency drivers are controlled. The variable frequency drivers controls the speed of the electric motors for the LFG blower by using signals of the LFG pressure/vacuum transmitter as input signal. LFG vacuum and pressure measurements are also electronically recorded.
- Continuous gas analyser (to measure fraction of CH₄ in collected LFG): Fraction of CH₄ in collected LFG has been continuously measured by a Siemens Ultramat 23 gas analyser. This gas analyser continuously monitors the composition of collected LFG in terms of methane, oxygen, and carbon dioxide. As per the setting adjustments made in the gas analyzer, alarm signals are sent to the control panel for the high temperature enclosed flares whenever CH₄ content of collected LFG is out of the user-set range⁸. CH₄ content measurements performed by the continuous gas analyser are electronically recorded and reported with every 1-minute frequency.



Figure 6 - View of the continuous gas analyser (used to measure fraction of CH₄ in collected LFG)

- Project data supervisory/controlling system (supervisory control and data acquisition system (SCADA)): Win CC platform is used for control the operation of the project activity. Win CC solution is supplied by Siemens A.G. and it is customized to the project activity. A general view of the installed SCADA system during the present monitoring period is shown in the below:

⁸ During the considered monitoring period, the gas analyzer unit was set in a way that alarm signals are sent whenever measurements are out of the following ranges:

- From 30% - 70% (for measurements of CH₄ content in collected LFG flow)
- From 0% - 100% (for measurements of CO₂ content in collected LFG flow)
- From 0% - 5% (for measurements of O₂ content in collected LFG flow)

The main reason for such settings that trigger alarm signals are security and operational reasons.

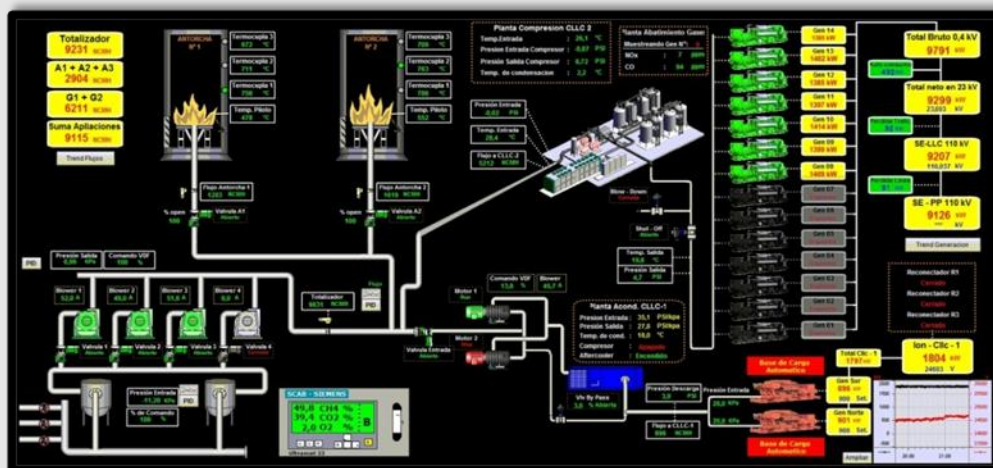


Figure 7 - View of the SCADA system for the project activity

It is important to note that while the operational status of each engine-generator set of the CLLC-2 electricity generation facility is managed by the Win CC platform, the CLLC-2 has its own SCADA system.

The following paragraphs include general details about the project's electricity generation component.

Central Loma Los Colorados-1 (CLLC-1) electricity generation facility

- **Power generation equipment:** The CLLC-1 electricity generation facility is equipped with two identical engine-generator set units manufactured by GE Waukesha and of APG1000 model. Each GE Waukesha APG1000 engine-generator set has 1.0 MW of nameplate power generation capacity.
- **LFG cooling station:** All LFG sent to the CLLC-1 electricity generation facility passes through a LFG cooling station where temperature of LFG is reduced through the use of heat exchangers.



Figure 8 – View of the installed engine-generator set GE Waukesha APG1000 as part of CLLC-1 electricity generation facility



Figure 9 – View of the LFG destruction facility (referenced as “FLARE 1”, “FLARE 2” and “BLOWER SKID”), CLLC-1 electricity generation facility (referenced as “POWER PLANT”). The LFG cooling station for LFG sent to the CLLC-1 power plant is referenced as “CONDITIONING PLANT” in the picture.

- Transmission of electricity generated at the CLLC-1 power plant: During the considered monitoring period, all electricity generated by CLLC-1 electricity generation facility was exported to the National Electricity Grid of Chile (SIC grid) through the same 110 kV voltage and 20 km length transmission line which was built for exporting electricity generated by the CLLC-2 electricity generation facility.

All electricity generated by both electricity generation facilities (CLLC-1 and CLLC-2) was accounted as exported electricity by the Chilean electricity dispatch coordinating entity (CDEC-SIC⁹) on the basis of measurements performed by a dedicated meter and regularly recorded in monthly transfer balances of electricity for the power generation source registered at the CDEC-SIC as “CTRL_LOMA_LOS_COLORG_LOM_LCOAES GENER (KDM)”.

It is important to note that regardless of electricity being generated at the project site by 2 electricity generation facilities (CLLC-1 and CLLC-2), during the considered monitoring period, electricity demand for all equipment of the LFG flaring station was met by imports of grid electricity. The electricity demand of both electricity generation facilities (CLLC-1 and CLLC-2) (electricity demand for auxiliary equipments) whenever the plants are not under operation are met by imports of grid electricity measured by electricity meter M2 (since electricity for both power plants is exported/imported through the same line), as explained in further sections of the present monitoring report. Moreover, three captive off-grid electricity generators (fuelled by diesel) were used as a backup power source for the LFG flaring station, CLLC-1 and CLLC-2 whenever supply of grid electricity to the project activity was temporarily interrupted¹⁰.

⁹ The “Centro de Despacho Económico de Carga (CDEC-SIC)” is the national electricity dispatch coordinating entity in Chile. Besides of coordinating the dispatch of all grid connected power generation sources in Chile, this entity also has the role of

- Keeping safety of the service in electrical system
- Guarantee the most economical operation for the set of electrical system installations.
- Guarantee the right of easement over transmission systems established by concession.

Further details about the CDEC-SIC are available online: https://www.cdec-sic.cl/index_en.php

¹⁰ More details on the utilization of the backup diesel generators are found further on this monitoring report.

Central Loma Los Colorados-2 (CLLC-2) electricity generation facility*Power generation equipment:*

At the end of the considered monitoring period, the CLLC-2 electricity generation facility encompassed 11 GE Jenbacher J420 engine-generator sets (with nameplate installed capacity of 1.4 MW each). The total nameplate installed capacity for CLLC-2 was 15.4 MW at the end of the considered monitoring period. Exhaust gases from each one of the installed GE Jenbacher J420 engine-generator sets are evacuated through ducts equipped with a double filtration and emission abatement system (consisting of a catalytic oxidation filter (which reduces carbon monoxide emissions), and a selective catalytic reduction (SCR) type filter (which abates NO_x emissions).

LFG cooling and filtering facility:

All engine-generator sets of the CLLC-2 electricity generation facility are fuelled by LFG through a LFG supply pipeline of maximum LFG supply capacity of up to 20,000 m³/h. A complete LFG cooling and filtering facility is also available. The LFG cooling and filtering facility is designed to cool LFG and also eliminate unwanted contaminants from the collected LFG (such as moisture and siloxanes). This facility is equipped with an efficient electric chiller (which has its electricity demand met by the CLLC-2 electricity generation facility). During start-up events of the CLLC-2 electricity generation facility, electricity demand for the electric chillers are temporarily met by a captive off-grid electricity generator (fuelled by diesel).

Transmission of electricity generated at the CLLC-2 power plant:

Each engine-generator set of the CLLC-2 power plant is coupled to a power transformer that increases the voltage level of generated electricity from 400 Volts to 23 kVolts. From these power transformers, electricity generated by each engine-generator set is transmitted through an overhead power line leading collector that concentrates all the electricity generated in a main power sub-station. From the main power station, electricity is exported to the National Electricity Grid of Chile through the 110 kV voltage and 20 km length transmission line. This transmission line, that starts at the Loma Los Colorados Landfill (at the sub-station named Sub-station Loma los Colorados (SELLC)), transmits electricity generated by both the CLLC-1 and CLLC-2 power plants by converting electricity from 23 kV to 110 kV in a main power transformer. The 20 km length transmission line connects the CLLC-1 and CLLC-2 electricity generation facilities to the Punta Peuco power substation, which is part of the SIC grid.

Backup captive off-grid electricity generators (fuelled by diesel):

Besides the captive off-grid electricity generator (fuelled by diesel) with 276 kW of nameplate electricity generation capacity used as a backup power source for the LFG flaring station and CLLC-1 (incl. LFG blowers, lighting, control equipment, etc.) whenever supply of grid electricity to the project's LFG flaring station and control room was temporarily interrupted, an emergency backup captive and off-grid electricity generator (fuelled by diesel) (and with internal reference "Diesel Backup Generator II") with 352 kW of nameplate power was used to meet the electricity demand of the CLLC-2 electricity generation facility whenever no electricity is being generated at this power plant (HVAC, lighting, control room, LFG cooling and filtering facility, etc.) during power generation interruption events with no connection to the grid available. Under circumstances with no power generation but with connection to the grid available, the electricity demand of the CLLC-2's HVAC, lighting, control room, LFG cooling and filtering facility, etc. is temporarily met by imports of electricity from the grid. When the CLLC-2 is under normal operation (generation of electricity by the engine-generator sets), all electricity demand of the whole CLLC-2 facility (incl. the electric chillers of the LFG cooling and filtering facility) is met by the electricity generated at the facility.

Moreover, at the earlier mentioned SELLC, an additional emergency backup captive and off-grid electricity generator (fuelled by diesel and with internal reference "Diesel Backup Generator III") with 80 kW of nameplate power was also installed. This backup generator is only used as a backup system during power failures to the SELLC.

On the next table is shown the backup captive off-grid electricity generators (fuelled by diesel) that were under operation on the project activity during the considered monitoring period:

Equipment id/tag	Manufacturer:	Model Number	Power (MW)	Purpose
Diesel Backup Generator I	Atlas Copco (using a Volvo diesel generator)	TAD941GE	0.276	Gas flaring systems and CLLC-1 auxiliary systems backup
Diesel Backup Generator II	Cummings	SDC - 400	0.352	CLLC-2 auxiliary systems backup
Diesel Backup Generator III	Protelec	S 100 - 10	0.080	SELLC systems backup

The figures below show the three captive off-grid electricity generator (fuelled by diesel) installed at the project activity:



Figure 10 – View of the captive off-grid electricity generator “Diesel Backup Generator I” (fuelled by diesel) used whenever supply of grid electricity to the project's LFG flaring station and control room is temporarily interrupted.



Figure 11 – View of the captive off-grid electricity generator “Diesel Backup Generator II” (fuelled by diesel) used for CLLC-2 auxiliary systems backup whenever grid electricity is temporarily interrupted.

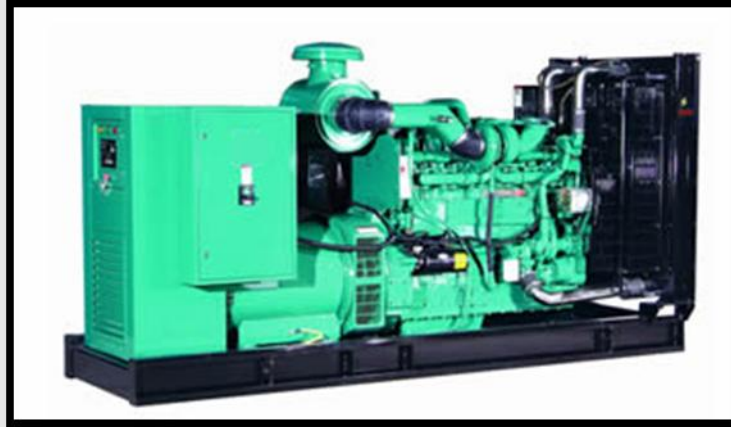


Figure 12 – View of the captive off-grid electricity generator “Diesel Backup Generator III” (fuelled by diesel) used for SELLC systems backup.

The next figures show the CLLC-2 power plant at the Loma Los Colorados Landfill:



Figure 13 - External view of CLLC-2 electricity generation facility, and its LFG cooling and purification plant (during its construction phase in Aug. 2011)



Figure 14 - Internal view of CLLC-2 electricity generation facility

Sub-station Loma los Colorados (SELLC):

This sub-station is located inside the area of the Loma Los Colorados landfill and is the starting point of the 20 Km electricity line, that ends at the Punta Peuco sub-station,. This sub-station also includes an additional emergency backup captive and off-grid electricity generator (fuelled by diesel and with internal reference "Diesel Backup Generator III") which has 80 kW of nameplate power. This backup generator is only used as a backup system during power failures to the SELLC.

Punta Peuco sub-station:

This sub-station is located 20 km away from the project site (in the end of the project's 110 kV voltage transmission line) and it includes a power transformer and protection and control system for high voltage (which is equipped with switches, circuit breakers and transformers).



Figure 15 - Detail of SELLC power transmission lines
(used to export electricity generated by CLLC-1 and CLLC-2 power plants)

Note on electricity metering

During the considered monitoring period, the net exported electricity values applicable for the CLLC-1 power plant are determined on the basis of measurements of the M2 electricity meter. The M1 electricity meter, in its exported electricity component, is only used to calculate operational hours of CLLC-1. Thus, measurements of the M2 electricity meter represent total exported and imported electricity by both CLLC-1 and CLLC-2 power plants.

Relevant facts about the operation of the project activity during the considered monitoring period:

The table below summarizes relevant facts about the operation of the project activity during the considered monitoring period:

Event / fact description	Reference date
LFG flaring station	
Finalization of construction of additional 30 LFG collection wells (Total number of total operating LFG collecting wells: 325)	31/12/2012
General maintenance and piping connection of the third flare	02/12/2012
Performed auditing events in the ISO 9001/ISO 14001 certified QA/QC and environmental management system of the Loma Los Colorados landfill	
Performance of internal auditings	12/07/2012
Performance of external auditings	03/09/2012
CLLC-2 electricity generation facility	
Start of continuous operation two additional GE Jenbacher J420 engines-generator sets (with nameplate installed capacity of 1.4 MW each)	13/11/2012

B.2. Post registration changes

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

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Not applicable.

B.2.2. Corrections

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Not applicable.

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

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Not applicable.

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

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Not applicable.

B.2.5. Changes to start date of crediting period

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Not applicable.

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

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Not applicable.

SECTION C. Description of monitoring system

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General description of the monitoring system:

The schematic diagram below illustrates the monitoring system of the project under the configuration which was valid from the beginning of the considered monitoring period until 12/11/2012:

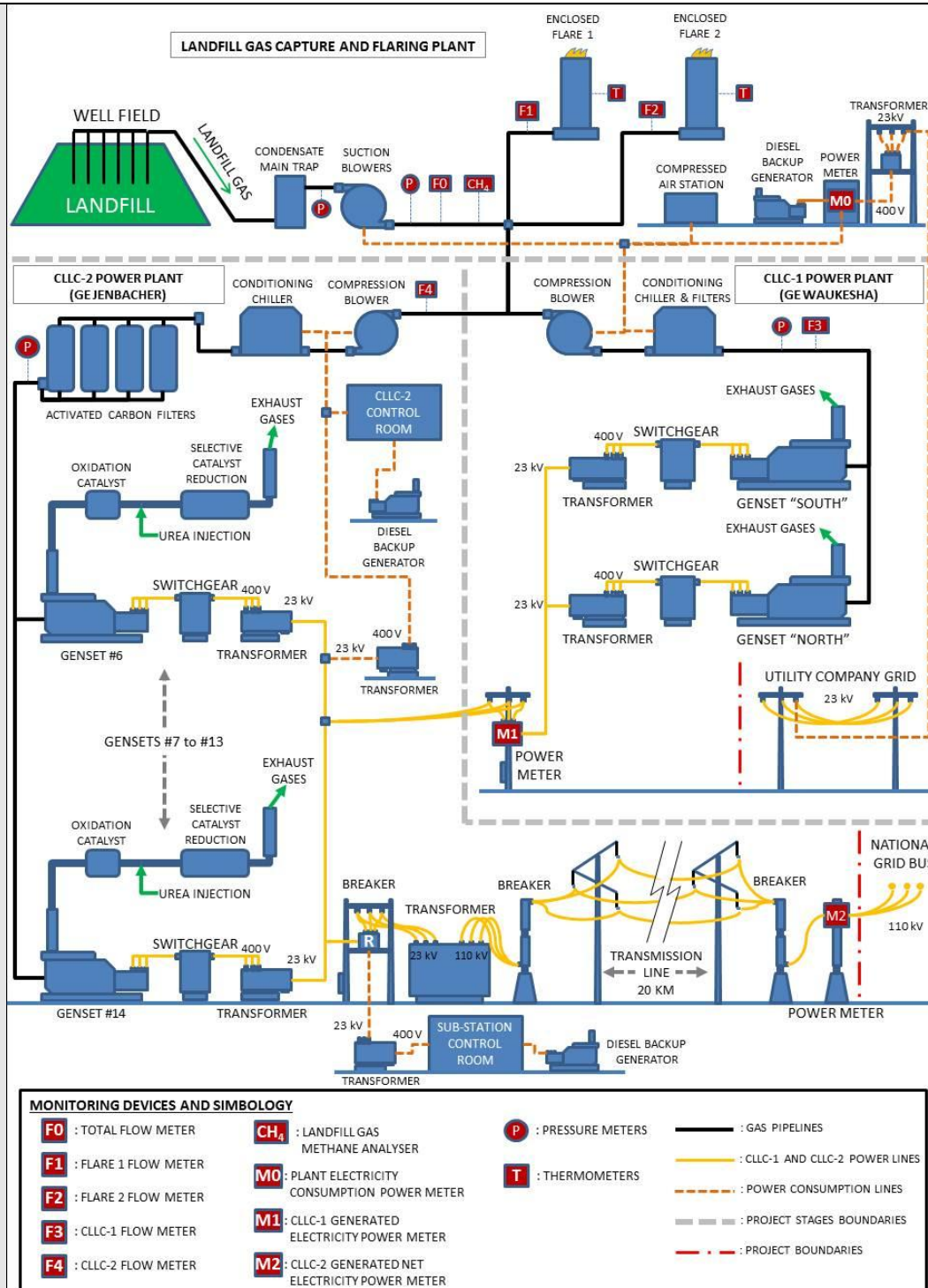


Figure 16 – Schematic diagram for the monitoring system under the project's configuration valid from the beginning of the considered monitoring period until 12/11/2012

The following diagram illustrates the project configuration valid from 13/11/2012 to 01/12/2012, as two additional engine-generator sets started to operate continuously in the CLLC-2 on 13/11/2012.

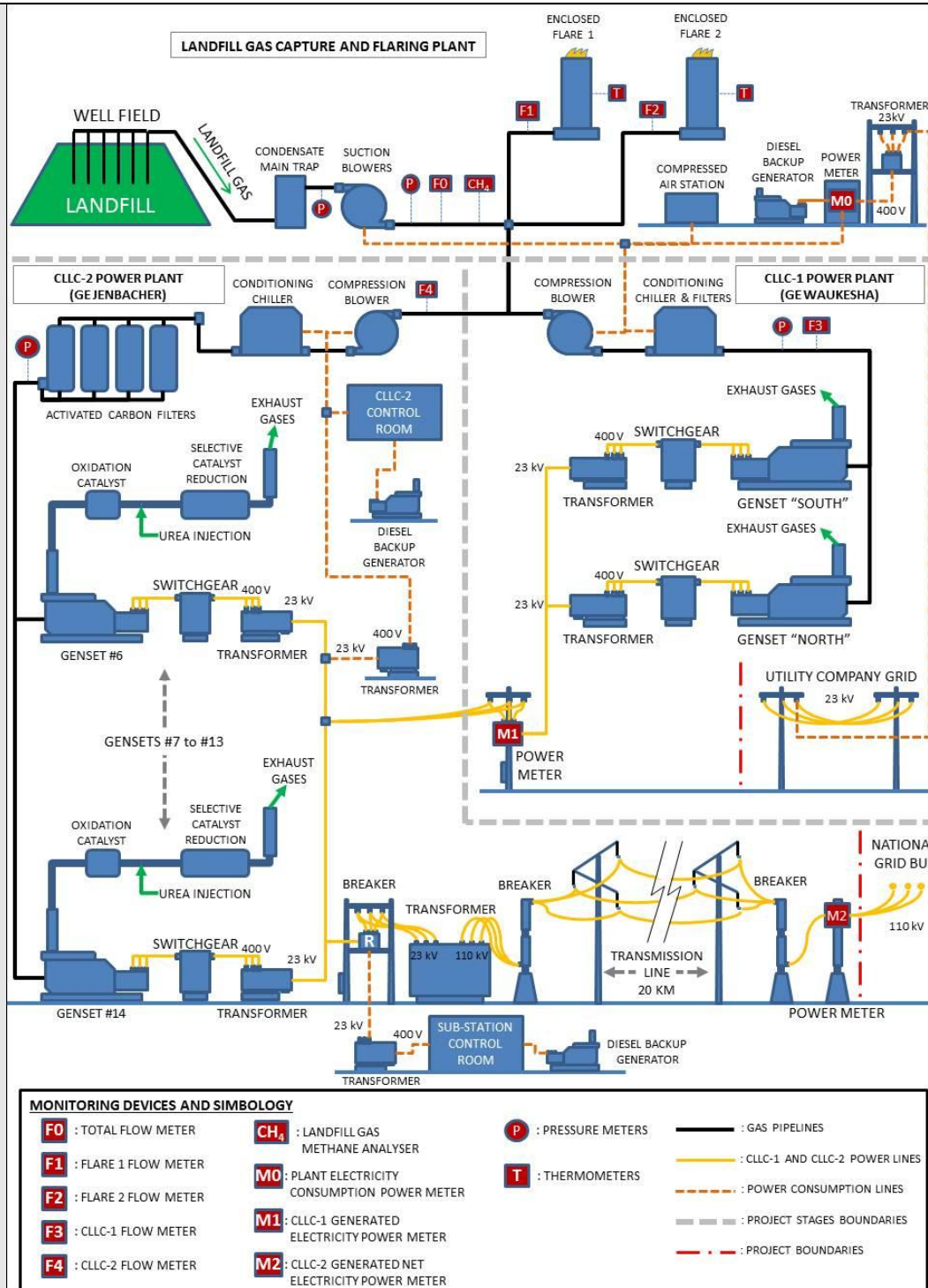


Figure 17 – Schematic diagram for the monitoring system under the project's configuration valid for the period from 13/11/2012 to 01/12/2012

As a third high temperature enclosed flare was installed at the project site, the following diagram illustrates the project configuration valid from 02/12/2012 until the end of the considered monitoring period:

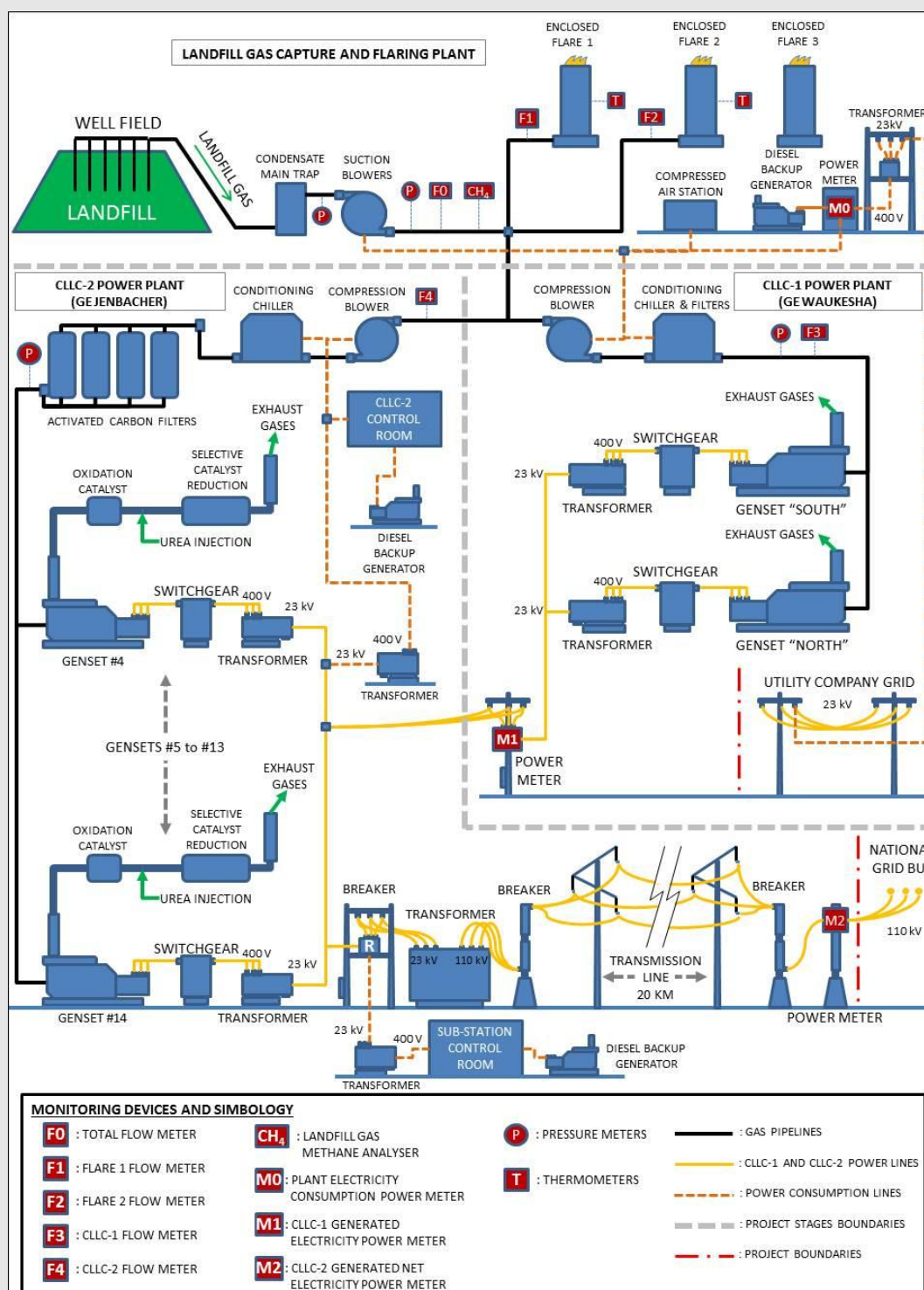


Figure 18 – Schematic diagram for the monitoring system under the project's configuration valid from 02/12/2012 until the end of the considered monitoring period

Gathering, recording and reporting of monitoring data:

During the considered monitoring period, signals for measurements of LFG flow (from the installed LFG flow meters F1, F2, F3, F4 and F0), CH₄ fraction in collected LFG, temperature of the exhaust gas of both Flare 1 and Flare 2 (as well as other control parameters such as LFG pressure, LFG temperature) were received and processed by the project's programmable logical controller unit (PLC unit) and recorded by the project's

supervisory and data acquisition system (SCADA) as data records. The available SCADA system is based on the “WinCC” platform. “WinCC” platform is supplied by Siemens AG and it is customized for the project activity. Data records for the measurements above-described are made available for each individual minute of the monitoring period. As per the project’s monitoring system, every-minute data records for such measurements are exported and utilized as raw data in monthly emission reduction calculation spread sheets. Such monthly emission reduction calculation spread sheets also report records of the monitoring parameters which are not recorded/handled by the project’s SCADA system. Information about this additional parameters are manually inserted in the monthly emission reduction calculation spread sheets.

SECTION D. Data and parameters

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

Data / Parameter:	GWP_{CH4}
Unit:	tCO ₂ e/tCH ₄
Description:	Global Warming Potential of methane
Source of data:	Default value as per ACM0001 (version 4) is applied.
Value(s) applied:	21
Purpose of data:	Value used for the determination of baseline emissions.
Additional comment:	

Data / Parameter:	D_{CH4}
Unit:	tCH ₄ /m ³ CH ₄
Description:	Density of methane
Source of data:	Default value as per ACM0001 (version 4) is applied.
Value(s) applied:	0.0007168
Purpose of data:	Value used for the determination of baseline emissions.
Additional comment:	

Data / Parameter:	TDL_{grid,y}
Unit:	%
Description:	Average technical transmission and distribution losses for grid electricity in year y.
Source of data:	Default values as per applicable guidance of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” is applied.
Value(s) applied:	20%
Purpose of data:	Value used for the determination of project emissions.
Additional comment:	

Data / Parameter:	MD_{reg,y}
Unit:	tCH ₄
Description:	Amount of methane that would have been destroyed during the year in the absence of the project activity
Source of data:	Annual value is ex-ante defined in the registered PDD based on previously existent (pre-project) LFG collection and destruction system. Value was adjusted for the considered 92 days monitoring period.
Value(s) applied:	82 tCH ₄

Purpose of data:	Value used for the determination of baseline emissions.
Additional comment:	As per the PDD, the value of $MD_{req,y}$ is 245 tCH ₄ per year. While the considered monitoring period encompasses 92 days, the value of $MD_{req,y}$ for the considered period is calculated as 62 tCH ₄

Data / Parameter:	CEF_y
Unit:	tCO ₂ /MWh
Description:	CO ₂ emission factor of the electricity grid
Source of data:	Calculated ex-ante in the PDD as per ACM0002 (version 6) based on data valid for the CDEC-SIC grid.
Value(s) applied:	0.408 tCO ₂ e/MWh
Purpose of data:	Value used for the determination 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						
Measured/ Calculated / Default:	Measured.						
Source of data:	Measured by a thermal mass flow meter (KDM internal symbol: F0).						
Value(s) of monitored parameter:	Every minute measurement records of Total amount of landfill gas captured are reported in the monthly emission reduction calculation spreadsheets (which are enclosed to this Monitoring Report).						
Monitoring equipment:	<p><u>Specifications of the installed LFG flow meters used to measure LFG_{total,y}:</u></p> <ul style="list-style-type: none"> - Manufacturer: FCI Fluid Components International LLC - Model: ST98 Thermal Mass Flow meter - Accuracy: ±1% - Serial Numbers: <table border="1"> <thead> <tr> <th>Serial Number (S/N)</th><th>Period in use</th></tr> </thead> <tbody> <tr> <td>300541</td><td>From 18/04/2012 to 02/12/2012</td></tr> <tr> <td>407207</td><td>From 02/12/2012 until the end of the monitoring period</td></tr> </tbody> </table> - Calibration frequency and maintenance requirements: Every 18 months. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. Both the PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or 	Serial Number (S/N)	Period in use	300541	From 18/04/2012 to 02/12/2012	407207	From 02/12/2012 until the end of the monitoring period
Serial Number (S/N)	Period in use						
300541	From 18/04/2012 to 02/12/2012						
407207	From 02/12/2012 until the end of the monitoring period						

	<p>other specification requirement for such instruments/equipment either.</p> <p>Details about performed calibration events valid for the considered monitoring period:</p> <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Customer Order Number</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td>300541</td><td>FCI Fluid Components International LLC</td><td>28/03/2012</td><td>RA34940</td></tr><tr><td>407207</td><td>FCI Fluid Components International LLC</td><td>13/07/2011</td><td>C055419</td></tr></table>	Calibration Certificate		Calibration Date	Customer Order Number	Serial Number (S/N)	Calibration by	300541	FCI Fluid Components International LLC	28/03/2012	RA34940	407207	FCI Fluid Components International LLC	13/07/2011	C055419
Calibration Certificate		Calibration Date	Customer Order Number												
Serial Number (S/N)	Calibration by														
300541	FCI Fluid Components International LLC	28/03/2012	RA34940												
407207	FCI Fluid Components International LLC	13/07/2011	C055419												
Measuring/ Reading/ Recording frequency:	Continuous measurements of LFG flow are recorded and reported every minute and made available in the monthly emission reduction calculation spreadsheets.														
Calculation method (if applicable):	Not applicable.														
QA/QC procedures:	Each performed calibration event has a validity of 18 months (as per the calibration frequency requirement informed by the equipment manufacturer). However, as part of its internal project's operational control, KDM S.A. normally replaces the LFG flow meter when a flow meter is sent to the supplier FCI for calibration ¹¹ . Under this circumstances a spare and calibrated flow meters is installed.														
Purpose of data:	See informative box " <i>Taking into account records of $LFG_{total,y}$ (on the basis of continuous measurements of LFG flow from LFG flow meter "F0") in the context of determination of emission reductions</i> " in Section E.1.														
Additional comment:	-														

Data / Parameter:	$LFG_{flare,y}$
Unit:	Nm^3
Description:	Amount of landfill gas flared
Measured/ Calculated / Default:	Measured.
Source of data:	<p>While during the considered monitoring period, collected LFG was destroyed in 2 high temperature enclosed flares (Flare 1 and Flare 2), monitoring for $LFG_{flare,y}$ was thus performed on the basis of measurements of LFG sent to each one of the flares ($LFG_{flare,y,Flare-1}$ and $LFG_{flare,y,Flare-2}$).</p> <p>$LFG_{flare,y,Flare-1}$ was measured by LFG thermal mass flow meter F1.</p> <p>$LFG_{flare,y,Flare-2}$ was measured by LFG thermal mass flow meter F2.</p>

¹¹ FCI ST98 flow meters available in the project site are sent to the calibration/testing workshop of Fluid Components International L.L.C. (which is located in the United States) every 18-months in order to be tested and calibrated. This is in accordance to the calibration and testing requirements established by this equipment manufacturer for the FCI ST98 units.

Value(s) of monitored parameter:	Every minute measurements of Amount of landfill gas flared (for each one of the flares) are reported in the monthly emission reduction calculation spreadsheets which are enclosed to this Monitoring Report.																		
Monitoring equipment:	<p><i>LFG flow meters used to measure $LFG_{flare,y,Flare-1}$ in Flare 1:</i></p> <p>Specifications of the monitoring equipment:</p> <ul style="list-style-type: none">- Manufacturer: FCI Fluid Components International LLC- Model: ST98 Thermal Mass Flow meter- Accuracy: $\pm 1\%$- Serial Number: <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>268935</td><td>From 18/04/2012 until the end of the monitoring period</td></tr></table> <p>Details about performed calibration events valid for the considered monitoring period:</p> <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Customer Order Number</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td>268935</td><td>FCI Fluid Components International LLC</td><td>29/03/2012</td><td>RA34940</td></tr></table> <p><i>LFG flow meters used to measure $LFG_{flare,y,Flare-2}$ in Flare 2:</i></p> <p>Specifications of the monitoring equipment:</p> <ul style="list-style-type: none">- Manufacturer: FCI Fluid Components International LLC- Model: ST98 Thermal Mass Flow meter- Accuracy: $\pm 1\%$- Serial Number: <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>341600-A</td><td>From 02/02/2012 until the end of the monitoring period</td></tr></table> <p>Details about performed calibration events valid for the considered monitoring period:</p>	Serial Number (S/N)	Period in use	268935	From 18/04/2012 until the end of the monitoring period	Calibration Certificate		Calibration Date	Customer Order Number	Serial Number (S/N)	Calibration by	268935	FCI Fluid Components International LLC	29/03/2012	RA34940	Serial Number (S/N)	Period in use	341600-A	From 02/02/2012 until the end of the monitoring period
Serial Number (S/N)	Period in use																		
268935	From 18/04/2012 until the end of the monitoring period																		
Calibration Certificate		Calibration Date	Customer Order Number																
Serial Number (S/N)	Calibration by																		
268935	FCI Fluid Components International LLC	29/03/2012	RA34940																
Serial Number (S/N)	Period in use																		
341600-A	From 02/02/2012 until the end of the monitoring period																		

	<table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Customer Order Number</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td>341600-A</td><td>FCI Fluid Components International LLC</td><td>01/08/2011</td><td>RA34075</td></tr></table> <p>Calibration frequency and maintenance requirements: Every 18 months. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.</p>	Calibration Certificate		Calibration Date	Customer Order Number	Serial Number (S/N)	Calibration by	341600-A	FCI Fluid Components International LLC	01/08/2011	RA34075
Calibration Certificate		Calibration Date	Customer Order Number								
Serial Number (S/N)	Calibration by										
341600-A	FCI Fluid Components International LLC	01/08/2011	RA34075								
Measuring/ Reading/ Recording frequency:	Continuous measurement. Measured values of LFG flow are to be recorded and reported every minute and made available in monthly emission reduction calculation spreadsheets.										
Calculation method (if applicable):	Not applicable.										
QA/QC procedures:	Each calibration event has a validity of 18 months, as informed by the equipment manufacturer. However, for internal operational control, KDM S.A. normally replaces the LFG flow meter (which is sent to the supplier for a calibration), on each replacement event a calibrated flow meters is installed.										
Purpose of data:	Data is used for baseline emissions.										
Additional comment:	-										

Data / Parameter:	LFG _{electricity,y}
Unit:	Nm ³
Description:	Amount of landfill gas combusted in power plant
Measured/ Calculated / Default:	Measured.
Source of data:	While during the considered monitoring period, collected LFG was used as fuel for electricity generation in both the CLLC-1 and CLLC-2 electricity generation facilities, monitoring for LFG _{electricity,y} was thus performed on the basis of measurements of LFG sent to each one of the power plants (LFG _{electricity,v,CLLC-1} and LFG _{electricity,v,CLLC-2}). LFG _{electricity,y,CLLC-1} was measured by LFG thermal mass flow meter F3. LFG _{electricity,v,CLLC-2} was measured by LFG thermal mass flow meter F4.

Value(s) of monitored parameter:	Every minute measurements of Amount of landfill gas combusted in power plant are reported in the monthly emission reduction calculation spreadsheets (which are enclosed to this Monitoring Report). The amount of landfill gas sent the CLLC-1 electricity generation facility was measured by the F3 flow meter and the amount of landfill gas sent the CLLC-2 electricity generation facility was measured by the F4 flow meter.																				
Monitoring equipment:	<p><u>Specifications of the installed LFG flow meters used to measure $LFG_{electricity,v}$ sent to CLLC-1 Power plant ($LFG_{electricity,v,CLLC-1}$):</u></p> <ul style="list-style-type: none">- Manufacturer: FCI Fluid Components International LLC- Model: ST98 Thermal Mass Flow meter- KDM internal symbol: F3- Accuracy: $\pm 1\%$- Serial Number: <table><tr><th>Serial Number (S/N)</th><th>Period in use</th></tr><tr><td>342850</td><td>From 14/11/2011 to 02/12/2012</td></tr><tr><td>325926</td><td>From 02/12/2012 until the end of the monitoring period</td></tr></table> <p>Calibration frequency and maintenance requirements: Every 18 months. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.</p> <p>Details about performed calibration events valid for the considered monitoring period:</p> <table><tr><th colspan="2">Calibration Certificate</th><th rowspan="2">Calibration Date</th><th rowspan="2">Customer Order Number</th></tr><tr><th>Serial Number (S/N)</th><th>Calibration by</th></tr><tr><td>342850</td><td>FCI Fluid Components International LLC</td><td>22/06/2011</td><td>C054982</td></tr><tr><td>325926</td><td>FCI Fluid Components International LLC</td><td>28/03/2012</td><td>RA34940</td></tr></table> <p><u>Specifications of the installed LFG flow meters used to measure $LFG_{electricity,v}$ sent to CLLC-2 Power plant ($LFG_{electricity,v,CLLC-2}$):</u></p> <ul style="list-style-type: none">- Manufacturer: FCI Fluid Components International LLC	Serial Number (S/N)	Period in use	342850	From 14/11/2011 to 02/12/2012	325926	From 02/12/2012 until the end of the monitoring period	Calibration Certificate		Calibration Date	Customer Order Number	Serial Number (S/N)	Calibration by	342850	FCI Fluid Components International LLC	22/06/2011	C054982	325926	FCI Fluid Components International LLC	28/03/2012	RA34940
Serial Number (S/N)	Period in use																				
342850	From 14/11/2011 to 02/12/2012																				
325926	From 02/12/2012 until the end of the monitoring period																				
Calibration Certificate		Calibration Date	Customer Order Number																		
Serial Number (S/N)	Calibration by																				
342850	FCI Fluid Components International LLC	22/06/2011	C054982																		
325926	FCI Fluid Components International LLC	28/03/2012	RA34940																		

- Model: ST98 Thermal Mass Flow meter
- KDM internal symbol: F4
- Accuracy: $\pm 1\%$
- Serial Number:

Serial Number (S/N)	Period in use
339540	From July 2011 to 27/09/2012
325925	From 27/09/2012 until the end of the monitoring period

Calibration frequency and maintenance requirements: Every 18 months. The calibration frequencies adopted for the installed LFG flow meters are as per the recommendations of equipment/instrument manufacturer. The registered PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meters. Moreover, the registered PDD and ACM0001 (version 4) methodology do not specify any accuracy or other specification requirement for such instruments/equipment either.

Details about performed calibration events valid for the considered monitoring period:

Calibration Certificate		Calibration Date	Customer Order Number
Serial Number (S/N)	Calibration by		
339540	FCI Fluid Components International LLC	06/04/2011	C053853
325925	FCI Fluid Components International LLC	02/12/2011	RA34595

Measuring/ Reading/ Recording frequency:	Continuous measurement. Measured values of LFG flow are to be recorded and reported every minute and made available in monthly emission reduction calculation spread sheets.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Each calibration event has a validity of 18 months, as informed by the equipment manufacturer. However, for internal operational control, KDM S.A. normally replaces the LFG flow meter (which is sent to the supplier for a calibration), on each replacement event a calibrated flow meters is installed.
Purpose of data:	Data is used for baseline emissions.
Additional comment:	-

Data / Parameter:	FE
Unit:	%
Description:	Flare/combustion efficiency, determined by the operation hours (1) and the methane content in the gas exhaust gas (2)
Measured/ Calculated / Default:	<p>FE is determined <i>inter-alia</i> on the basis of regular measurements of the amount of residual methane content in the exhaust gas of the flare (every year), which are performed by a third party independent inspection service company.</p> <p>The operational status of the flare (which is also considered in the context of the determination of adopted FE values for every minute of the considered monitoring period) is also determined based on continuous monitoring of the temperature of exhaust gas of the flares (T_{flare}).¹² Whenever flare temperature is lower than 500°C or higher than 1095°C (valid for both Flare 1 and Flare 2: $T_{\text{flare,Flare-1}}$ and $T_{\text{flare,Flare-2}}$), no emission reduction is claimed for the time instant in question.¹³</p>
Source of data:	<p>While during the considered monitoring period, collected LFG was destroyed in 2 high temperature enclosed flares (Flare 1 and Flare 2), monitoring for flare/combustion efficiency (FE) was thus performed on the basis of measurements and calculations applicable for each one of the flares ($FE_{\text{Flare-1}}$ and $FE_{\text{Flare-2}}$).</p> <p>As established in the PDD and in accordance with ACM0001 (version 4), values of FE were regularly determined for each flare based inter-alia on (i) measurements of flow of methane sent to the flare in question (performed by KDM S.A.) as well as (ii) performed measurements of residual methane content in the exhaust gas of the flare in question (as per measurements in collected samples of exhaust gas for each flare performed by the accredited external laboratory Airón, Ingeniería y Control Ambiental S.A.) and (iii) related calculations.</p> <p>After the collection of measurement data related to the FE calculation for the flare in question, reported value for FE is calculated by KDM S.A. by</p>

¹² Temperature of the exhaust gas of the flares ($T_{\text{flare,Flare-1}}$ and $T_{\text{flare,Flare-2}}$) is not explicitly listed as a monitoring parameter as per the monitoring plan of the registered PDD neither as per ACM0001 (version 4). However, as per the monitoring plan of the registered PDD, monitoring details for the parameter Flare combustion/efficiency (FE) include the following requirements:

- "(...) The flare operation shall be continuously monitored by continuous measurement of operation time of flare using a run time meter connected to a flame detector or a flame continuous temperature controller, irrespective of whether the flare efficiency is monitored (...)"

- "The enclosed flares shall be operated and maintained as per the specifications prescribed by the flare manufacturer."

The temperature of the exhaust gas of the flare (T_{flare}) was thus also monitored (for both Flare 1 and Flare 2: $T_{\text{flare,Flare-1}}$ and $T_{\text{flare,Flare-2}}$) in order to meet the above-described requirements for determination of FE and its consideration/application in every minute time instant of the considered monitoring period (for the determination of values of methane destroyed by the flares ($MD_{\text{flare,Flare-1}}$ and $MD_{\text{flare,Flare-2}}$) for every minute of the considered monitoring period.

¹³ The conditions $T_{\text{flare}} > 500^{\circ}\text{C}$ and $T_{\text{flare}} < 1,095^{\circ}\text{C}$ (for both Flare 1 and Flare 2: $T_{\text{flare,Flare-1}}$ and $T_{\text{flare,Flare-2}}$) are thus regarded as pre-requisite for determining values for FE and $MD_{\text{flare,y}}$ values for any particular 1-minute period of the monitoring period based inter-alia on valid regular measurements of amount of residual methane in the exhaust gas of the flare. Whenever these conditions are not met, the amount of methane destroyed by the flare in question ($MD_{\text{flared,y,Flare-1}}$ or $MD_{\text{flared,y,Flare-2}}$) are assumed as null (zero).

Both flares are equipped with flame detectors. No LFG is sent for combustion to Flare 1 or Flare 2 if no flame is detected for the flare in question. The use of flame detectors in the flares also address the above-quote requirement of the monitoring plan of the registered PDD.

	<p>following applicable procedure. All calculations are summarized in Section D.2 and detailed in a calculation spreadsheet enclosed to the Monitoring Report.</p> <p>All performed measurements and results are evidenced and detailed in the following technical reports:</p> <table><tr><th>Technical Report number</th><th>Flare identification</th><th>Measurement date</th></tr><tr><td>562A-2012</td><td>Flare 1</td><td>09/07/2012</td></tr><tr><td>568A-2012</td><td>Flare 2</td><td>10/07/2012</td></tr></table>	Technical Report number	Flare identification	Measurement date	562A-2012	Flare 1	09/07/2012	568A-2012	Flare 2	10/07/2012
Technical Report number	Flare identification	Measurement date								
562A-2012	Flare 1	09/07/2012								
568A-2012	Flare 2	10/07/2012								
Value(s) of monitored parameter:	<p>Determined values of Flare/combustion efficiency are valid for the periods as indicated below:</p> <table><tr><th>Flare no</th><th>Period</th><th>Value of FE</th></tr><tr><td>Flare 1</td><td>10/07/2012 to end of monitoring period</td><td>99.9971%</td></tr><tr><td>Flare 2</td><td>11/07/2012 to end of monitoring period</td><td>99.9973%</td></tr></table>	Flare no	Period	Value of FE	Flare 1	10/07/2012 to end of monitoring period	99.9971%	Flare 2	11/07/2012 to end of monitoring period	99.9973%
Flare no	Period	Value of FE								
Flare 1	10/07/2012 to end of monitoring period	99.9971%								
Flare 2	11/07/2012 to end of monitoring period	99.9973%								
Monitoring equipment:	<p>All related measurements were performed by following applicable requirements as per applicable procedure of the U.S. Environmental Protection Agency (US-EPA). All related measurements of residual methane fraction in the exhaust gas of the flares were performed by Airón Ingeniería y Control Ambiental S.A. by following the measurement methods/procedures as follows:</p> <ul style="list-style-type: none">- Method 3A “Determination of O₂ and CO₂ concentration in stationary source, procedure with instrumental analyzer” Measurement equipment: Manufacturer: California Analytical Instruments Model: ZRH Sensitivity: 0.1%- Method 6C “Determination of SO₂ concentration in stationary source, procedure with instrumental analyzer” Measurement equipment: Manufacturer: Thermo Environmental Instruments Model: 43C HL Sensitivity: 0.1 a 1 ppm- Method 7E “Determination of NO_x concentration in stationary source, procedure with instrumental analyzer” Measurement equipment: Manufacturer: Thermo Environmental Instruments Model: 42H Sensitivity: 0.1 a 1 ppm									

- Method 10 "Determination of CO concentration in stationary source, procedure with instrumental analyzer"
Measurement equipment:
Manufacturer: California Analytical Instruments
Model: ZRH
Sensitivity: 0.1 a 1 ppm
- Method CH-25A: "Determination of Total Organic Compounds"
Measurement equipment:
Manufacturer: DANI Instruments
Model: TNMH 462
Sensitivity: 0.1 a 1 ppm
- Method CH-2 "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Measurement equipment:
Manufacturer: Dwyer Instruments
Model: 42H
Sensitivity: 0.1 a 1 ppm

For monitoring LFG flow and CH₄ content of the LFG sent to the flares, measurement data recorded by KDM S.A. used for monitoring the parameters "Amount of landfill gas flared" (LFG_{flare,v}) for both Flare 1 and Flare 2 as well as methane fraction in the landfill gas (W_{CH₄,v}) were used in the context of the calculation of parameter Flare/combustion efficiency (FE).

For monitoring LFG flow in the exhaust gas of the flares and CH₄ content of the LFG in the exhaust gas of the flares the following equipment/instruments were used:

Pitot Tube:

Manufacturer: Environmental Supply Company, Inc
Model: Stainless Steel Type "S" Pitot Tube
Sensitivity: 1.0%

For measuring the residual concentration of CH₄ in the exhaust gas of the flare, the following equipment was used:

Gas analyzer:

Manufacturer: Synspec BV
Model: Alpha Model 115 Methane/TNMHC
Sensitivity: 0.1 to 10 ppm for methane

For measuring temperature of exhaust gas of the flares, the following equipment were used:

Thermocouple used for monitoring temperature of exhaust gas on Flare 1:

Manufacturer: Reotemp Instrument Corporation
Model: DMT, type K
Accuracy: ±1.0%
Serial Number/Period in use: 59555 – From the beginning of the monitoring period to the end of the monitoring period
Instrument internal identification number: T_{flare-Flare-1}

Thermocouple used for monitoring temperature of exhaust gas on Flare 2:

Manufacturer: Reotemp Instrument Corporation
Model: DMT, type K

	<p>Accuracy: $\pm 1.0\%$ Serial Number/Period in use: 64568 – From the beginning of the monitoring period to the end of the monitoring period Instrument internal identification number: T_{flare,Flare-2}</p> <p>Note about the thermocouples: The thermocouples are not calibrated. Instead, project participants exchange the thermocouples every 12 months, according to manufacturer recommendation.</p>
Measuring/ Reading/ Recording frequency:	<p>The value of Flare/combustion efficiency is calculated based on:</p> <ul style="list-style-type: none"> (i) Continuous measurement of LFG flow and CH₄ content of the LFG sent to the flares, which are recorded and reported every minute and made available in monthly emission reduction calculation spreadsheets. (ii) Periodic measurements of LFG flow in the exhaust gas of the flares and CH₄ content of the LFG in the exhaust gas of the flares, which shall be monitored yearly. <p>Thus, the value for Flare/combustion efficiency shall be monitored yearly.</p>
Calculation method (if applicable):	See Section E.1.
QA/QC procedures:	Information about calibration of sampling equipment and further related relevant issues are described in inspection reports issued by Airón, Ingeniería y Control Ambiental S.A.
Purpose of data:	Data is used for the determination of baseline emissions.
Additional comment:	-

Data / Parameter:	W_{CH₄,y}
Unit:	m ³ CH ₄ /m ³ LFG
Description:	Methane fraction in the landfill gas
Measured/ Calculated / Default:	Measured.
Source of data:	Continuous measurements performed by an installed continuous CH ₄ /O ₂ /CO ₂ content gas analyzer.
Value(s) of monitored parameter:	Every minute measurement records are presented in the monthly emission reduction calculation spreadsheets which are enclosed to the Monitoring Report.
Monitoring equipment:	<p><i>Specification of the CH₄/O₂/CO₂ content gas analyzer unit:</i> One CH₄/O₂/CO₂ content gas analyzer unit was utilized for measuring CH₄ content of collected LFG during the whole monitoring period. The specifications of the CH₄/O₂/CO₂ content gas analyzer unit are as follows:</p> <ul style="list-style-type: none"> - Manufacturer: Siemens AG - Model: Ultramat 23 - Serial Number: N1-W2-678 - Accuracy: $\pm 1\%$

Calibration events valid for the considered monitoring period:

Serial Number	Calibration event date
N1-W2-678	01/10/2011
	26/09/2012
	29/10/2012
	03/12/2012

As part of each individual calibration event performed in the installed CH₄/O₂/CO₂ content gas analyzer unit by trained staff of Siemens AG, the measurement error/deviation has been always appropriately identified, calculated and reported in the calibration certificate issued by Siemens AG.

Calibration frequency and/or maintenance requirements: Calibration is to be performed yearly (as established by the internal calibration procedure which is in accordance with calibration frequency recommendation from the equipment manufacturer). No calibration frequency requirements are specified in the monitoring plan of the registered PDD or AM0001 (version 3).

During the current monitoring period, an extra CH₄/O₂/CO₂ content gas analyzer unit was available at the flaring plant for backup purposes, only if necessary. This equipment was properly calibrated by Siemens AG and has not been in operation since its installation.

- Manufacturer: Siemens AG
- Model: Ultramat 23
- Serial Number: N1-B2-711
- Accuracy: ±1%

Calibration events valid for the considered monitoring period:

Serial Number	Calibration event date
N1-B2-711	01/10/2011
	26/09/2012
	29/10/2012
	03/12/2012

Measuring/
Reading/
Recording frequency:

Continuously measurements are recorded/reported every minute.

Calculation method
(if applicable):

Not applicable.

QA/QC procedures:

Regular maintenance and calibration events are performed in the equipment in order to ensure accuracy and availability of measurements.

Purpose of data:

Data is used for baseline emissions.

Additional comment:

-

Data / Parameter:	Regulatory Requirements
Unit:	-
Description:	Regulatory requirements relating to landfill gas projects
Measured/ Calculated / Default:	Not applicable.
Source of data:	According to the procedure P-GEN-AMB-003, regulatory requirements must be revised every year, the technical staff which take part of such revision are the Environmental engineers of the specific area, with collaboration of the quality department of the company. On specific cases, a request of revision of such regulatory requirements should be asked to an external staff of advocates. For this specific monitoring period, the applicable revision was performed on 10/01/2012, 03/09/2012 and 02/01/2013. For this period the mentioned report shows no new incidents/changes on the Project activities or in the local environmental regulations. The mentioned procedure and document are available for the audit team.
Value(s) of monitored parameter:	Not applicable.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	Not applicable.
Additional comment:	-

Data / Parameter:	EL _{EXP LFG,y}
Unit:	MWh
Description:	Total amount of net electricity exported out of the project
Measured/ Calculated / Default:	Measured.
Source of data:	<p>During the considered monitoring period, collected LFG was used as fuel for electricity generation in both the CLLC-1 and CLLC-2 electricity generation facilities, monitoring for EL_{EXP LFG,y} was thus performed on the basis of measurements of exported electricity which was generated by both power plants (EL_{EXP LFG,y,CLLC-1+2}) from that point forward.</p> <p>Electricity meter used during the present monitoring for each plant are shown in the following table:</p>

	<table><tr><th>Power Plant</th><th>Electricity meter used to measure the electricity exported by the plant</th><th>Approach to determine amount of electricity exported by each power plant</th></tr><tr><td>CLLC-1 + CLLC-2</td><td>M2 meter</td><td>Records of exported electricity from M2 meter</td></tr></table>	Power Plant	Electricity meter used to measure the electricity exported by the plant	Approach to determine amount of electricity exported by each power plant	CLLC-1 + CLLC-2	M2 meter	Records of exported electricity from M2 meter
Power Plant	Electricity meter used to measure the electricity exported by the plant	Approach to determine amount of electricity exported by each power plant					
CLLC-1 + CLLC-2	M2 meter	Records of exported electricity from M2 meter					
Value(s) of monitored parameter:	<p>Every hour measurements electronically recorded by the installed electricity meters are presented in the monthly emission reduction calculation spreadsheets which are enclosed to the Monitoring Report. Accumulated value for $EL_{EXP\ LFG,y}$ during the whole monitoring period is reported as follows:</p> <table><tr><td>Accumulated monthly amount of electricity generated by the CLLC-1 and CLLC-2 power plants ($EL_{EXP\ LFG,y,CLLC-1+2}$) and exported through the electricity grid (MWh)</td></tr><tr><td>34,376</td></tr></table>	Accumulated monthly amount of electricity generated by the CLLC-1 and CLLC-2 power plants ($EL_{EXP\ LFG,y,CLLC-1+2}$) and exported through the electricity grid (MWh)	34,376				
Accumulated monthly amount of electricity generated by the CLLC-1 and CLLC-2 power plants ($EL_{EXP\ LFG,y,CLLC-1+2}$) and exported through the electricity grid (MWh)							
34,376							
Monitoring equipment:	<p>An electricity meter measures the electricity exported by the project activity.</p> <p><u>Specifications of the installed electricity meter used to measure $EL_{EXP\ LFG,CLLC-1+2}$ by the CLLC-1 and CLLC-2 Power plants</u></p> <ul style="list-style-type: none">- Manufacturer: Schneider Electric- Model: ION 8600- Serial Number: PT-1011A447-01- Class: ± 0.2- Accuracy: $\pm 0.2\%$- Serial number: PT-1011A447-01 <p>Calibration events valid for the considered monitoring period:</p> <table><tr><td>Serial Number:</td><td>Calibration date:</td><td>Calibrated by:</td></tr></table>	Serial Number:	Calibration date:	Calibrated by:			
Serial Number:	Calibration date:	Calibrated by:					

		PT-1011A447-01	21/02/2012	CAM Chile S.A.
			05/09/2012	CAM Chile S.A.
Measuring/ Reading/ Recording frequency:	Continuous measurements are recorded/reported every hour.			
Calculation method (if applicable):	Not applicable.			
QA/QC procedures:	Amount of electricity exported measured by the installed electricity meter was crosschecked with the monthly CDEC SIC report.			
Purpose of data:	Data is used for baseline emissions.			
Additional comment:	The manufacturer of the ION 8600 electricity meter, Schneider Electric, states in Technical note 70074-0193-01 that the digital ION™ electricity meters do not require any calibration, but only a periodic verification of the precision. The equipment's supplier – Schneider electric - does not specify the frequency of verifications, thus project participants contacted a well experienced supplier of this equipment and the conclusion is that common practise is to verify the electricity meters every 2 years. Thus project participants did not calibrate the ION 8600 S/N PT-1011A447-01 electricity meter.			
Data / Parameter:	Operational Hours			
Unit:	Hours			
Description:	Operation of the power plant			
Measured/ Calculated / Default:	Measured.			
Source of data:	<p>For every individual hour of the whole monitoring period, it is monitored whether the electricity generation facilities were under operation. This is checked on the basis of available records of electricity generation at the CLLC-1 and CLLC-2 electricity generation facilities for the hour in question + records of flow of LFG sent to the CLLC-1 and CLLC-2 electricity generation facility in the same hour. The amount of operational hours as reported in the monthly emission reduction calculation spreadsheets is increased by 1 (one) unit in the hour h whenever both conditions for the following logical tests are met:</p> <p>For Operational Hours_{CLLC-1}:</p> <ul style="list-style-type: none"> - Record of LFG flow sent to the CLLC-1 electricity facility (in m³/h) for the hour $h > 0$ - Record of electricity exported by the CLLC-1¹⁴ electricity generation facility (in kWh) for the hour $h > 0$ <p>For Operational Hours_{CLLC-2}:</p> <ul style="list-style-type: none"> - Record of LFG flow sent to the CLLC-2 electricity facility (in m³/h) for the hour $h > 0$ 			

¹⁴ It is noteworthy that records of electricity exported by the CLLC-1 power plant used in the calculation of Operational Hours_{CLLC-1} are measured by the electricity meter M1, which measures only electricity exported and imported by the CLLC-1 power plant. It is also important to note that this meter is only used in the context of the calculations for the parameter Operational Hours_{CLLC-1}. Records of electricity exported by the CLLC-1 power plant which are registered by the M1 electricity meter are not used in the context of the parameter EL_{EXP LFG,y}.

	<p>- Record of electricity exported by the CLLC-2 electricity generation facility (in kWh) for the hour $h > 0$</p> <p>The reported quantity of hourly periods for which operation of the electricity generation facility is confirmed (on the basis of records of electricity generation and flow of LFG sent to the electricity generation facility) is thus used for the determination of accumulated monthly values of parameter Operation of the power plant (Operational Hours).</p>																								
Value(s) of monitored parameter:	<p>The accumulated monthly values of parameter Operation of the power plant (Operational Hours) for the considered monitoring period are as follows:</p> <table><tr><th>Month</th><th>Operational Hours CLLC-1</th><th>Operational Hours CLLC-2</th><th>Total Operation Hours</th></tr><tr><td>September 2012</td><td>688</td><td>712</td><td>1.400</td></tr><tr><td>October 2012</td><td>203</td><td>736</td><td>939</td></tr><tr><td>November 2012</td><td>514</td><td>697</td><td>1.211</td></tr><tr><td>December 2012</td><td>706</td><td>720</td><td>1.426</td></tr><tr><td>Total operational hours during the monitoring period</td><td>2,111</td><td>2,865</td><td>4,976</td></tr></table>	Month	Operational Hours CLLC-1	Operational Hours CLLC-2	Total Operation Hours	September 2012	688	712	1.400	October 2012	203	736	939	November 2012	514	697	1.211	December 2012	706	720	1.426	Total operational hours during the monitoring period	2,111	2,865	4,976
Month	Operational Hours CLLC-1	Operational Hours CLLC-2	Total Operation Hours																						
September 2012	688	712	1.400																						
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November 2012	514	697	1.211																						
December 2012	706	720	1.426																						
Total operational hours during the monitoring period	2,111	2,865	4,976																						
Monitoring equipment:	<p>The determination of the quantity of hourly periods for which the electricity generation facility is confirmed to be under operative status is confirmed on the basis of comparison of records of electricity generation against records of flow of LFG sent to the electricity generation facility in the same time instant (hour h). All data is made available in the monthly emission reduction calculation spread sheets. Given the purpose of the parameter "Operation of the power plant" in the context of emission reduction determination, the comparative spread sheet thus acts as a reliable counter for operation hour of the electricity generation facility.</p> <p>The specifications of the flow meters used to measure flow of LFG sent to both the CLLC-1 and CLLC-2 power plants are presented in the table of the parameter $LFG_{\text{electricity},y}$.</p> <p>Two different electricity meters were used for monitoring electricity generated by the CLLC-1 and CLLC-2 electricity generation facilities (meters M1 and M2). The specifications of the meter M2 (used for measuring electricity generated by both the CLLC-1 and CLLC-2 electricity generation facilities) are presented in the table for the parameter $EL_{\text{EXP LFG},y}$.</p> <p>The specifications of the meter M1 (which is only used in the context of the calculation of $Operational\ Hours_{\text{CLLC-1}}$) are presented below:</p> <ul style="list-style-type: none">- Manufacturer: Schneider Electric- Model: ION 7650- Serial Number: PJ-1201A782-03- Class: ± 0.2																								

	<p>- Accuracy: $\pm 0.2\%$</p> <p>A calibration event for the ION 7650 meter was performed on 04/09/2012 by CAM Chile S.A. (the certificate is identified with the same number as the serial number of the meter).</p>
Measuring/ Reading/ Recording frequency:	Records for "Operation of the power plant" (Operational Hours) are determined, recorded and reported on an hourly basis. Accumulated monthly values are also reported in the monthly emission reduction calculation spreadsheets.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	-
Purpose of data:	Data is used for baseline emission determination.
Additional comment:	-

Data / Parameter:	EC_{grid,y}
Unit:	MWh
Description:	Amount of grid electricity consumed by the project activity
Measured/ Calculated / Default:	Measured.
Source of data:	Measured by installed electricity meters (KDM Internal symbol: M0) and also by M2 – bidirectional meter – whenever the CLLC-1 and CLLC-2, are not under operation.
Value(s) of monitored parameter:	Measurement records are presented in the summarized emission reduction calculations spreadsheet which is enclosed to the Monitoring Report.
Monitoring equipment:	<p>Specifications of electricity meter M2 are presented in the table for the parameter EL_{EXP LFG,y}.</p> <p><i>Installed electricity meters M0:</i> Two electricity meters have been utilized simultaneously since 13/03/2007 (prior the monitoring period) for measuring grid electricity consumption by the project activity. The specifications of the electricity meters are as follows:</p> <ul style="list-style-type: none"> - Manufacturer: Schneider Electric - Model: Power Logic PM710 - Serial Number: 02B0629 and 02B0637 - Class: ± 1.0 - Accuracy: $\pm 1.0\%$ <p>According to a letter delivered by the manufacturer Schneider Electric dated of 23/04/2007, the installed Power Logic meters which are used to register the electricity consumption of the flaring station, require no calibration, because they are digital and do not possess any internal mechanical system to realize the functions of measure and control. However, in order to demonstrate that the electrical meters used for measure the electricity consumption of the flaring station are in perfect</p>

	operation conditions, KDM requested the following external calibrations:												
	<table border="1"> <thead> <tr> <th>Serial Number</th><th>Certificate Number</th><th>Calibration date</th><th>Calibrated by</th></tr> </thead> <tbody> <tr> <td>02B0629</td><td>0790-PM44BCA53B</td><td>05/07/2011</td><td>Under Fire Laboratorio de Ensayos</td></tr> <tr> <td>02B0637</td><td>0789-PM450530E</td><td>05/07/2011</td><td>Under Fire Laboratorio de Ensayos</td></tr> </tbody> </table>	Serial Number	Certificate Number	Calibration date	Calibrated by	02B0629	0790-PM44BCA53B	05/07/2011	Under Fire Laboratorio de Ensayos	02B0637	0789-PM450530E	05/07/2011	Under Fire Laboratorio de Ensayos
Serial Number	Certificate Number	Calibration date	Calibrated by										
02B0629	0790-PM44BCA53B	05/07/2011	Under Fire Laboratorio de Ensayos										
02B0637	0789-PM450530E	05/07/2011	Under Fire Laboratorio de Ensayos										
Measuring/ Reading/ Recording frequency:	Continuous measurements are recorded/reported every hour.												
Calculation method (if applicable):	Not applicable.												
QA/QC procedures:	Not applicable.												
Purpose of data:	Data is used for project emissions.												
Additional comment:	<p>Whenever CLLC-1 or CLLC-2 are not under operation electricity may be consumed either from the grid or from the diesel backup generators. For each case the attached spread sheets take that electricity consumption in account as project emissions, calculated by the applicable provisions in the registered PDD.</p> <p>Grid electricity is not directly sourced to the project's LFG collection and destruction (flaring) system by the regional electricity distribution company.</p> <p>The local distribution company Empresa Eléctrica Municipal de Til Til supply electricity to the whole Loma Los Colorados landfill in 23 kV medium voltage, with all supplied grid electricity landfill being monthly invoiced against KDM S.A. (based on measurements as per applicable legislation of the Chilean power market) by using an electricity meter which is located prior to the main power transformer in the entrance of the landfill. After passing through the main power transformer, grid electricity supplied by the Empresa Eléctrica Municipal de Til Til is distributed (with 400 kV voltage) to several power consumers located within the landfill area. All power consumers located in the area of the landfill are part of the operations of KDM S.A. (including the CDM project activity "Loma Los Colorados Landfill Gas Project").</p> <p>There are no internal billing process implemented within KDM S.A. In the particular case of the project activity, measurements of consumed amount of grid electricity are performed in order to meet applicable CDM monitoring requirements and also for operational reasons.</p> <p>Since no invoices, receipts or control are monthly issued for billing/accounting reasons, no internal invoices for consumption of grid electricity are thus available.</p> <p>Thus, available monitoring records were not checked against invoices or receipts of purchase of grid electricity.</p>												
Data / Parameter:	PP _{CP} Diesel-generator												

Unit:	MW																													
Description:	Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel)																													
Measured/ Calculated / Default:	Measured.																													
Source of data:	According to name plate of the three installed generators.																													
Value(s) of monitored parameter:	0.708 MW = 0.276 MW + 0.352 MW + 0.080 MW																													
Monitoring equipment:	<p>The project activity from the start-up of CLLC – 2 onwards encompasses 3 diesel backup generators:</p> <p><i>Specifications of the captive off-grid electricity generators:</i></p> <table><tr><th>Equipment id/tag</th><th>Manufacturer:</th><th>Model Number</th><th>Power (MW)</th><th>Fuel consumption (liters per hour) at 100% load</th><th>Purpose</th></tr><tr><td>Diesel Backup Generator I</td><td>Atlas Copco (using a Volvo diesel engine)</td><td>TAD941GE</td><td>0.276</td><td>71.6</td><td>Gas flaring systems and CLLC-1 auxiliary systems backup</td></tr><tr><td>Diesel Backup Generator II</td><td>Cummins</td><td>SDC - 400</td><td>0.352</td><td>77.9</td><td>CLLC-2 auxiliary systems backup</td></tr><tr><td>Diesel Backup Generator III</td><td>Protelec</td><td>S 100 - 10</td><td>0.080</td><td>16.2</td><td>SELLC systems backup</td></tr></table>						Equipment id/tag	Manufacturer:	Model Number	Power (MW)	Fuel consumption (liters per hour) at 100% load	Purpose	Diesel Backup Generator I	Atlas Copco (using a Volvo diesel engine)	TAD941GE	0.276	71.6	Gas flaring systems and CLLC-1 auxiliary systems backup	Diesel Backup Generator II	Cummins	SDC - 400	0.352	77.9	CLLC-2 auxiliary systems backup	Diesel Backup Generator III	Protelec	S 100 - 10	0.080	16.2	SELLC systems backup
Equipment id/tag	Manufacturer:	Model Number	Power (MW)	Fuel consumption (liters per hour) at 100% load	Purpose																									
Diesel Backup Generator I	Atlas Copco (using a Volvo diesel engine)	TAD941GE	0.276	71.6	Gas flaring systems and CLLC-1 auxiliary systems backup																									
Diesel Backup Generator II	Cummins	SDC - 400	0.352	77.9	CLLC-2 auxiliary systems backup																									
Diesel Backup Generator III	Protelec	S 100 - 10	0.080	16.2	SELLC systems backup																									
Measuring/ Reading/ Recording frequency:	Not applicable.																													
Calculation method (if applicable):	Not applicable.																													
QA/QC procedures:	Not applicable.																													
Purpose of data:	Data is used for project emissions.																													
Additional comment:	-																													

Data / Parameter:	FC_{LPG,y}
Unit:	Ton
Description:	Quantity of fuel LPG combusted by the project activity
Measured/ Calculated / Default:	Measured.
Source of data:	Amount of consumed LPG was measured by the LPG supplier in each event of supply of cylinders of LPG with 45 kg capacity each to the project site.

Value(s) of monitored parameter:	49.1 kg During the considered monitoring period, two cylinders containing 45 kg of LPG each were supplied to the project activity on 17/08/2012. $FC_{LPG,y}$ was determined by weighing the LPG cylinders prior to the beginning of the present monitoring period and after terminating the present monitoring period.						
Monitoring equipment:	<p><i>Specifications of the weight scale used to measure quantity of LPG consumed by the project activity:</i></p> <ul style="list-style-type: none"> - Manufacturer: Mettler Toledo - Model: BBA 221 - Serial Number: 61673256GM - Capacity: 150 kg - Accuracy: ± 0.02 kg <p>The BBA 221 weight scale was calibrated on 19/07/2012 by Precision (Certificate number 42608).</p>						
Measuring/ Reading/ Recording frequency:	<p>The measurements of consumption of LPG by the project activity were performed prior the beginning of the monitoring period and after the end of the monitoring period as indicated in the table below:</p> <table border="1"> <thead> <tr> <th>LPG Cylinder Internal Tag - Cylinder Number</th><th>Dates of the measurement events</th></tr> </thead> <tbody> <tr> <td>1 - 37464</td><td>18/08/2012 and 02/01/2013</td></tr> <tr> <td>2- 0432</td><td>18/08/2012 and 02/01/2013</td></tr> </tbody> </table>	LPG Cylinder Internal Tag - Cylinder Number	Dates of the measurement events	1 - 37464	18/08/2012 and 02/01/2013	2- 0432	18/08/2012 and 02/01/2013
LPG Cylinder Internal Tag - Cylinder Number	Dates of the measurement events						
1 - 37464	18/08/2012 and 02/01/2013						
2- 0432	18/08/2012 and 02/01/2013						
Calculation method (if applicable):	Not applicable.						
QA/QC procedures:	Not applicable.						
Purpose of data:	Data is used for project emissions.						
Additional comment:	-						
Data / Parameter:	$EF_{CO_2,LPG,y}$						
Unit:	tCO ₂ /GJ						
Description:	CO ₂ emission factor for fuel LPG						
Measured/ Calculated / Default:	Default value.						
Source of data:	The applicable conservative default value as established by the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" is selected.						

Value(s) of monitored parameter:	0.0656 tCO ₂ /GJ (as per IPCC 2006 volume 2 chapter 1)
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	Data is used for project emissions.
Additional comment:	-

Data / Parameter:	NCV_{LPG,y}
Unit:	TJ/ton LPG
Description:	Net calorific value of the fuel LPG
Measured/ Calculated / Default:	Default value.
Source of data:	The applicable conservative default value as established by the option d) of the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" is selected.
Value(s) of monitored parameter:	0.0522 TJ/ton _{LPG} (as per IPCC 2006 volume 2 chapter 1)
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	Data is used for project emissions.
Additional comment:	-

The following parameters (which are also identified as parameters to be monitored ex-post in the monitoring plan of the registered PDD) were **not** monitored:

- Temperature of the landfill gas (T).

Justification for non-monitoring of T:

While the installed LFG flow meters automatically convert and express the measurement of LFG flow in normalized cubic meters per hour (Nm³/h), monitoring of Temperature of the landfill gas (T) is thus not required.

- Pressure of the landfill gas (P).

Justification for non-monitoring of P:

While the installed LFG flow meters automatically convert and express the measurement of LFG flow in normalized cubic meters per hour (Nm³/h), monitoring of Pressure of the landfill gas (P) is thus not required.

- Amount of electricity sourced by the captive off-grid electricity generator (fuelled by Diesel) and consumed by the project activity ($EC_{\text{captive},y}$).
- Quantity of fuel Diesel combusted by the captive off-grid electricity generator (FC_{Diesel}).
- Net calorific value of fuel Diesel (NCV_{Diesel}).
- CO_2 emission factor of fuel Diesel ($EF_{CO_2,\text{Diesel}}$).
- Quantity of electricity generated by captive off-grid electricity generator fuelled by Diesel ($EG_{\text{Diesel-generator}}$).

Justification for non-monitoring of $EC_{\text{captive},y}$, FC_{Diesel} , NCV_{Diesel} , $EF_{EL,\text{captive},y}$, $EF_{CO_2,\text{Diesel}}$ and $EG_{\text{Diesel-generator}}$:

Project emissions due to consumption of electricity sourced by the back-up captive off-grid electricity generator (fuelled by diesel) ($PE_{EC,\text{captive},y}$) are calculated by applying the conservative option B4 of the “Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion” to each of the diesel generators) during the considered monitoring period, as follows:

$$PE_{EC,\text{captive},y} = 11,400 * PP_{CP,\text{Diesel-generator}}$$

Where:

$$PP_{CP,\text{Diesel-generator}} = \text{Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel) (in MW)}$$

Thus, by considering the applied approach to calculate the project emissions due to sourcing of electricity by the backup captive electricity generators, monitoring of $EC_{\text{captive},y}$, FC_{Diesel} , NCV_{Diesel} , $EF_{CO_2,\text{Diesel}}$ and $EG_{\text{Diesel-generator}}$ are not required.

D.3. Implementation of sampling plan

>>

Not applicable.

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

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

>>

For the monitoring period covered by this Monitoring Report, GHG emission reductions are achieved by mitigation of emissions two GHGs:

- Destruction of methane (through combustion of LFG in enclosed high temperature flares and combustion of LFG in engine-generator sets)
- Reduction of CO_2 emissions due to generation of electricity which is exported through the grid and thus displace the generation of equivalent amount of electricity that, in the absence of the project activity (baseline scenario) would be generated by fossil fuel power plants and by new additions of power generation sources also using fossil fuel.

At the end of each subsection a sample of the calculations is presented.

E.1.1. Determination of baseline emissions for the project's methane destruction component:

Baseline emissions associated with methane destruction promoted by the project activity (ERM_y) during the considered monitoring period are calculated as the sum of amount of methane actually collected and combusted in the high temperature enclosed flares and combusted in the engine-generator sets of the CLLC-1 and CLLC-2 electricity generation facility ($MD_{\text{project},y}$) minus the amount of the methane that is assumed as destroyed in the baseline scenario (absence of the project) ($MD_{\text{req},y}$). times ex-ante determined values for Global Warming Potential for methane (GWP_{CH_4}) as follows:

$$ERM_y = (MD_{\text{project},y} - MD_{\text{req},y}) * GWP_{CH_4}$$

Where:

GWP_{CH_4} Global Warming Potential for methane. GWP_{CH_4} is ex-ante selected as 21 tCO_2e/tCH_4

Further details about the ex-ante determined parameter GWP_{CH_4} are made available in Section D.1.

$MD_{req,y}$ Amount of methane that is assumed as destroyed in the baseline scenario (absence of the project). $MD_{req,y}$ is ex-ante determined as 245 ton of methane per year (365 days). As the monitoring period from encompasses exactly **122** days, $MD_{req,y}$ is thus equal to **82 tCH₄**,

$MD_{project,y}$ Amount of methane actually destroyed by the project activity during the considered monitoring period. As defined by the PDD, $MD_{project,y}$ is determined as the sum of the values of the parameter for each individual minute of the whole monitoring period as follows¹⁵:

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y}^{16}$$

Where:

$MD_{electricity,y}$ Quantity of methane destroyed by generation of electricity. During the considered monitoring period, $MD_{electricity,y}$ is determined (in tCH₄) as follows:

$$MD_{electricity,y} = MD_{electricity,y,CLLC-1} + MD_{electricity,y,CLLC-2}$$

Where:

$MD_{electricity,y,CLLC-1}$ Amount of methane destroyed by generation of electricity in the CLLC-1 power plant.

$MD_{electricity,y,CLLC-2}$ Amount of methane destroyed by generation of electricity in the CLLC-2 power plant.

In accordance with provisions of the PDD for the determination of $MD_{electricity,y}$, values of $MD_{e1electricity,y,CLLC-1}$ and $MD_{e1electricity,y,CLLC-2}$ are determined as the sum of the values of the parameter for each individual minute of the whole monitoring period as follows:

$$MD_{electricity,y,CLLC-1} = LFG_{electricity,y,CLLC-1} * w_{CH_4,y} * D_{CH_4}$$

And

$$MD_{electricity,y,CLLC-2} = LFG_{electricity,y,CLLC-2} * w_{CH_4,y} * D_{CH_4}$$

Where:

$LFG_{electricity,y,CLLC-1}$ Quantity of landfill gas fed into the CLLC-1 power plant during the year y measured in normalized cubic meters (Nm³/h). Measurements of $LFG_{electricity,y,CLLC-1}$ reported in Nm³/h are converted to Nm³/min (by dividing every 1-minute measurement by 60) for the calculation of values of $MD_{electricity,y,CLLC-1}$ for every minute.

$LFG_{electricity,y,CLLC-2}$ Quantity of landfill gas fed into the CLLC-2 power plant during the year y measured in normalized cubic meters (Nm³/h)¹⁷. Measurements of

¹⁵ The calculation requirements as presented in the informative box "Taking into account records of $LFG_{total,y}$ (measurements from LFG flow meter "F0" in the context of emission reductions" are also taken into account for the determination of every minute values for $MD_{project,y}$.

¹⁶ For the considering monitoring period $MD_{flared,y} = MD_{flared,y,Flare-1} + MD_{flared,y,Flare-2}$ and $MD_{electricity,y} = MD_{electricity,y,CLLC-1} + MD_{electricity,y,CLLC-2}$ thus $MD_{project,y}$ can be calculated as $MD_{project,y} = MD_{flared,y,Flare-1} + MD_{flared,y,Flare-2} + MD_{electricity,y,CLLC-1} + MD_{electricity,y,CLLC-2}$.

¹⁷ Whenever measurements of the parameters $LFG_{flared,y}$ ($LFG_{flared,y,Flare-1}$ and $LFG_{flared,y,Flare-2}$), $LFG_{electricity,y}$ ($LFG_{electricity,y,CLLC-1}$ and $LFG_{electricity,y,CLLC-2}$), $w_{CH_4,y}$ and temperature of the landfill gas are recorded as outside the interval indicated below, it is assumed that related equipments (Flare 1, Flare 2 and the generator sets of the CLLC-1 and CLLC-2 power plant) are operating outside the manufactures specifications/requirements. In such case, data records are not

LFG_{electricity,y,CLLC-2} reported in Nm³/h are converted to Nm³/min (by dividing every 1-minute measurement by 60) for the calculation of values of MD_{electricity,y,CLLC-2} for every minute.

w_{CH₄,y} and D_{CH₄} are determined as explained below.

MD_{flared,y} Amount of methane destroyed by flaring. While during the considered monitoring period methane has been destroyed by flaring in 2 high temperature enclosed flares, MD_{flared,y} is thus determined (in tCH₄) as the sum of methane actually destroyed in each one of the flares as follows:

$$MD_{\text{flared},y} = MD_{\text{flared},y,\text{Flare-1}} + MD_{\text{flared},y,\text{Flare-2}}$$

Where:

MD_{flared,y,Flare-1} Amount of methane destroyed in Flare 1

MD_{flared,y,Flare-2} Amount of methane destroyed in Flare 2

In accordance with provisions of the PDD for the determination of MD_{flared,y}, values of MD_{flared,y,Flare-1} and MD_{flared,y,Flare-2} are determined as the sum of the values of the parameter for each individual minute of the whole monitoring period as follows as follows:

$$MD_{\text{flared},y,\text{Flare-n}} = LFG_{\text{flare},y,\text{Flare-n}} * w_{\text{CH}_4,y} * D_{\text{CH}_4} * FE_n$$

Where:

LFG_{flare,y,Flare-n} Amount of landfill sent to Flare n (where n = 1 and 2). LFG_{flare,y,Flare-n} is determined on the basis of every minute measurement records of LFG flow sent to the flare n (in Nm³/h)¹⁸. Measurements of LFG_{flare,y,Flare-1} and LFG_{flare,y,Flare-2} reported in Nm³/h are converted to Nm³/min (by dividing every 1-minute measurement by 60) for the calculation of values of MD_{flared,y,Flare-1} and MD_{flared,y,Flare-2} for every minute.

w_{CH₄,y} Methane fraction of collected landfill gas (in m³CH₄/m³LFG). Every minute measurement records are considered for the determination of every minute values of MD_{flared,y,Flare-1} and MD_{flared,y,Flare-2}

D_{CH₄} Density of methane. D_{CH₄} is ex-ante determined as 0.0007168 tCH₄/m³CH₄.

FE_n Flare/combustion efficiency of flare n (the fraction of the methane destroyed) In accordance to the PDD, FE_n is determined based in a mass balance, within the period of measurement of the flare efficiency, between the flow and the amount of residual methane in the exhaust gases of flares and also in the gas sent to the flares as follows:

taken in account for the calculation of emission reductions of the project activity (no emission reductions from methane destruction is claimed).

Equipment	Flow of LFG (Nm ³ /h)	Temperature (°C)	Methane (%)
Flare 1	800 - 5,097	500 - 1,095	30 - 70
Flare 2	800 - 5,097	500 - 1,095	30 - 70
CLLC-1	100 - 1,800	-	30 - 70
CLLC-2	180 - 12,600	-	30 - 70

$$FE_n = 1 - (MD_{nd,kg/h,n} / MD_{flared,kg/h,n})$$

Where:

$MD_{nd,kg/h,n}$ Quantity of methane non destroyed in each flare (kg/hour). $MD_{nd,kg/h,n}$ is determined as follows:

$$MD_{nd,kg/h,n} = (LFG_{residual,y,n} * w_{CH4,y,residual,n}) / 1,000,000 \text{ [kg/g]}$$

Where:

$LFG_{residual,y,n}$:

Amount of landfill gas in the exhaust gas of each flare (Nm^3/h). This value is measured by the third party company Airón Ingeniería y Control Ambiental S.A.

$w_{CH4,y,residual,n}$:

Determined as the average of the measured CH_4 content in the exhaust gas of each flare during the interval of time in which the value for FE_n is applied for each FE_n determination. This value is measured by the third party company Airón Ingeniería y Control Ambiental S.A.

$MD_{flared,kg/h,n}$ Quantity of methane sent to each flare (kg/hour). $MD_{flared,kg/h,n}$ is determined as follows:

$$MD_{flared,kg/h,n} = LFG_{flare,y,n} * w_{CH4,y,average} * D_{CH4} * 1,000 \text{ [kg/ton]}$$

Where:

$LFG_{flare,y,n}$:

Amount of landfill gas flared in each flare (Nm^3/h). Data measured by flow meters F1 and F2 is used for the calculation of FE_1 and FE_2 , respectively.

$w_{CH4,y,average}$:

Determined as the average of the measured value for monitoring parameter $w_{CH4,y}$ during the interval of time in which the value for FE is applied for each FE determination.

The calculated values for FE_n ($MD_{nd,kg/h,n}$ and $MD_{flared,kg/h,n}$) in the context of each one of the valid third party evaluations are indicated in the table below:

Calculated values for $MD_{nd,kg/h,n}$ and $MD_{flared,kg/h,n}$:

Flare	Date of the evaluation/testing	$MD_{nd,kg/h,n}$ (kg/h)	$MD_{flared,kg/h,n}$ (kg/h)
1	09-07-2012	0.0446229	1516.04592

2	10-07-2012	0.0388776	1451.659045
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The calculated values for FE_n , in order to determine the applicable values of the parameter $MD_{project,y}$ as follows:

Adopted values for FE_n along the monitoring period

Flare	Period within the considered monitoring period	Value of FE
1	All monitoring period	99.9971%
2	All monitoring period	99.9973%

Taking into account records of $LFG_{total,y}$ (on the basis of continuous measurements of LFG flow from LFG flow meter "F0") in the context of determination of emission reductions:

In accordance with applicable guidance of ACM0001 (version 4) and available provisions in the PDD, during the considered monitoring period, baseline emission calculations due to methane destruction by the project activity was calculated by also taking into account the following conditions involving a measurements of total amount of LFG collected by the project activity which was sent to Flare 1, Flare 2, CLLC-1 and CLLC-2 power plant.

- a) In case the condition " $MD_{total,y} > MD_{flared,y} + MD_{electricity,y}$ " is met for a particular minute of the monitoring period, $MD_{project,y}$ is calculated as follows for the minute in question:

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} = (LFG_{flare,y,Flare-1} * w_{CH4,y} * D_{CH4} * FE_1) + (LFG_{flare,y,Flare-2} * w_{CH4,y} * D_{CH4} * FE_2) + (LFG_{electricity,y,CLLC-1} * w_{CH4,y} * D_{CH4}) + (LFG_{electricity,y,CLLC-2} * w_{CH4,y} * D_{CH4})$$

- b) In case the condition " $MD_{total,y} < MD_{flared,y} + MD_{electricity,y}$ " is met for a particular minute of the monitoring period, $MD_{project,y}$ is calculated as follows for the minute in question:

$$MD_{project,y} = MD_{total,y} = LFG_{total,y} * w_{CH4,y} * D_{CH4} * \text{Min}(FE_1; FE_2)^{19}$$

By taking into account the calculated values for $MD_{flared,y}$ and $MD_{electricity,y}$ for the considered monitoring period, $MD_{project,y}$ is thus calculated as **9,129 tCH₄**.

During the present monitoring period $ERM_y = 189,989 \text{ tCO}_2\text{e}$

E.1.2. Baseline emissions for the project's renewable energy generation component:

As outlined in the PDD, baseline CO₂ emissions for electricity generation using LFG as fuel (which promotes displacing of equivalent amount of electricity that would otherwise be generated by existing fossil fuel plants and new generation sources additions in the SIC-grid in Chile) are determined by following calculation and monitoring approaches as per ACM0002 (version 6).

¹⁹ As per the registered PDD in case the condition " $MD_{total,y} < MD_{flared,y} + MD_{electricity,y}$ " is met, $MD_{project,y} = MD_{total,y} = LFG_{total,y} * w_{CH4,y} * D_{CH4}$. However, as such calculation approach does not take in account values for Flare/combustion efficiency (FE); the project participants thus also applied the lowest value of flare/combustion efficiency (FE_n) in the formulae as a conservative approach for the determination of baseline emission in all particular minutes of the whole monitoring period where the condition " $MD_{total,y} < MD_{flared,y} + MD_{electricity,y}$ " was met.

As per ACM0002 (version 6), such baseline emissions are determined as associated emission for equivalent amount of electricity that would otherwise be generated in existing and/or new grid-connected power plants in the absence of the project activity (baseline scenario).

As also defined in the PDD, baseline CO₂ emissions for the project's renewable energy generation component (ERC_y) for the considered monitoring period are determined (in tCO₂) as follows:

$$ERC_y = EL_y * CEF_y \quad (\text{Where: } EL_y = EL_{EXPLFG,y}) , \text{ thus } ERC_y = EL_{EXPLFG,y} * CEF_y$$

Where:

EL_{EXPLFG,y} Quantity of electricity generated by the project activity using LFG as fuel which is exported (in MWh). For the considered monitoring period, the accumulated value of EL_{EXPLFG,y} during the whole monitoring period is reported as **34,376 MWh**. Further monitoring details about EL_{EXPLFG,y} are presented in Section D.2.

CEF_y Emissions factor for electricity generation (in tCO₂/MWh). CEF_y is ex-ante calculated as 0.408 tCO₂/MWh.

For the considered monitoring period, ERC_y = **14,025 tCO₂**.

E.1.3. Total baseline emissions for the project activity

Total baseline emissions for the project activity (BE_y) are determined (in tCO₂e) as the sum of (i) baseline emissions associated with methane destruction promoted by the project activity (ERM_y) and (ii) baseline CO₂ emissions for the project's renewable energy generation component (ERC_y). For the considered monitoring period, ERM_y is calculated as follows:

$$BE_y = ERM_y + ERC_y = 189,989 + 14,133 = 204,014 \text{ tCO}_2\text{e}$$

All calculations of baseline emissions are detailed in emission reduction calculation spreadsheets enclosed to the Monitoring Report.

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

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The project activity has three sources of project emissions:

- Project emissions due to the consumption of grid electricity by the project activity
- Project emissions due to consumption of electricity sourced by the backup captive off-grid electricity generators (fuelled by diesel)
- Project emissions due to the consumption of LPG by the project activity

The project emissions are calculated as follows²⁰:

$$PE_{i,y} = PE_{EC,grid,y} + PE_{EC,captive,y} + PE_{LPG}$$

Where:

PE_{EC,y} = Project emissions due to electricity consumption in year y (in tCO₂).

PE_{LPG,y} = Project emissions due to consumption of fossil fuel LPG²¹ by the project activity (for uses other than electricity generation) (in tCO₂).

²⁰ Details of calculations are shown in the annex spread sheet of the monitoring report.

²¹ Liquefied Petroleum Gas (LPG) is used for igniting the flares.

$PE_{EC,captive,y}$ = Project emissions due to the consumption of electricity sourced by the backup captive off-grid electricity generator (fuelled by diesel) (in tCO₂).

E.2.1. Project emission due to the consumption of grid electricity by the project activity:

Project emissions due to electricity consumption ($PE_{EC,grid,y}$) are determined (in tCO₂) as follows:

$$PE_{EC,grid,y} = EC_{grid,y} * CEF_y * (1 + TDL_{grid,y})$$

Where:

$EC_{grid,y}$ Amount of grid electricity consumed by the project activity. For the considered monitoring period $EC_{grid,y}$ was determined based on measurements as per applicable provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". For the considered monitoring period $EC_{grid,y}$ is equal as **164** MWh. Further monitoring details for $EC_{grid,y}$ are presented in Section D.2.

CEF_y CO₂ emission factor for grid electricity. CEF_y is ex-ante determined as **0.408** tCO₂/MWh. Further details of CEF_y are presented in Section D.1.

$TDL_{grid,y}$ Average technical transmission and distribution losses for grid electricity. In accordance with applicable provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and the PDD, $TDL_{grid,y}$ is ex-ante determined as 20% (conservative default value fixed along the whole crediting period). Further details about $TDL_{grid,y}$ are presented in Section D.1.

$PE_{EC,grid,y}$ is thus calculated as $164 * 0.408 * (1 + 0.20) = \mathbf{80.3}$ tCO₂

E.2.2. Project emissions due to the consumption of electricity sourced by backup captive off-grid electricity generator (fuelled by diesel):

By following applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) as highlighted in the PDD, project emissions due to consumption of electricity sourced by a captive off-grid electricity generator (fuelled by diesel) ($PE_{EC,captive,y}$) are taken into account in the determination of emission reductions.

Since the amount of electricity actually sourced by the captive electricity generator (fuelled by diesel) and consumed by the project activity (parameter $EC_{captive,y}$) was not monitored in accordance with the related provisions of the monitoring plan, $PE_{EC,captive,y}$ is thus determined by applying the conservative approach of option B4 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1). The PDD refers to this option as a conservative alternative for determining $PE_{EC,captive,y}$.

On the next table it is shown the diesel generators under operation during the considered monitoring period, as well as the period that they were under operation and their nameplate power.

Equipment id/tag	Nameplate installed power generation capacity	Period under operation
Diesel Backup Generator I	0.276	During all monitoring period (122 days – 2,928 hours)
Diesel Backup Generator II	0.352	
Diesel Backup Generator III	0.080	

As per option B4 of the methodological tool, only the rated capacity of the captive off-grid electricity generator is to be monitored since under a very conservative simplification, emission factor of 1.3 tCO₂/MWh and operation time of 8,760 hours during the year at the rated capacity are considered as follows:

$$PE_{EC,captive,y} = 11,400 * PP_{CP,Diesel-generator}$$

Where:

$PP_{CP,Diesel-generator}$ Rated capacity of the installed captive off-grid electricity generator fuelled by diesel ($PP_{CP,Diesel-generator}$) (in MW). $PP_{CP,Diesel-generator}$ is selected as 0.276, 0.352 and 0.080 MW. These values are indicated as the nameplate power of the installed captive off-grid electricity generators. Further details about the determination of $PP_{CP,Diesel-generator}$ are included in Section D.2.

By applying the value of $PP_{CP,Diesel-generator}$ as well as the period the installed captive off-grid electricity generators were under operation:

$$PE_{EC,captive,y} = 1.3 * 2,928 * (0.276 + 0.352 + 0.080) = \mathbf{2,695 \text{ tCO}_2}$$

Thus, project emissions due to the consumption of electricity sources by the backup captive offgrid electricity generator (fuelled by diesel) are calculated as **2,695 tCO₂**.

E.2.3. Project emissions due to the consumption of LPG by the project activity:

As defined by the revised version of the PDD, GHG emissions due to the consumption LPG by the project activity (PE_{LPG}) are also accounted as project emissions. Such project emissions are determined by following applicable guidance of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” as also outlined in the PDD. As per such methodological tool related project emissions source are determined as follows:

$$PE_{LPG,y} = FC_{LPG,y} * COEF_{LPG,y}$$

Where:

$FC_{LPG,y}$ Amount of fossil fuel (LPG) consumed by the project activity. During the considered monitoring period, $FC_{LPG,y}$ was determined by weighing the LPG cylinders prior to the beginning of the present monitoring period and after terminating the present monitoring period as shown in the next table.

LPG Cylinder	Date	Weight (kg)	Date	Weight (kg)	LPG consumed (kg)
Internal Tag - Cylinder Number					
1 - 37464	18/08/2012	77.38	02/01/2013	47.32	30.06
2- 0432	18/08/2012	77.62	02/01/2013	59.58	19.04
Total					49.00

During the considered monitoring **49 kg (0.049 ton)** of LPG were consumed by the project activity. Further monitoring details for $FC_{LPG,y}$ are presented in Section D.2.

$COEF_{LPG,y}$ CO₂ emission factor for consumed LPG (in mass basis). $COEF_{LPG}$ is determined as the product between the Net Calorific Value for consumed LPG (NCV_{LPG}) and the CO₂ emission factor for consumed LPG (in energy basis) (EF_{LPG}), as follows:

$$COEF_{LPG,y} = EF_{CO2,LPG,y} * NCV_{LPG,y}$$

Where:

$EF_{CO_2,LPG,y}$ Emission factor for consumed LPG (in energy basis). The value for $EF_{CO_2,LPG,y}$ is selected as 65.6 tCO₂/TJ. This value is selected as per IPCC Guidelines for National Greenhouse Gas Inventories, 2006 (IPCC, 2006), Chapter 1, Volume 2, Table 1.4 - value at the upper limit of the uncertainty at 95% confidence interval. Further details about the determination of $EF_{CO_2,LPG,y}$ are described in Section D.2.

$NCV_{LPG,y}$ Net Calorific Value for consumed LPG $NCV_{LPG,y}$. The value for $NCV_{LPG,y}$ is selected as 0.0522 TJ/ton. This value is selected as per IPCC Guidelines for National Greenhouse Gas Inventories, 2006 (IPCC, 2006), Chapter 1, Volume 2, Table 1.2 - value at the upper limit of the uncertainty at 95% confidence interval. Further details about the determination of $NCV_{LPG,y}$ are described in Section D.2.

By applying the above summarized calculation, $COEF_{LPG,y}$ is thus determined as **3.43 tCO₂/ton_{LPG}**

By taking into account the determined values for $FC_{LPG,y}$ and $COEF_{LPG,y}$ within the considered monitoring period, $PE_{LPG,y}$ is thus calculated as = **0.2 tCO₂**

E.2.4. Total project emissions:

By taking into account the determined values for $PE_{EC,grid,y}$, $PE_{EC,captive,y}$ and $PE_{LPG,y}$; total project emissions ($PE_{i,y}$) are thus determined as calculated as **2,776 tCO₂** (rounded value), as show in the next formula:

$$PE_{i,y} = PE_{EC,grid,y} + PE_{EC,captive,y} + PE_{LPG,y} = 80.3 + 2,695 + 0.2 = \mathbf{2,776 \text{ tCO}_2}$$

All calculations of baseline and project emissions are summarized in a emission reduction calculation spreadsheet enclosed to the Monitoring Report.

E.3. Calculation of leakage

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Not applicable. As per ACM0001 (version 4) and registered PDD, no leakage emissions are to be accounted.

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

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	204,014	2,776	0	201,238

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 CO ₂ e)	232,898	201,238

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

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No relative increase in the achieved emission reductions occurred when compared to emission reduction estimations for a comparable period as per the registered PDD. As demonstrated in Section E.5, the total achieved emission reduction during the monitoring period represents **86%** of the comparable figure for the ex-ante estimations of emission reduction as per the registered PDD.

The values estimated in ex-ante calculation of registered PDD were calculated based on the predicted value of the registered PDD by considering 3 months in 2012. The result is shown on the next table:

Year	Values estimated in ex-ante calculation of registered PDD for the full year period (tCO ₂ e)	Values estimated in the ex-ante calculation of the registered PDD for the period covered by this monitoring report (tCO ₂ e)
2012	698,694	(4 months) 232,898

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)	201,238	-

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Document information

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