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

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	10/09/2012
Registration date of the project activity	17/03/2007
Monitoring period number and duration of this monitoring period	Monitoring period #7 from 01/06/2012 to 31/08/2012
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; Applied CDM baseline and monitoring methodologies: 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	174,674
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	153,730

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

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 verification period, as part of the project activity, there were 295 LFG collecting wells built over a 55 Ha surface of the landfill.

During this monitoring period there were changes in terms of transmission of electricity generated by the project activity. Power generation capacity additions also occurred. The occurred changes are as follows:

Changes in transmission lines:

- From the beginning of the monitoring period to 06/07/2012, while all net electricity generation from the Central Loma Los Colorados 1 (CLLC–1) electricity generation facility was exported electricity through a dedicated 23 kV voltage transmission line (which was connected to the local power distribution grid), all net electricity generated by the Central Loma Los Colorados 2 (CLLC-2) electricity generation facility has been exported through a dedicated 110 kV voltage and 20 km lenght transmission line which is connected to the Punta Peuco substation.
- From 06/07/2012 onwards, the earlier available dedicated transmission line for the CLLC–1 electricity generation facility has not been under operation anymore (discontinued). Since this date, all net electricity generation of the CLLC–1 power plant has also been exported through a more recently built 110 kV voltage and 20 km length transmission line which is connected to the Punta Peuco substation. This solution was implemented in order to increase the reliability of power transmission of electricity generated by the CLLC–1 facility.

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 engines-generator sets (with nameplate installed capacity of 1.4 MW each) were installed at the project site (with continuous operation starting on 21/07/2012). Thus, since this date, the CLLC–2 electricity generation facility has 9.8 MW of total nameplate installed electricity generation capacity and CLLC-1 still with 2.0 MW of installed capacity. This capacity increase is in accordance to the project design details made available in the PDD.

As per the planned gradual implementation plan for the CLLC-2 electricity generation facility, further capacity additions are yet to occur:

- additional GE Jenbacher model J420 engine-generator sets are expected to be implemented. In year 2012, an additional set of 2 more engine-generator sets are yet expected to be installed and additional units are also expected to be further implemented during the period from year 2013 until 2028. By 2028, the total combined nameplate installed capacity for CLLC-1 and CLLC-2 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 20/07/2012

LFG Flaring installed capacity	Flare 1	Flare 2:	Total = 10,194 Nm^3/h
	5,097 Nm^3/h	5,097 Nm^3/h	
Electricity generation installed capacity	CLLC-1	CLLC-2	Total = 11.8 MW
	2.0 MW	9.8 MW	

Period from 21/07/2012 to the end of the monitoring period

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

Emission Reductions (ER) achieved during the 7th monitoring period (from 01/06/2012 to 31/08/2012) are **153,730** tCO_2e.

Monitoring period	Achieved emission reductions (tCO_2e)
From 01/06/2012 to 31/08/2012	**153,730**

A.2. Location of project activity

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 Northern 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 km^2.

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

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);

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 CO_2 emissions from fossil fuel combustion" (version 2);

A.5. Crediting period of project activity

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

During the considered verification period the project activity encompasses the following equipment:

- Two enclosed high temperature flares (supplied by LFG Specialities L.L.C.) with the following specifications and operational conditions[2]:

[2] *Design details of the installed two high temperature enclosed flares:*
Details about the stacks: Carbon steel construction with ANSI 150 lb flanged inlet connection. 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 flare have a flow range of 500 – 3,000 scfm (800 – 5,097 Nm^3/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.

- Min. LFG flow: 800 Nm^3/h (500 scfm)
- Max. LFG flow: 5,097 Nm^3/h (3,000 scfm)
- Min. temperature of exhaust gas: 800 ^oC (in order to ensure acceptable combustion efficiency)
- Max. temperature of exhaust gas:1,095 ^oC (in order to ensure acceptable combustion efficiency)

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)[3]

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.

[3] *Design details for the condensate knock-out pot:*
The installed KOP unit has 60 inch diameter x 90 inch high and it is supplied by OAH LFG Specialties L.L.C. It has 150# flanged 24 inch inlet and 18 inch 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

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

- 3 LFG blowers[4]

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)[5]

[4] *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 TEFC electrical motor. Each blower is of centrifugal type, spark proof, cast iron construction, cast aluminium 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.

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 meters[6].

Figure 5 - View of the installed 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 receive 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 CH_4 in collected LFG): Fraction of CH_4 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,

[5] *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.

[6] 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.

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 CH_4 content of collected LFG is out of the user-set range[7]. CH_4 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:

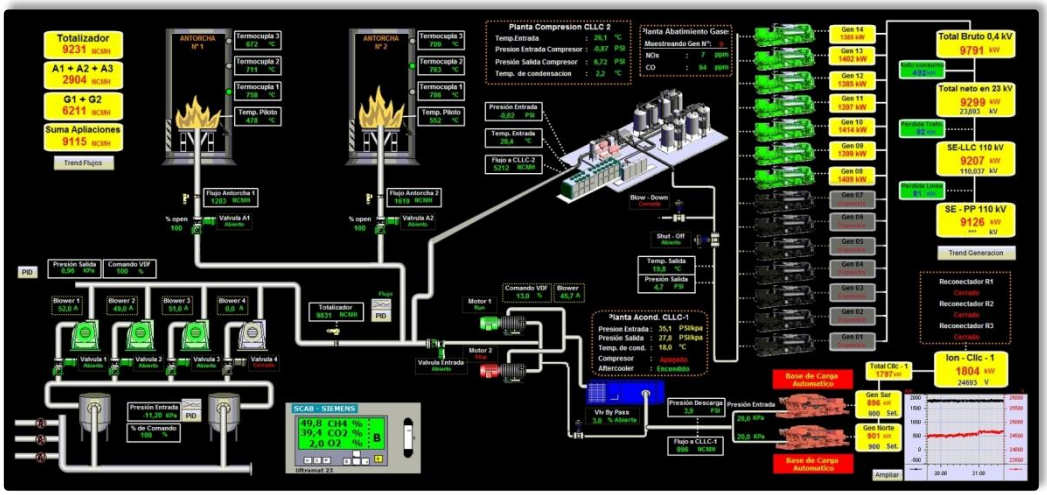

Figure 7 - View of the SCADA system for the project activity

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.

[7] 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 CH_4 content in collected LFG flow)
- From 0% - 100% (for measurements of CO_2 content in collected LFG flow)
- From 0% - 5% (for measurements of O_2 content in collected LFG flow)

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

The following paragraphs includes 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 period from the beginning of the monitoring period until 06/07/2012, a 1 km length transmission line was used to transmit electricity generated by the CLLC–1 power plant and connect it to the SIC grid. This transmission line is connected to an existing local 23 kV power distribution line which is part of the SIC grid. This transmission line was disconnected on 06/07/2012 by KDM S.A.[8] Due to that, since this date, all net electricity generated by CLLC–1 electricity generation facility has been exported to National Electricity Grid of Chile (SIC grid) through the 110 kV voltage and 20 km length transmission line which was more recently built for the for CLLC–2 electricity generation facility.

[8] The decision of KDM S.A. to not any longer export electricity generated by the CLLC-1 electricity generation facility through the existing local 23 kV power distribution line is based on the following aspects:
- the more recently built 110 kV voltage and 20 km length transmission line (used to export electricity generated by the CLLC-2 power plant) is of higher reliability
- comercial reasons

Figure 10 – View of the 23 kV power transmission line (referenced as "*KDM Transmission line 23 kV*" and the existing local 23 kV power distribution line (referenced as "*Transmission line 23 kV*"). This configuration was valid until 06/07/2012.

Up to 06/07/2012, all net electricity generated by the CLLC-1 electricity generation facility was accounted as exported electricity by the Chilean electricity dispatch coordinating entity (CDEC-SIC[9]) on the basis of measurements per formed by dedicated meter and regularly recorded in monthly transfers balance of electricity for the power generation source registered at CDEC-SIC as "*Central Loma Los Colorados 1 (CLLC-1)*"

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 destruction facility (LFG flaring station) was met by imports of grid electricity. Moreover, a captive off-grid electricity generator (fuelled by diesel) and with 276 kW of nameplate electricity generation capacity (internal reference "Diesel Backup Generator I") was used as a backup power source for the LFG flaring station (incl. LFG blowers, lighting, HVAC, control equipment, etc.) whenever supply of grid electricity to the project's LFG flaring station and control room was temporarily interrupted.

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 9 GE Jenbacher J420 engine-generator sets (with nameplate installed capacity of 1.4 MW each). The total nameplate installed capacity for

[9] The Centro de Despacho Económico de Carga (CDEC-SIC) is the national electricity dispatch coordinating entity in Chile. Besides of coordinating the dispacht 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

CLLC-2 was 12.6 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 m^3/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 is 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.

  Due to capacity restrictions of the earlier existent electricity transmission line (used to export electricity from the CLLC–1 power plant), KDM S.A. built a new 110 kV voltage and 20 km length power transmission line in order to meet the electricity transmission demand of the new CLLC-2 electricity generation facility. This transmission line transmits electricity generated by CLLC-2 power plant (and more recently electricity generated at the CLLC-1 power plant too) by converting electricity from 23 kV to 110 kV in a main power transformer. The 20 km length transmission line connects the CLLC-2 electricity generation facility to the new Punta Peuco power substation which is part of the SIC grid. This new sub-station (also named Sub-station Loma los Colorados (SELLC)).

- *Backup captive off-grid electricity generator (fuelled by diesel):*
  An emergency backup captive and off-grid elecricity generator (fuelled by diesel) (and with internal reference "Diesel Backup Generator II") and with 320 kW of nameplate power is used meeting 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.

Figure 11 - External view of CLLC-2 electricity generation facility
(during construction phase in Aug. 2011)

Figure 12 - Internal view of CLLC-2 electricity generation facility

- Sub-station Loma los Colorados (SELLC) (also named "Punta Peuco power substation"):
  This substation 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). 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.

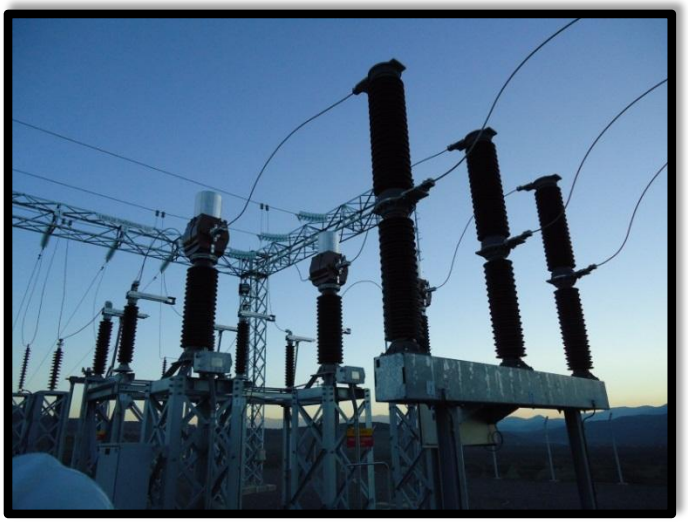

Figure 13 - Detail of power transmission line for CLLC-2 power plant (also used for the CLLC-1 power plant since 06/07/2012)

Note on electricity metering

Since 06/07/2012 14:00, both net electricity generated by the CLLC-1 power plant and net electricity generated by the CLLC-2 power plant are exported through the SIC grid thought the 100 kV voltage and 20 km length transmission line. M2 electricity meter is available in the substation in the end of this transmission line.

During the period from the start of the monitoring period to 06/07/2012, as net electricity generated by the CLLC-1 power plant were exported thought the 23 kV voltage transmission line, M2 electricity meter was thus used only to measure the total exported net electricity generated by the CLLC-2 power plant. M1 electricity meter was was used to measure the electricity exported through the 23 kV transmission line (electricity generated by CLLC-1 power plant).

For the period from 06/07/2012, the operational hours and net exported electricity values applicable for the CLLC-1 power plant are determined on the basis of measurements of the M1 electricity meter.

Thus, for the period from 06/07/2012, measurements of the M2 electricity meter represent total exported electricity generated by both CLLC-1 and CLLC-2 power plants.

Also, electricity imported measured in CLLC - 1 is always presented as zero from that point forward, since it is only imported from the grid when CLLC-1 and CLLC-2 are stopped at the same time. Moreover the amount of electricity measured by M2 takes in account all electricity imported from the grid for CLLC-1 and CLLC–2.

The following table summarizes the configuration of M1 and M2 electricity meters which are used to measure electricity exports and imports:

Period	Power Plant	Electricity meter used to measure the electricity exported/imported by the plant	Approach to determine amount of electricity exported by each power plant
From the beginning of the monitoring period to 06/07/2012 13:59	CLLC-1	M1 meter (bi-directional meter)	Records of exported electricity from M1 meter
	CLLC-2	M2 meter (bi-directional meter)	Records of exported electricity from M2 meter
From 06/07/2012 14:00 to end of the monitoring period	CLLC-1	M1 meter (bi-directional meter)	Records of exported electricity from M1 meter
	CLLC-2	M1 and M2 meters (where M2 meter measures the electricity exported by CLLC-1 and CLLC-2)	Difference between records of exported electricity from M2 meter and records of exported electricity from M1 meter

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 38 LFG collection wells	21/06/2012
Finalization of construction of additional 10 LFG collection wells (Total number of total operating LFG collecting wells: 295)	31/08/2012
Performed auditing events in the ISO 9001/ISO 14001 certified QA/QC and environmental management system of the Loma Los Colorados landfill (of which scope includes the project activity)	
Performance of internal auditings	12/07/2012
Performance of external auditings	-
CLLC-1 electricity generation facility	
Connection of CLLC–1 power plant to the 110 kV voltage transmission line	06/07/2012
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)	21/07/2012

The following relevant events also occurred during the considered monitoring period:[11]:

[11] In CLLC - 2 the installed set of 9 engine-generator sets are numbered from 6 to 14.

Date	Description of the event
	Gas flaring units
06/06/2012	Both Flare 1 and Flare 2 stop functioning due to too high oxygen content of collected LFG.
09/06/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped in order to perform general maintenance.
11/06/2012	Blower N°1 and both Flare 1 and Flare 2 stop functioning due to high temperature levels.
16/06/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped.
20/06/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped into order to perform general maintenance service.
26/06/2012	Operation of Flare 1 and Flare 2 were temporarily stopped due to failure in electricity supply.
03/07/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped in order to performe maintenance service in LFG collection pipelines, and in flame arrestors of both Flare 1 and Flare 2.
09/07/2012	LFG flow to Flare 2 was restricted during event of measurement exhaust gas in Flare 1.
10/07/2012	LFG flow to Flare 1 was restricted during event of measurement exhaust gas in Flare 2.
11/07/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped in order to perform general maintenance service.
18/07/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped due to too low LFG flow.
20/07/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped in order to performe maintenance service in LFG collection pipelines.
21/07/2012	Operation of Flare 2 is temporarily stopped.
13/08/2012	Operation of both Flare 1 and Flare 2 were temporarily stopped due to too high oxygen content in collected LFG.
16/08/2012	Operation of both Flare 1 was temporarily stopped due to too high temperature of exhaust gas of the flare.
23/08/2012	Operation of Flare 1 and Flare 2 were temporarily stopped due to failure in electricity supply.
	CLLC-1 electricity generation facility
02/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.
03/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.
05/06/2012	Operation of engine-generator sets were temporarily stopped due to too high oxygen content in collected LFG.
07/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.
07/06/2012	Operation of one of the engine-generator sets was temporarily stopped due to too low fuel pressure.
09/06/2012	Operation of engine-generator sets were temporarily stopped in order to perform general maintenance service.
11/06/2012	Operation of one of the engine-generator sets was temporarily stopped due to malfunction in main pneumatic valve.
16/06/2012	Operation of one of the engine-generator sets was temporarily stopped in order to have optical fibber cables installed.
18/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.

19/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.
21/06/2012	Operation of engine-generator sets were temporarily stopped due to too high voltage in the 23 kV transmission line.
21/06/2012	Operation of engine-generator sets were temporarily stopped due to malfunction in an electric valve of one of the engine-generator sets.
22/06/2012	Operation of engine-generator sets were temporarily stopped due to malfunction in an electric valve of one of the engine-generator sets.
23/06/2012	Operation of one of the engine-generator sets was temporarily stopped in order to perform general maintenance service (500 hours preventive maintenance service).
06/07/2012	Operation of one of the engine-generator sets was temporarily stopped in order to perform programming service in the protection relay.
06/07/2012	Operation of engine-generator sets were temporarily stopped in order to perform configuration service in protection relays in both engine-generator sets.
07/07/2012	Operation of one of the engine-generator sets was temporarily stopped due to recurrent failures.
07/07/2012	Operation of one of the engine-generator sets was temporarily stopped due to recurrent failures.
11/07/2012	Operation of engine-generator sets were temporarily stopped in order to perform general maintenance service.
20/07/2012	Operation of engine-generator sets were temporarily stopped in order to perform configuration service in electrical protections of the CLLC-2 power plant and start operations of two additional engine-generator sets at the CLLC-2 power plant.
03/08/2012	Operation of one of the engine-generator sets was temporarily stopped in order to perform general maintenance service.
04/08/2012	Operation of one of the engine-generator sets was temporarily stopped due to a malfunction in differential pressure sensor.
06/08/2012	Operation of one of the engine-generator sets was temporarily stopped in order to perform tests in differential pressure sensor and combustions systems.
20/08/2012	Operation of one of the engine-generator sets was temporarily stopped due to too high oil temperature.
25/08/2012	Operation of one of the engine-generator sets was temporarily stopped in order to replace oil temperature sensor in the engine.
27/08/2012	Operation of one of the engine-generator sets was temporarily stopped due to abnormal variations in LFG pressure.
	Power generation plant CLLC – 2
05/06/2012	The whole power plant temporarily stopped to operate due to too low methane fraction in collected LFG.
05/06/2012	The whole power plant temporarily stopped to operate due to too low methane fraction in collected LFG.
06/06/2012	The whole power plant temporarily stopped to operate due to too low methane fraction in collected LFG.
09/06/2012	The whole power plant temporarily stopped to operate in order to performe repair and cleaning service in the LFG cooling and purification station.
10/06/2012	The whole power plant temporarily stopped to operate due to recloser opening.
11/06/2012	The whole power plant temporarily stopped to operate due to malfunctions in transformer meter.
16/06/2012	The whole power plant temporarily stopped to operate in order to install optical fibber cables.
18/06/2012	The whole power plant temporarily stopped to operate due to too low methane fraction in collected LFG.
20/06/2012	The whole power plant temporarily stopped to operate due to too low methane

	fraction in collected LFG.
26/06/2012	The whole power plant temporarily stopped to operate due to too low methane fraction in collected LFG.
02/07/2012	One of the engine-generator sets (unit N° 10) temporarily stopped to operate due to malfunction.
03/07/2012	The whole power plant temporarily stopped to operate in order to perform tests in electrical protection system
03/07/2012	One of the engine-generator sets (unit N° 09) temporarily stopped to operate due to malfunction in the cooling system.
04/07/2012	One of the engine-generator sets (unit N° 13) temporarily stopped to operate due to malfunction in the cooling system.
07/07/2012	One of the engine-generator sets (unit N° 09) temporarily stopped to operate due to malfunction in cooling pump.
11/07/2012	One of the engine-generator sets (unit N° 13) temporarily stopped to operate due to malfunction in the cooling system.
11/07/2012	One of the engine-generator sets (unit N° 10) temporarily stopped to operate due to malfunction.
11/07/2012	One of the engine-generator sets (unit N° 13) temporarily stopped to operate due to malfunction in the cooling system.
12/07/2012	One of the engine-generator sets (unit N° 08) temporarily stopped to operate due to malfunction in the cooling system.
16/07/2012	One of the engine-generator sets (unit N° 10) temporarily stopped to operate due to malfunction.
18/07/2012	One of the engine-generator sets (unit N° 12) temporarily stopped to operate due to too low LFG pressure in the gas train.
19/07/2012	One of the engine-generator sets (unit N° 08) temporarily stopped to operate due to malfunction.
20/07/2012	One of the engine-generator sets (unit N° 08) temporarily stopped to operate due to too low LFG pressure in the gas train.
20/07/2012	The whole power plant temporarily stopped to operate in order to perform tests in electrical protection system.
24/07/2012	One of the engine-generator sets (unit N° 08) temporarily stopped to operate due to malfunction (open circuit overload).
24/07/2012	One of the engine-generator sets (unit N° 11) temporarily stopped to operate due to too low LFG pressure in the gas train.
24/07/2012	The whole power plant temporarily stopped to operate due to too low LFG pressure.

B.2. Post registration changes

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

Not applicable.

B.2.2. Corrections

Not applicable.

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

Not applicable.

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

Not applicable.

B.2.5. Changes to start date of crediting period

Not applicable.

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

Not applicable.

SECTION C. Description of monitoring system

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 06/07/2012:

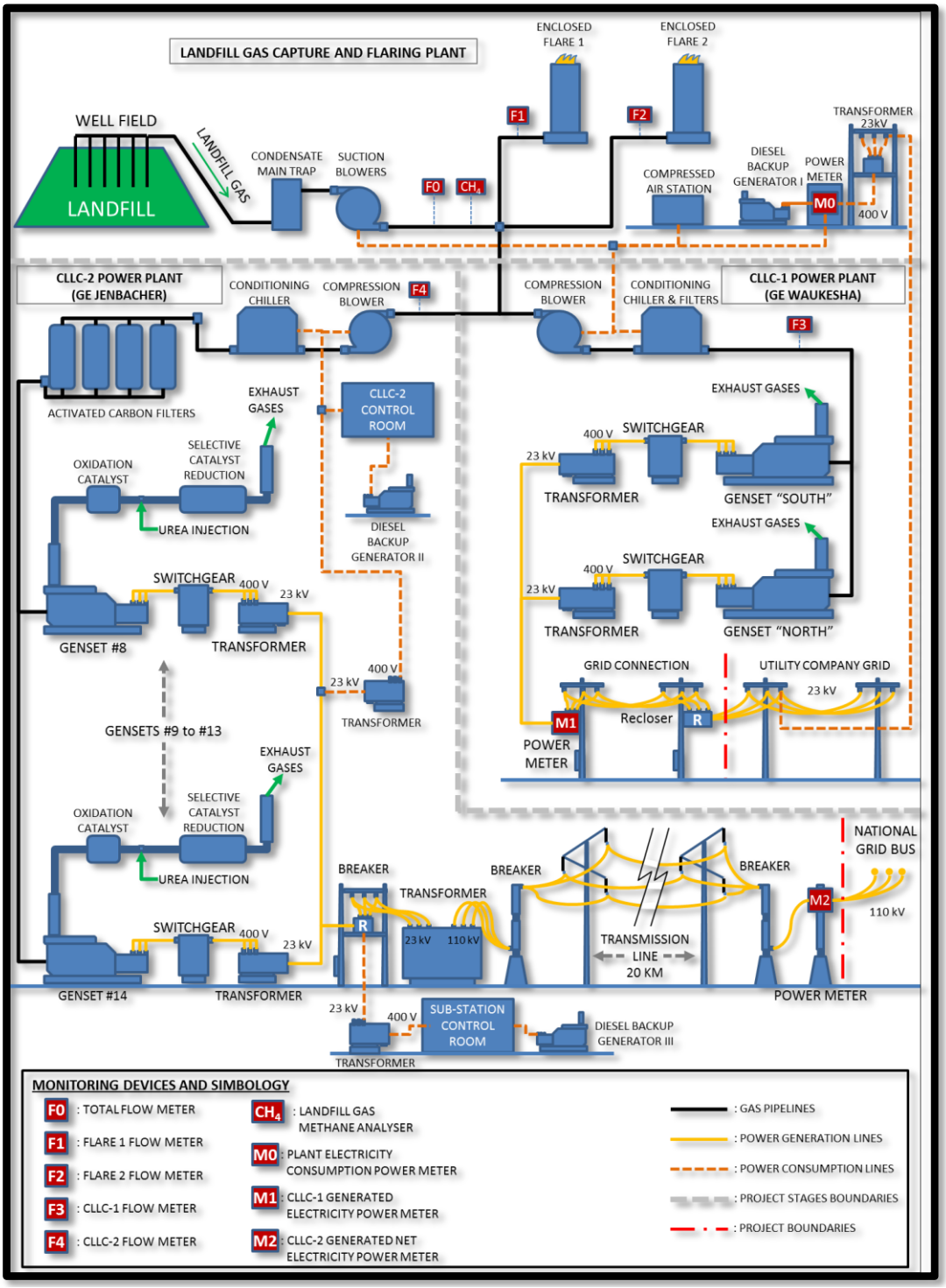

Figure 15 – Schematic diagram for the monitoring system applicable for the project activity under the configuration valid from the beginning of considered the monitoring period until 06/07/2012.

As the CLLC-1 power plant was connected to the 110 kV voltage and 20 km length transmission line on 06/07/2012, from this date to 20/07/2012 the following configuration was valid for the project activity:

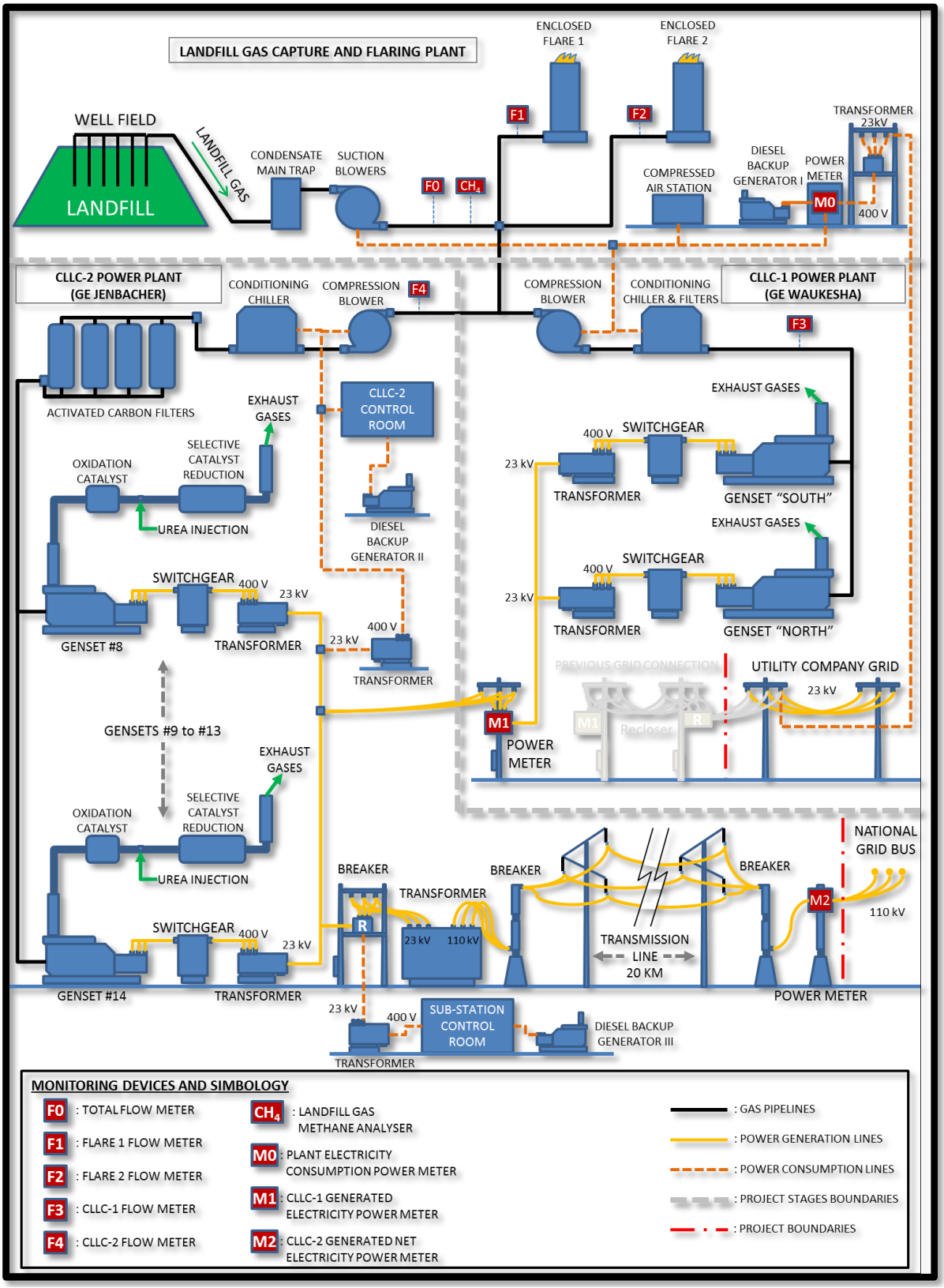

Figure 16 – Schematic diagram for the monitoring system applicable from 06/07/2012 to 20/07/2012.

Since two additional engine-generator sets started to continuous operate in the CLLC-2 power plant from 21/07/2012 onwards, the following diagram illustrates the project configuration valid from 21/07/2012 until the end of the considered monitoring period.

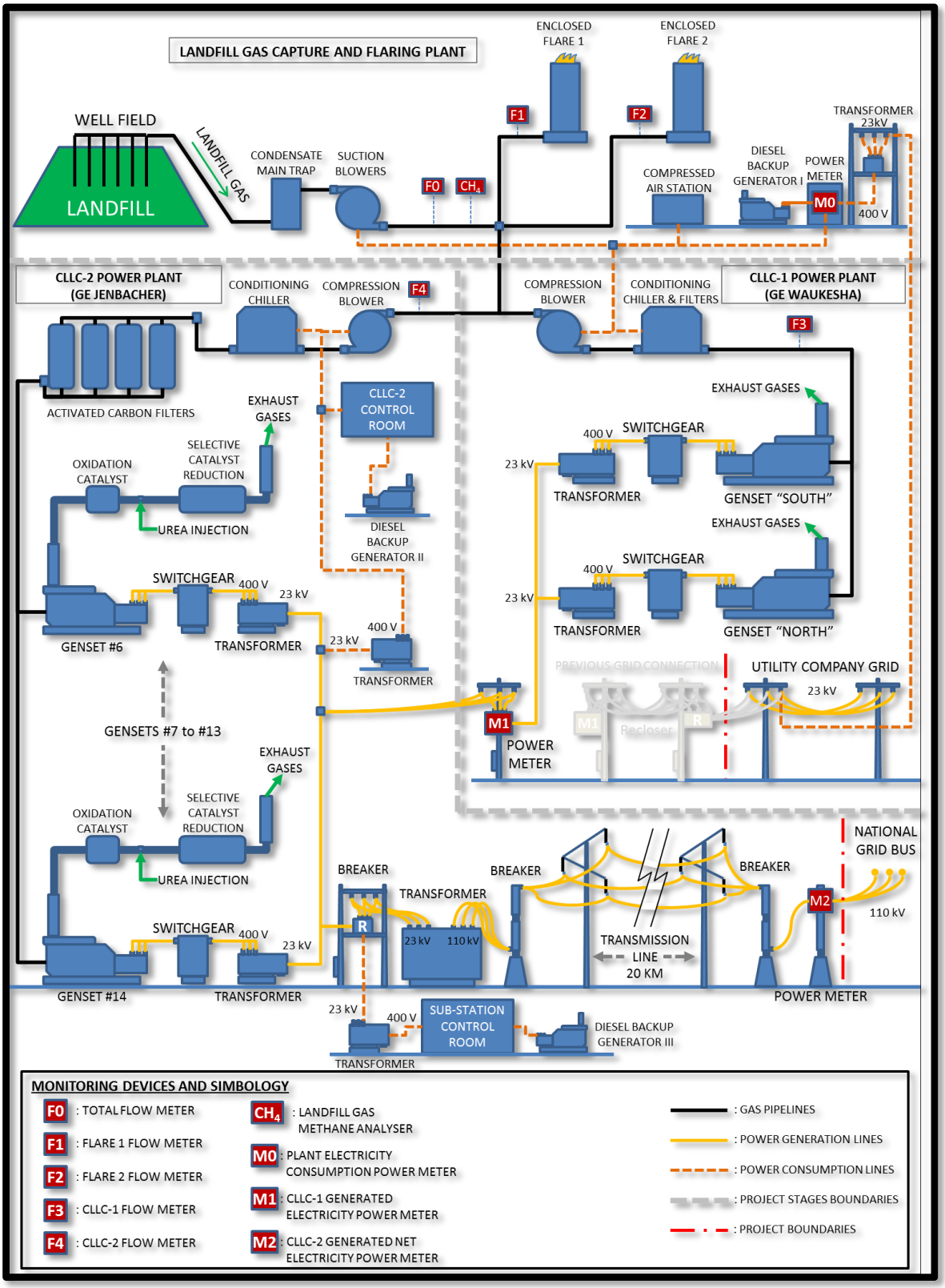

Figure 17 – Schematic diagram for the monitoring system under the project configuration valid from 21/07/2012 to the end of the monitoring period.

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), CH_4 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 spreadsheets. Such monthly emission reduction calculation spreadsheets 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 spreadsheets.

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

Data/Parameter	**GWP_{CH4}**
Unit	tCO2e/tCH4
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^3CH_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	**$TDL_{j,y}$**
Unit	**%**
Description	Average technical transmission and distribution losses for providing electricity to source j 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 90 days monitoring period.
Value(s) applied	60 tCH_4
Purpose of data	Value used for the determination of baseline emissions.
Additional comment	As per the PDD, the value of $MD_{reg,y}$ is 245 tCH_4 per year. While the considered monitoring period encompasses 90 days, the value of $MD_{reg,y}$ for the considered period is calculated as 60 tCH_4

Data/Parameter	**$CEF_y = EF_{CM}$**
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_2e/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	*Specifications of the installed LFG flow meter used to measure $LFG_{total,y}$:* - Manufacturer: FCI Fluid Components International LLC - Model: ST98 Thermal Mass Flow meter - Accuracy: ±1% - Serial Number:

Serial Number (S/N)	Period in use
300541	During the whole 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. Both the PDD and ACM0001 (version 4) methodology do not specify any frequency for the calibration of the LFG flow meter. 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 verification period:

Calibration Certificate		Calibration Date	Customer Order Number
Serial Number (S/N)	Calibration by		
300541	FCI Fluid Components International LLC	28/03/2012	RA34940

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[12]. Under this circumstances a spare and calibrated flow meters is installed.
Purpose of data	Measurement records of $LFG_{total,y}$ are used for calculation of baseline emissions in accordance with the following criteria: a) If $MD_{total} > MD_{flared} + MD_{electricity}$: $MD_{project,y}$ is calculated as follows: $MD_{project,y} = MD_{flared,y} + MD_{electricity,y} = LFG_{flare1,y} * w_{CH4,y} * D_{CH4} * F_1 + LFG_{flare2,y} * w_{CH4,y} * D_{CH4} * FE_2 + LFG_{electricity} * w_{CH4} * D_{CH4}$ b) If $MD_{total} < MD_{flared} + MD_{electricity}$ $MD_{project,y}$ is calculated as follows: $MD_{project,y} = MD_{total,y} = LFG_{total} * w_{CH4} * D_{CH4} * Min(FE_1;FE_2)$
Additional comment	-

[12] 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.

<table>
<tr><td>Data/Parameter</td><td>$LFG_{flare,y}$</td></tr>
<tr><td>Unit</td><td>Nm^3</td></tr>
<tr><td>Description</td><td>Amount of landfill gas flared</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured.</td></tr>
<tr><td>Source of data</td><td>Measured by two thermal mass flow meters (one flow meter for Flare 1 and one flow meter for Flare 2) (KDM internal symbols: F1 and F2 respectively).</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>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.</td></tr>
<tr><td>Monitoring equipment</td><td>
LFG flow meters used to measure $LFG_{flare,y}$ in Flare 1:

Specifications of the monitoring equipment:

- Manufacturer: FCI Fluid Components International LLC

- Model: ST98 Thermal Mass Flow meter

- Accuracy: ±1%

- Serial Number:

<table>
<tr><th>Serial Number (S/N)</th><th>Period in use</th></tr>
<tr><td>268935</td><td>Monitoring period</td></tr>
</table>

Details about performed calibration events valid for the considered verification 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>268935</td><td>FCI Fluid Components International LLC</td><td>29/03/2012</td><td>RA34940</td></tr>
</table>

LFG flow meters used to measure $LFG_{flare,y}$ in Flare 2:

Specifications of the monitoring equipment:

- Manufacturer: FCI Fluid Components International LLC
</td></tr>
</table>

- Model: ST98 Thermal Mass Flow meter
- Accuracy: ±1%
- Serial Number:

Serial Number (S/N)	Period in use
341600-A	The whole monitoring period

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

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 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.

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	Measured by two thermal mass flow meter (KDM internal symbol: F3 for CLLC – 1 and F4 for CLLC - 2).
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). This monitored value is result of the sum of measured values by F3 and F4.
Monitoring equipment	*Specifications of the installed LFG flow meters used to measure $LFG_{electricity,y}$ sent to CLLC-1 Power plant:* - Manufacturer: FCI Fluid Components International LLC - Model: ST98 Thermal Mass Flow meter - KDM internal symbol: F3 - Accuracy: ±1% - Serial Number: **Serial Number (S/N)** | **Period in use** 342850 | 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. Calibration events valid for the considered verification period:

Calibration Certificate		Calibration Date	Customer Order Number
Serial Number (S/N)	Calibration by		
342850	FCI Fluid Components International LLC	22/06/2011	C054982

Specifications of the installed LFG flow meters used to measure $LFG_{electricity,y}$ sent to CLLC-2 Power plant:

- Manufacturer: FCI Fluid Components International LLC
- Model: ST98 Thermal Mass Flow meter
- KDM internal symbol: F4
- Accuracy: ±1%
- Serial Number:

Serial Number (S/N)	Period in use
339540	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.

Calibration events valid for the considered verification period:

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

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	-

<table>
<tr><td>Data/Parameter</td><td>FE</td></tr>
<tr><td>Unit</td><td>%</td></tr>
<tr><td>Description</td><td>Flare/combustion efficiency, determined by the operation hours (1) and the methane content in the gas exhaust gas (2)</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured/calculated.</td></tr>
<tr><td>Source of data</td><td>Flare/combustion efficiency is determined for each flare based inter-alia on measurements of flow of methane sent to the flare in question (performed by KDM S.A.) as well as 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 related calculations.

After the collection of data related to the Flare efficiency calculation, the reported value for Flare efficiency is calculated by KDM S.A. (see excel file: System Flare Efficiency Calculation.xls).

All performed measurements and results are evidenced and detailed in the following technical reports:

<table>
<tr><th>Technical Report number</th><th>Flare identification</th><th>Measurement date</th></tr>
<tr><td>703A-2011</td><td rowspan="2">Flare 1</td><td>18/08/2011</td></tr>
<tr><td>562A-2012</td><td>09/07/2012</td></tr>
<tr><td>706A-2011</td><td rowspan="2">Flare 2</td><td>17/08/2011</td></tr>
<tr><td>568A-2012</td><td>10/07/2012</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Determined values of Flare/combustion efficiency are valid for the periods as indicated below:

<table>
<tr><th>Flare no</th><th>Period</th><th>Value of FE</th></tr>
<tr><td rowspan="2">Flare 1</td><td>19/08/2011 to 09/07/2012</td><td>99.9879%</td></tr>
<tr><td>10/07/2012 to end of monitoring period</td><td>99.9971%</td></tr>
<tr><td rowspan="2">Flare 2</td><td>20/08/2011 t o10/07/2012</td><td>99.9887%</td></tr>
<tr><td>11/07/2012 to end of monitoring period</td><td>99.9973%</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>All related measurements were performed by following applicable requirements of the U.S. Environmental Protection Agency (US-EPA). The performed measurements performed by Airón Ingeniería y Control Ambiental S.A. encompassed the following methods:</td></tr>
</table>

	- Method 3A "Determination of O_2 and CO_2 concentration in stationary source, procedure with instrumental analyzer" Measurement equipment: Manufacturer: California Analitical Instruments Model: ZRH Sensitivity: 0.1% - Method 6C "Determination of SO_2 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 Analitical 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 CH_4 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 ($LFG_{flare,y}$) and Methane fraction in the landfill gas ($w_{CH4,y}$) 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 CH_4 content of the LFG in the exhaust gas of the flares:* Measurement equipment for LFG flow:

	Manufacturer: Environmental Supply Company, Inc Model: PitotTubes Serial Numbers: ISP-TP-16-71 ISP-TP-16-72 ISP-TP-16-73 ISP-TP-16-74 ISP-TP-16-75 ISP-TP-16-76 ISP-TP-16-77 ISP-TP-16-78 ISP-TP-16-79 ISP-TP-16-80 ISP-TP-16-81 ISP-TP-16-82 ISP-TP-16-83 ISP-TP-16-84 Measurement equipment for CH_4 content of the LFG: Manufacturer: Synspec BV Model: Alpha Model 115 Range: 0.1 – 10 ppm for methane Repeatability: <1.0% of FS
Measuring/Reading/ Recording frequency	The value of Flare/combustion efficiency is calculated based on: (i) Continuous measurement of LFG flow and CH_4 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 CH_4 content of the LFG in the exhaust gas of the flares, which shall be monitored yearly. Thus, the value for Flare/combustion efficiency shall be monitored yearly.
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 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	*Specification of the $CH_4/O_2/CO_2$ content gas analyzer unit:* One $CH_4/O_2/CO_2$ content gas analyzer units was utilized for measuring CH_4 content of collected LFG. The specifications of the $CH_4/O_2/CO_2$ content gas analyzer unit are as follows: - Manufacturer: Siemens AG - Model: Ultramat 23 - Serial Number: N1-W2-678 - Accuracy: ±1% - Serial number: Calibration events valid for the considered verification period: As part of each individual calibration event performed in the installed $CH_4/O_2/CO_2$ 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 AM0003

Serial Number	Period in use
N1-W2-678	Monitoring period

Serial Number	Calibration event date
N1-W2-678	01/10/2011

<table>
<tr><td></td><td>(version 3).

During the current monitoring period, an extra $CH_4/O_2/CO_2$ 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%
- Serial number:
<table><tr><th>Serial Number</th><th>Calibration event date</th></tr><tr><td>N1-B2-711</td><td>18/08/2011</td></tr></table></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Continuously measurements are recorded/reported every minute.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Regular maintenance and calibration events are performed in the equipment in order to ensure accuracy and availability of measurements.</td></tr>
<tr><td>Purpose of data</td><td>Data is used for baseline emissions.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

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 and 03/09/2012. 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	Data is used for baseline emissions.
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	Measured by installed electricity meters (KDM Internal symbol: M1 and M2).
Value(s) of monitored parameter	Measurement records are presented in the summarized emission reductions calculation spreadsheet which is enclosed to the Monitoring Report. This monitored value is result of the sum of measured values by M1 and M2.
Monitoring equipment	Two electricity meters measure the electricity exported by the project activity. *Specifications of the installed electricity meter used to measure $EL_{EXP\ LFG,y}$ by CLLC-1 Power plant:* Two electricity meters have been utilized during this monitoring period for measuring amount of net electricity exported out of the project by CLLC-1 Power plant. The specifications of the electricity meters are as follows: - Manufacturer: Schneider Electric - Model: ION 7650 - Serial Number: PJ-1111A463-02 - Class: ±0.2 - Accuracy: ±0.2% - Manufacturer: Schneider Electric - Model: ION 7650 - Serial Number: PJ-1201A782-03 - Class: ±0.2 - Accuracy: ±0.2% - Serial number:

Serial Number	Period in use:
PJ-1111A463-02	From beginning of monitoring period to 06/07/2012
PJ-1201A782-03	06/07/2012 to end of monitoring period

The following electricity meter previously used in other monitoring periods was not used in the present monitoring period:

- Manufacturer: Ametek Power Instruments
- Model: JEMSTAR meter JS-09R50110C0
- Serial Number: 092312090

<table>
<tr><td></td><td>
- Class: ±0.1
- Accuracy: ±0.1%

<u>Specifications of the installed electricity meter used to measure $EL_{EXP\ LFG,y}$ by CLLC-2 Power plant:</u>
- Manufacturer: Schneider Electric
- Model: ION 8600
- Serial Number: PT-1011A447-01
- Class: ±0.2
- Accuracy: ±0.2%
- Serial number:

<table>
<tr><th>Serial Number</th><th>Period in use:</th></tr>
<tr><td>PT-1011A447-01</td><td>Monitoring period</td></tr>
</table>

Calibration events valid for the considered verification period:

<table>
<tr><th>Certificate Number:</th><th>Calibration date:</th><th>Calibrated by:</th></tr>
<tr><td>PJ-1111A463-02</td><td>21/02/2012</td><td>CAM Chile S.A.</td></tr>
<tr><td>PT-1011A447-01</td><td>21/02/2012</td><td>CAM Chile S.A.</td></tr>
<tr><td>PJ-1201A782-03</td><td>20/06/2012</td><td>CAM Chile S.A.</td></tr>
</table>
</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Continuous measurements are recorded/reported every hour.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Amount of electricity exported measured by the installed electricity meter was crosschecked with the monthly CDEC SIC report.</td></tr>
<tr><td>Purpose of data</td><td>Data is used for baseline emissions.</td></tr>
<tr><td>Additional comment</td><td>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. Equipment supplier – Schneider electric - does not specify the frequency of verifications, thus project participants contacted a well experienced supplier of those equipments – the supplier supplies ENDESA, one of the biggest generation companies in Chile – 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.</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>Operational Hours</td></tr>
<tr><td>Unit</td><td>Hours</td></tr>
<tr><td>Description</td><td>Operation of the power plant</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured.</td></tr>
<tr><td>Source of data</td><td>For every individual hour of the whole monitoring, it is monitored whether each of the electricity generation facility – CLLC -1 and CLLC – 2 - were under operation on the basis of available records of electricity generation the hour in question + records of flow of LFG sent to the electricity generation facility in the hour in question.

The quantity of hourly periods for which the electricity generation facility is confirmed to be under operative status (on the basis of records of electricity generation and flow of LFG sent to the electricity generation facility) is used as a basis for the determination of accumulated monthly values of parameter Operation of the power plant (Operational Hours)</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>The accumulated monthly values of parameter Operation of the power plant (Operational Hours) for the considered monitoring period are as follows:

<table>
<tr><th>D.2.1.1.1. Month</th><th>Operation Hours CLLC - 1</th><th>Operation Hours CLLC - 2</th><th>Total Operation Hours</th></tr>
<tr><td>June 2011</td><td>677</td><td>673</td><td>1,350</td></tr>
<tr><td>July 2011</td><td>714</td><td>723</td><td>1,437</td></tr>
<tr><td>August 2011</td><td>733</td><td>740</td><td>1,473</td></tr>
<tr><td>Total during the period</td><td>2,124</td><td>2,136</td><td>4,260</td></tr>
</table>
</td></tr>
</table>

Monitoring equipment	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 spreadsheets. Given the purpose of the parameter "Operation of the power plant" in the context of emission reduction determination, the comparative spreadsheet thus acts as a reliable counter for operation hour of the electricity generation facility.
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	For every individual hourly period, the amount of electricity generated by the engine-generator sets (in kWh) is compared with the amount of LFG (in Nm^3) sent to the engine-generator sets during the same hourly period. By taking into account that the average net LFG-to-electricity energy conversion efficiency of the installed engine-generator sets are specified by equipment manufacturer (550 Nm^3/h of LFG (with 50% CH_4 content) for generating 1 MW of constant net power), it is thus possible to use records of hourly electricity generation and average hourly flow of LFG sent to the engine-generator sets as a rough[14] checking.
Purpose of data	Data is used for baseline emission determination.
Additional comment	-

[14] This checking allows a rough checking. The performance of the engine-generator sets in terms of LFG to electricity conversion efficiency) can vary depending on operational & ambient conditions (quality and temperature of supplied LFG, ambient temperature, ambient pressure, humidity, etc.) and also depending on working conditions of major components of the engine generator-sets.

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 by M1 and M2 – bidirectional meters - whenever CLLC – 1 and CLLC – 2, respectively, 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	*Installed electricity meters:* 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: - Manufacturer: Schneider Electric - Model: Power Logic PM710 - Serial Number: 02B0629 and 02B0637 - Class: ±1.0 - Accuracy: ±1.0% According to the letter delivered by the manufacturer Schneider Electric with date of 23/04/2007, the meters installed and used since February 2007 to register the consumption of the plant, require no calibration, because they are digital and 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 power plant are in perfect operation conditions, KDM requested the following external calibrations:

Serial Number:	Certificate Number:	Calibration date:	Calibrated by:
02B0629	3508	22/06/2010	D.2.1.1.2. kWh Comulsa Comercializadora Multinacional S.A.
	0790-PM44BCA53B	05/07/2011	D.2.1.1.3. Under Fire Laboratorio de Ensayos
02B0637	3508	22/06/2010	D.2.1.1.4. kWh Comulsa Comercializadora Multinacional S.A.
	0789-PM450530E	05/07/2011	D.2.1.1.5. 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	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 spreadsheats take that electricity consumption in account as project emissions, calculated by the applicable provisions in the registered PDD.

Data/Parameter	**$EF_{ELcaptive,y}$**
Unit	tCO_2/ MWh
Description	Emission factor for electricity sourced by the the captive off-grid electricity generator
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 electricity consumption" is selected.
Value(s) of monitored parameter	1.3 tCO_2/MWh (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	-

<table>
<tr><td>Data/Parameter</td><td>$PP_{Diesel\text{-}generator}$</td></tr>
<tr><td>Unit</td><td>MW</td></tr>
<tr><td>Description</td><td>Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel)</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured.</td></tr>
<tr><td>Source of data</td><td>According to name plate of the three installed generators.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>0.676 MW = 0.276 MW + 0.320 MW + 0.080 MW</td></tr>
<tr><td>Monitoring equipment</td><td>The project activity from the start-up of CLLC – 2 onwards encompasses 3 diesel backup generators:

Specifications of the captive off-grid electricity generators:
<table>
<tr><th>Equipment id/tag</th><th>Manufacturer:</th><th>Model Number</th><th>Power</th><th>Fuel consumption (liters per hour)</th><th>Purpose</th></tr>
<tr><td>Diesel Backup Generator I</td><td>Atlas Coppo (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>Cummings</td><td>SDC - 400</td><td>0.320</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></td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Not applicable.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures</td><td>Not applicable.</td></tr>
<tr><td>Purpose of data</td><td>Data is used for project emissions.</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

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	90 kg During the verification period and as per information of the project participant cross checked with receipts from the local supplier Abastible S.A., two cylinders containing 45 kg of LPG each were supplied to the project activity. It is assumed that all supplied LPG was consumed during the verification period. That accounts to 90 kg of LPG consumed (0.090 ton). As per common practice in Chile, LPG was sourced to the project activity bottled in standardized cylinder with capacity of 45kg of LPG. $FC_{LPG,y}$ is determined based on measurements performed by the local LPG distribution company Abastible S.A.
Monitoring equipment	The local LPG wholesaler company Abastible S.A. measures the quantity of LPG contained in each cylinder supplied by using an electronic multipurpose unit scale, according to applicable Chilean Standard: . *"Norma Chilena 1782/1. Of85 - Cilindros Portátiles para Gases licuados de petróleo - Distribución - Parte: 1 Requisitos y control del contenido neto de GLP".* Based on information supplied by Abastible S.A. KDM states that the LPG consumed at the project activity and comprised of two 45kg capacity cylinders were weighted at Abastible by a The specifications of the utilized weight scales are as follows: - Manufacturer: Crisplant - Models: EMU (Electronic Multipurpose Unit) - Serial numbers: Ex-92.Y.2601 X - Accuracy: ± 50 grams
Measuring/Reading/ Recording frequency	Amount of consumed LPG is reported every time a new delivery event is performed by the LPG supplier.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Not applicable.
Purpose of data	Data is used for project emissions.
Additional comment	-

Data/Parameter	**$EF_{CO2,LPG}$**
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}
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	0.0473 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 (Nm^3/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 (Nm^3/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 ($EC_{captive,y}$).
  Justification for non-monitoring of $EC_{captive,y}$:
  Project emissions due to consumption of electricity sourced by the backup captive off-grid electricity generator (fuelled by diesel) ($PE_{EC,captive,y}$) is calculated as follows:

$$PE_{EC,captive,y} = EF_{ELcaptive,y} * HO_{Diesel\text{-}generator} * PP_{Diesel\text{-}generator}$$

  Where:

  $EF_{ELcaptive,y}$ = Emission factor for electricity sourced by the the captive off-grid electricity generator (in tCO_2/MWh)

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

Thus, by considering the applied approach to calculate the Project emissions due to sourcing of electricity by the backup captive electricity generators, monitoring records of consumption of diesel by such captive electricity generators are not required.

- Quantity of fuel Diesel combusted by the captive off-grid electricity generator (FC_{Diesel}).
Justification for non-monitoring of FC_{Diesel}: the justification for non-monitoring of $EC_{captive,y}$ (as presented above) is also applicable.

- Net calorific value of fuel Diesel (NCV_{Diesel}).
Justification for non-monitoring of NCV_{Diesel}: the justification for non-monitoring of $EC_{captive,y}$ (as presented above) is also applicable.

CO_2 emission factor of fuel Diesel ($EF_{CO2,Diesel}$).
Justification for non-monitoring of $EF_{CO2,Diesel}$: the justification for non-monitoring of $EC_{captive,y}$ (as presented above) is also applicable.

- Quantity of electricity generated by captive off-grid electricity generator fuelled by Diesel ($EG_{Diesel\text{-}generator}$).
Justification for non-monitoring of $EG_{Diesel\text{-}generator}$: the justification for non-monitoring of $EC_{captive,y}$ (as presented above) is also applicable.

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 of 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 that 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.

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

GHG emission reduction associated with methane destruction by the project activity during the monitoring period are calculated as baseline emissions (ERM_y) (as it is assumed that in the absence of the project (baseline scenario), the amount of methane destroyed by the project activity ($MD_{project,y}$) minus the amount of the methane that is would be destroyed regardless of

the implementation of the project activity ($MD_{reg,y}$) would be directly emitted into the atmosphere. Thus, baseline emissions (equivalent to ERM_y) are determined as the difference between $MD_{project,y}$ and $MD_{reg,y}$, times ex-ante determined values for Global Warming Potential (GWP) for methane (GWP_{CH_4}) as follows:

$$ERM_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH_4}$$

Where:

- $MD_{project,y}$ and $MD_{reg,y}$ are measured in ton of methane (tCH_4)
- GWP_{CH_4} is ex-ante selected as 21 tCO_2e/tCH_4

Determination of $MD_{reg,y}$:

As per the PDD, $MD_{reg,y}$ is ex-ante defined as 245 ton methane per year (365 days). As the monitoring period from 01/06/2012 to 31/08/2012 encompasses **90** days, $MD_{reg,y}$ for this period is thus determined as follows:

$MD_{reg,y}$ = 245 [tCH_4/year] / 365 [days/year]*Number of days of the considered monitoring period [days].

As the "Number of days of the considered monitoring period" is **90**, the value of $MD_{reg,y}$ is thus equal to **60** tCH_4 (conservative rounded value).

Determination of $MD_{project,y}$:

As established by the PDD, the amount of methane actually destroyed by the project activity during the considered monitoring period $MD_{project,y}$ is determined as follows:

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

Where:

$MD_{flared,y}$ is the quantity of methane destroyed by flaring. $MD_{flared,y}$ is determined (in tCH_4) as follows:

$$MD_{flared,y} = LFG_{flare,y} \cdot w_{CH_4,y} \cdot D_{CH_4} \cdot FE$$

Where:

$LFG_{flared,y}$	Quantity of landfill gas flared or during the year measured in cubic meters (m^3)
$w_{CH_4,y}$	Methane fraction of the landfill gas as measured and expressed as a fraction (in m^3CH_4/m^3LFG)

D_{CH_4} Density of methane. D_{CH_4} is ex-ante determined as 0.0007168 (tCH_4/m^3CH_4).

FE Flare efficiency (the fraction of the methane destroyed)

In accordance to the PDD, FE is determined based in a mass balance, within the period of measurement of the flare efficiency, between methane inlet and methane in the exhaust gases of flare as follows:

$$FE = 1 - \frac{M_{nd,kg/h}}{MD_{flared,kg/h}}$$

Where:

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

$$\mathrm{MD}_{\mathrm{flared,kg/h}} = \mathrm{LFG}_{\mathrm{flared},\frac{\mathrm{m}^3}{\mathrm{h}}} \bullet \mathrm{w}_{\mathrm{CH4,average}} \bullet \mathrm{D}_{\mathrm{CH4}} \bullet 1000\left[\frac{\mathrm{kg}}{\mathrm{ton}}\right]$$

$M_{nd,kg/h}$ Quantity of methane non destroyed in kg/hour. $M_{nd,kg/h}$ is determined as follows:

$$\mathrm{M}_{\mathrm{nd,kg/h}} = \frac{\mathrm{CH}_4[\mathrm{mg/Nm}^3].\mathrm{Flow}_{[\mathrm{Nm}^3/\mathrm{h}]}}{1{,}000{,}000_{[\mathrm{Kg/g}]}}$$

$MD_{electricity,y}$ is the quantity of methane destroyed by generation of electricity. $MD_{electricity,y}$ is determined (in tCH_4) as follows:

$$MD_{electricity,y} = LFG_{electricity,y} \cdot w_{CH_4,y} \cdot D_{CH_4}$$

Where:

$LFG_{electricity,y}$ Quantity of landfill gas fed into electricity generator during the year measured in cubic meters (m^3)

$w_{CH_4,y}$ Methane fraction of the landfill gas as measured and expressed as a fraction (in m^3CH_4/m^3LFG). Monitoring details are presented in section E.

D_{CH_4} is the methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3CH_4).

Note 1: Criteria for monitored data from methane destruction component of the project activity either by flaring in flare or in electricity generation being taken in account for calculation of baseline emission reductions: Whenever the measured parameters are outside the following

ranges, the equipments are operating outside the manufactures specifications[16], thus the corresponding data is not taken in account for the calculation of emission reductions of the project activity.

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

As defined in the PDD, baseline emission calculations arising from methane destruction from this project activity are thus calculated according to the following conservative criteria:

a) If $MD_{total} > MD_{flared} + MD_{electricity}$:

$MD_{project,y}$ is calculated as follows:

$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} =$
$LFG_{flare1,y} * w_{CH4,y} * D_{CH4} * F_1 + LFG_{flare2,y} * w_{CH4,y} * D_{CH4} * FE_2 + LFG_{electricity} * w_{CH4} * D_{CH4}$

b) If $MD_{total} < MD_{flared} + MD_{electricity}$

$MD_{project,y}$ is calculated as follows:

$MD_{project,y} = MD_{total,y} = LFG_{total} * w_{CH4} * D_{CH4} * Min(FE_1;FE_2)$[17]

The next table shows the parameter measured by each flow meter.

Equipment Id/tag	Parameter measured
F0	LFG_{total}
F1	LFG_{flared} for Flare 1
F2	LFG_{flared} for Flare 2
F3	$LFG_{electricity}$ for CLLC-1
F4	$LFG_{electricity}$ for CLLC-2

During the present monitoring period ERM_y = **144,660** tCO_2e

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

Carbon dioxide emissions reductions promoted by the project's renewable energy component during a given year y (*ERC y*) are determined (in tCO_2) as follows:

[16] The calibration certificates of flow meter F3, the flow meter used to measure LFG flow to the CLLC-1, are valid to a range of 100 – 1,800 m^3/h, therefore project participants included this criteria to not take in account emission reductions from the methane destruction component of the project activity whenever the flow of LFG sent to CLLC-1 is outside of the flow meter calibration range. For CLLC – 2 a criteria is also applied on the flow. If the flow is lower than 180 or higher than 12,600 m^3/h, emission reductions are not taken into account from CLLC – 2.

[17] As per the registered PDD in case the $MD_{total} < MD_{flared} + MD_{electricity}$ then $MD_{project,y} = MD_{total,y} = LFG_{total} * w_{CH4} * D_{CH4}$. However, as that calculation approach does not take in account Flare Efficiency (FE); thus project participants conservatively apply the minor value of the two Flare Efficiency (FE) values from each flare for determining baseline emission for the project's LFG destruction component.

$$ERC_y = EL_y * CEF_y$$

Where:

ERC_y Quantity of net exported electricity[18] during the year *y* (in MWh), given by:

$$EL_y = EL_{EXPLFG,y}$$

Where:

$EL_{EXPLFG,y}$ Quantity of net electricity generated by the project activity using LFG as fuel which is exported during year *y* (in MWh)

CEF_y Emissions factor for electricity generation (in tCO_2/MWh).

CEF_y is determined as follows:

$$CEF_y = \frac{CEF_{OM,y} + CEF_{BM,y}}{2}$$

Where:

$CEF_{OM,y}$ Operating margin emission factor (in tCO_2/MWh)

$CEF_{BM,y}$ Build margin emission factor (in tCO_2/MWh).

CEF_y is determined by using the applicable approved consolidated methodology ACM0002 (version 6), requiring a determination of the Build Margin (BM), the Operating Margin (OM) and a Combined Margin (CM). CEF_y is ex-ante calculated **as 0.408 tCO_2/MWh**.

The calculations are presented on Annex A.

During the present monitoring period ERC_y = **9,132** tCO_2

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

The project activity has three sources of project emissions:

- Project emissions due to the consumption of grid electricity by the project activity
- Project emissions 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 follows[21]:

[18] Note that "exported" here refers to net electricity being exported by the project activity through the SIC power grid: Note that exported net electricity could eventually be used to meet electricity demand from the landfill (e.g. leachate treatment, office use, etc., that are not associated with the landfill gas collection, flaring and use).

[21] Details of calculations are shown in Annex A of the monitoring report.

E.2.1. Project emissions:

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

Where:

$PE_{EC,y}$ = Project emissions due to electricity consumption in year y (in tCO_2/year).

$PE_{LPG,y}$ = Project emissions due to consumption of fossil fuel LPG[22] by the project activity (for uses other than electricity generation) (in tCO_2/year).

E.2.1.1. Project emission due to electricity consumption:

Project emissions due to electricity consumption ($PE_{EC,y}$) are determined (in tCO_2) as follows:

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

Where:

$PE_{EC,grid,y}$ Project emissions sue to consumption of grid electricity in year y (tCO_2). $PE_{EC,grid,y}$ is calculated by following the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) 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. $EC_{grid,y}$ will be measured and monitored in MWh as per applicable provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". During the present monitoring period monitored as **122** MWh[23].

CEF_y = CO_2 emission factor for grid electricity. CEF_y is ex-ante calculated as **0.408** tCO_2/MWh.

$TDL_{grid,y}$ = 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", $TDL_{grid,y}$ is ex-ante determined as 20% (conservative default value fixed along the whole crediting period).

Thus $PE_{EC,grid,y} = 122 * 0.408 * (1 + 0.20) =$ **59.80** tCO_2e

[22] Liquefied Petroleum Gas (LPG) is used for igniting the flares.
[23] Details of monitored data are presented in Annex A and CER calculation spreadsheets

$PE_{EC,captive,y}$ Project emissions due to consumption of electricity sourced by the captive off-grid electricity generator (fuelled by diesel) in year y (tCO_2). $PE_{EC,captive,y}$ is calculated during the present monitoring period by following the option B4 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" where project or leakage emissions from consumption of electricity are determined based on the rated capacity of the captive power plant(s), assuming, as a very conservative simplification, an emission factor of 1.3 tCO_2/MWh and an operation of 8,760 hours per year at the rated capacity, as follows:

$$PE_{EC,captive,y} = 1.3\ tCO_2/MWh * 8{,}760\ hour * PP_{Diesel\text{-}generator} = 11{,}400 * PP_{Diesel\text{-}generator}$$

Where:

$PP_{Diesel\text{-}generator}$: Rated capacity of the diesel generator

By taking into account the very reduced time of utilization of the installed captive off-grid electricity generators (fuelled by diesel) during the considered monitoring period, $PE_{EC,captive,y}$ is thus calculated as follows:

$$PE_{EC,captive,y} = 1.3\ tCO_2/MWh * HO_{Diesel\text{-}generator} * PP_{Diesel\text{-}generator}$$

Where:

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

$HO_{Diesel\text{-}generator}$ = Operational hours of the installed captive off-grid electricity generator (fuelled by diesel) (in hours).

Thus appliyng the above formula to each of the diesel generators:

$$PE_{EC,captive,y} = 1.3\ tCO2/MWh * (3 * 0.276 + 42 * 0.320 + 52.3 * 0.80) = \mathbf{26}\ tCO_{2e}$$

Thus project emissions due to the consumption of electricity sources by the backup diesel generator are calculated as **26** tCO_{2e}[24].

[24] The project participants also registered consumption of 1,314 liters of diesel by the captive off-grid electricity generators during the considered monitoring period. However, as data from diesel consumption of each individual diesel generator is not available (only the total amount of diesel consumed by all 3 generators are available), the following conservative calculation is adopted merely as a cross checking for the applied approach to determine $PE_{EC,captive}$.
While the electricity generator with the biggest diesel engine has specific fuel consumption of 18.9 Gallons (71.6 liters) of diesel per hour (as per information from the equipment manufacturer) this generator delivers 0.276 MWh per hour (at its maximum power), fuel consumption of generator is thus determined as 71.6 / 0.276 = 260 liters/MWh. By taking into account the monitored consumption of the diesel during the monitoring period, the total amount of electricity generated is thus calculated as 1,314 / 260 = 5.05 MWh. By applying this estimated value for electricity generation and the conservative default emission factor value as per Option B.3 of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", related project emission ($PE_{EC,captive}$) are determined as 1.3 tCO_2/MWh * 5.05 MWh = **6.57** tCO_2. That demonstrates that the selected determination approach for $PE_{EC,captive}$, - calculated as **26** tCO_2 in this monitoring period - is very conservative. Due to that all monitoring parameters required for the determination of $PE_{EC,captive}$ as per the

E.2.1.2. Project emissions due to consumption of LPG (for igniting the flares):

Project emissions due to the consumption LPG by the project activity (PE_{LPG}) are also accounted as project emissions[25]. As established by the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" such project emission source is 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 (in kg). $FC_{LPG,y}$ is determined on the basis of measurements of LPG performed by the LPG supplier Abastible S.A. for all LPG which was delievered to the project. As per the valid LPG purchasing receipts issued by local LPG supplier Abastible S.A., 2 cylinders of 45 kg of LPG each cylinder were delievered to the project activity. .During the verification period, two cylinders containing 45 kg of LPG was supplied to the project activity. It is assumed, conservatively that all supplied LPG was consumed by the project activity during the considered monitoring period. That accounts of **90** kg (0.090 ton) of LPG.
As per common practice in Chile, LPG was sourced to the project activity bottled in standardized cylinder with capacity of 45kg of LPG. $FC_{LPG,y}$ is thus determined based on measurements performed by the local LPG distribution company Abastible S.A. and records of the project participants. The local LPG wholesaler company Abastible S.A. measures the quantity of LPG contained in each cylinder supplied by using an electronic multipurpose unit scale, according to applicable Chilean Standard: . "*Norma Chilena 1782/1. Of85 - Cilindros Portátiles para Gases licuados de petróleo - Distribución - Parte: 1 Requisitos y control del contenido neto de GLP".*

$COEF_{LPG,y}$ CO_2 emission factor for consumed LPG (in mass basis). $COEF_{LPG}$ is determined as follows:

Where:

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

Where:

$EF_{CO2,LPG,y}$ Emission factor for consumed LPG (in energy basis).
$NCV_{LPG,y}$ Net Calorific Value for consumed LPG.

options other than Option B.4 (Options B.1, B.2, B.3) are regarded as not measured and thus not considered for the monitoring period covered by this Monitoring Report as highlighted in Section D.2.

[25] Further details about the rationale/reasons for accounting consumption of LPG as project are presented in this section of the Monitoring Report.

The CO_2 emission factor for consumed LPG (in mass basis) is calculated as the product between the Net Calorific Value for consumed LPG (NCV_{LPG}) and CO_2 emission factor for consumed LPG (in energy basis) (EF_{LPG}), as follows;

$NCV_{LPG,y}$ = 0.0473 TJ/ton[26]
$EF_{CO2,LPG,y}$ = 65.6 tCO_2/TJ[27]

According to the previous calculations $\underline{COEF_{LPG,y}}$ is **3.11** tCO_2/ton_{LPG}

$$PE_{LPG,y} = FC_{LPG,y} * COEF_{LPG,y} = 0.090 * 3.11 = \mathbf{0.300}\ tCO_2$$

Finally $PE_{i,y} = PE_{EC,grid,y} + PE_{EC,captive,y} + PE_{LPG,y}$ = 59.80 + 26 + 0.300 = **62.1** tCO_{2e}

E.3. Calculation of leakage

Not applicable

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

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	153,792	62.1	0	153,730

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

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	174,674	153,730

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

No relative increase in the achieved emission reductions occurred in comparison with related emission reduction estimations as per the registered PDD.

[26] Value sourced by IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Chapter 1, Volume 2, Table 1.4 - value at the upper limit of the uncertainty at 95% confidence interval1

[27] Value sourced by IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Chapter 1, Volume 2, Table 1.4 - value at the upper limit of the uncertainty at 95% confidence interval

ANNEX A

ER Calculation Spreadsheets

Ex-ante determined Parameters

Parameters	Description	Value	Unit
GWP_{CH4}	Global Warming Potential of Methane	21	tCO_2e/tCH_4
D_{CH4}	CH_4 Density	0.0007168	tCH_4/m^3
CEF_y	Emissions factor for electricity generation	0.408	tCO_2/MWh
Md_{reg}	Amount of methane that would have been destroyed during the year in th	245	tCH_4

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

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

Period		$MD_{project}$ tCH_4	MD_{reg} tCH_4	GWP_{CH4} tCO2e/tCH4	ERM_y tco_2e
01-06-2012 00:00	30-06-2012 23:59	2255.400988	60	21	
01-07-2012 00:00	31-07-2012 23:59	2333.994796			
01-08-2012 00:00	31-08-2012 23:59	2359.961234			
Total of period		6,949	60	-	**144,660**

$$ERM_y = (MD_{project,y} - MD_{reg,y}) \cdot GWP_{CH_4}$$

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

Period		Electricity export MWh	Emissions factor for electricity generation tCO2/MWh	ERC_y tCO2e
01-06-2012 00:00	30-06-2012 23:59	6,673.1737	0.4080	2,722.6548
01-07-2012 00:00	31-07-2012 23:59	7,464.0760		3,045.3430
01-08-2012 00:00	31-08-2012 23:59	8,247.3875		3,364.9341
Total		**22,384**	-	**9,132**

$$ERC_y = EL_y * CEF_y$$

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

E.2.1. Project emissions: $PE_{i,y} = PE_{EC,y} + PE_{LPG,y}$

E.2.1.1. Project emission due to electricity consumption: $PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$

E.2.1.1.1. Project emission due to electricity consumption from the grid

Period		Electricity Consumption MWh	CEFy tCO2/MWh	$(1 + TDL_{grid,y})$	$PE_{EC,grid,y}$ tCO2e
01-06-2012 00:00	30-06-2012 23:59	37.2211	0.4080	1.2	18.2234
01-07-2012 00:00	31-07-2012 23:59	42.3445			20.7319
01-08-2012 00:00	31-08-2012 23:59	41.9141			20.5211
Total		**122**	-	-	**59.80**

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

E.2.1.1.1. Project emission due to electricity consumption from captive sources

Date	Emission factor tCO2/MWh	Accumulated hours of the generator	PPDiesel-generator MW	$PE_{EC,captive,y}$ tCO2e
23-05-2012	1.3	658	0.276	
04-09-2012		661		
Total	-	**3**	-	**2**

$PE_{EC,captive,y} = 1.3\ tCO_2/MWh * HO_{Diesel\text{-}generator} * PP_{Diesel\text{-}generator}$ Diesel Backup Generator I

Date	Emission factor tCO2/MWh	Accumulated hours of the generator	PPDiesel-generator MW	$PE_{EC,captive,y}$ tCO2e
24-05-2012	1.3	43	0.32	
05-09-2012		85		
Total	-	**42**	-	**18**

$PE_{EC,captive,y} = 1.3\ tCO_2/MWh * HO_{Diesel\text{-}generator} * PP_{Diesel\text{-}generator}$ Diesel Backup Generator II - CLLC - 2

Date	Emission factor tCO2/MWh	Accumulated hours of the generator	PPDiesel-generator MW	$PE_{EC,captive,y}$ tCO2e
20-04-2012	1.3	33	0.08	
01-09-2012		85.3		
Total	-	**52.3**	-	**6**

$PE_{EC,captive,y} = 1.3\ tCO_2/MWh * HO_{Diesel\text{-}generator} * PP_{Diesel\text{-}generator}$ Diesel Backup Generator III - SELLC

E.2.1.2. Project emissions due to consumption of LPG (for igniting the flares):

Date	$FC_{LPG,y}$ (ton)	$NCV_{LPG,y}$ TJ/ton	$EF_{CO2,LPG,y}$ tCO2/TJ	$COEF_{LPG,y}$	$PE_{LPG,y}$
17-08-2012	0.09	0.0473	65.6	3.11	**0.300**

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

Total project emissions	$PE_{EC,grid,y}$ tCO2e	$PE_{EC,captive,y}$ tCO2e	$PE_{LPG,y}$	$PE_{EC,y}$ tCO2e
	59.8000	26	0.300	**62.1**

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

E.3. Calculation of leakage

Not aplicable

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

Time Period	Baseline emissions or baseline net GHG removals by sinks	Project emissions or actual net GHG removals by sinks	Leakage	Emission reductions or net anthropogenic GHG removals by sinks
	(tCO_2e)	(tCO_2e)	(tCO_2e)	(tCO_2e)
Total	153,792	62.1	0	153,730

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History of the document

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02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
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