MONITORING REPORT FORM (CDM-MR)
Version 01- in effect as of: 28/09/2010

CONTENTS

MONITORING REPORT
Version 01 – 10/02/2011

SÃO JOÃO LANDFILL GAS TO ENERGY PROJECT (SJ)
0373
14th Monitoring Period - From 01/11/2010 to 31/01/2011

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

São João Landfill Gas to Energy is a project designed to explore the landfill gas produced in São João landfill, one of the biggest landfills in Brazil. This landfill is located in the metropolitan region of São Paulo, Brazil's biggest city and financial center of the country. With an estimated population of around 10 million citizens in 2000, São Paulo generates nearly 15,000 tons of waste daily. São João Landfill Gas to Energy's goal is to explore the gas produced in São João landfill, using it to generate electricity and flaring.

São João landfill was designed according to the best practices at the time of its conception, applying modern engineering and environmental sound technology in order to avoid environmental hazards, such as underground water contamination. Regarding landfill gas emissions, the project contemplated only passive venting, intending to solely let the gas escape. Eventually, the gas was flared in the past at the top of well's heads, in a very inefficient combustion mechanism. It is estimated that only around 20% of the gas was flared through such system.

With the implementation of São João Landfill Gas to Energy Project, the above situation has been terminated. Sealing properly the well's heads, the project has ensured that methane previously released to the atmosphere is extracted either to the flares or to the powerhouse, where the gas will be ultimately used to generate energy. São João Landfill Gas to Energy Project's implementation will therefore reduce greenhouse gas emissions.

São João Landfill Gas to Energy Project also avoids greenhouse gas emissions through grid electricity displacement. The methane extracted from the landfill is combusted to generate electricity which is going to feed the Brazilian grid. With that, emission reductions occur due to fossil-fueled energy generation displacement at the margin of the electric system.

The installation of the SJ Project was executed in the period 2007/2008.Firstly, the LFG collecting system was implemented independently to start up flaring LFG as soon as possible. The CH_4 flaring would be enough to avoid GHG emission as prescribed by the UNFCCC. As a result, the Biogas Plant operation was started on June 1st, 2007. From that date up to March 2008, the SJ Project activity was limited exclusively to the LFG flaring, as properly verified by the monitoring and verification reports issued for that period particularly.

The second implementation phase of the São João LFGE Project was the start up of the power plant in the beginning of 2008. The power plant began to work with 14 engines, model CAT3520. Finally, on October 23rd, 2008, once the Power Plant was already operational, the PP invested in the acquisition of two additional engines, the same model than the others already installed, completing so the current existent power capacity of 24.64 MW which is given by the installation of 16 engines model CAT3520. The CERs due to electricity generation have been claimed only from April 01st, 2008. The final

configuration became effective only by the end of October 2008 and since then the output of the São João LFGE project is the following:

- Model CAT3520 Capacity at SJ site conditions: 1.54 MWe
- Number of Engine Units: 16
- Installed Capacity: 16 X 1.54 MWe: 24.64 MWe
- Final Energy Output delivered to the grid: 21.89 – 0.99 = 20.90 MWe[1]

The LFG degassing system includes more than 30 Km of high density polyethylene pipes connected to the about 160 landfill wells; 4 blowers to provide suction for extracting the gas from the landfill; facilities for gas treatment, such as heat exchangers, chillers; and 3 flares with capacity to destroy up to 15,000 Nm3 per hour of LFG that is not used to generate electricity.

This Monitoring Report refers to the 14th Monitoring Period that contemplates the period from November 1st 2010 until January 31st 2011. The total emission reductions achieved in this Monitoring Period is given on the table below:

Total tCO_2e from methane destroyed	97,927
Total tCO_2e from electricity dispatched	4,606
Total tCO2e from electricity consumed	33
TOTAL tCO_2e	**102,500**

A.2. Project Participants:

- Public entity: Prefeitura Municipal de São Paulo – Municipality of São Paulo - Brazil
- Private entity: Biogás Energia Ambiental S.A. - Brazil
- KfW Bankegruppe - Germany
- Mercuria Energy Trading SA – Switzerland

A.3. Location of the project activity:

The São João project is located at Av. Sapopemba, km 33, Bairro Jardim Rodolfo Pirane, São Paulo - Brazil. GPS coordinates from the location of the power house are the followings: Latitude -23.6362°, Longitude -46.4141°.

A.4. Technical description of the project

The SJ includes high density polyethylene pipes connected to the landfill wells; blowers to extract the gas from the landfill; facilities for gas treatment, such as heat exchangers, chillers; flares and generators, which destroys the methane previously released to the atmosphere. The project had in the monitoring period under consideration a total installed capacity of 24.64 MW[2].

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[1] The Caterpillar dealer (SOTREQ) assumes 88% of the installed capacity of 24.64 MW or 21.70 MW as the average energy output of the Power Plant before discounting the losses in the transmission system. However, assuming the 93% of the Expected Plant Operation Efficiency as mentioned in the revised PDD, the Maximum Power Plant Capacity Available for Export is 21.89MW and the final energy output delivered to the grid (i.e. after discounting transmission losses) is 20.90 MWe. For sake of conservatism the value 21.70MW was adopted in the investment analysis as described in PDD - Section B.3- step 2.

[2] The efficiency of the engines is 93%, according to Caterpillar's representative in Brazil - Sotreq. This makes that the real capacity installed is 22.91 MW. If we discount the internal consumption of the plant, somewhere around 1.02 MW, the actual power capacity to be exported is 21.89 MW. From this value we have to discount the power loss in the transmission up to connection point of 4.5%. So we can consider that the Final Energy Delivered to the grid is 20.90 MW. After 34 months of operation, since the Power Plant start-up in April 2008 up to January 2011, São João LFGE Project has not yet performed to the point of Delivering more than 20 MWh / h in 24 hour daily average into the Brazilian Electric Grid Operating System.

The degassing station is responsible for extracting the landfill gas from the landfill and transports it to the flares and to the gas engines in the power plant. During the transportation, the gas goes through a treatment to allow its use as fuel for energy generation. Other functions of the degassing station are: drying landfill gas by gas coolers; and measuring and analyzing the quantity and quality of the landfill gas for safety, process and operating purposes.

The landfill gas is cooled down when transported from the landfill, resulting in a condensate. This is be drained to condensate shafts, to be placed nearby the gas pipes. Once in the degassing station, the gas is measured and sent to a flaring and generation system. Biogás has chillers installed in order to remove moisture. This is a very important step in the gas treatment process, since the condensate, which contains silicium components, could block the gas pipes and also damage the gas engines, due to the silicium. After this step, the gas is heated again through a second heat exchanger, or economizer, to a temperature of around 25ºC, far enough from the dew point of 4ºC to avoid further condensation.

Blowers are used for transportation of the landfill gas from the landfill to the flares and power house. These blowers are equipped with all the necessary safety equipment, including a noise reducing housing.

The figure below presents the installation of all collecting equipment from SJ, the location of the degassing station and the location of the power house.

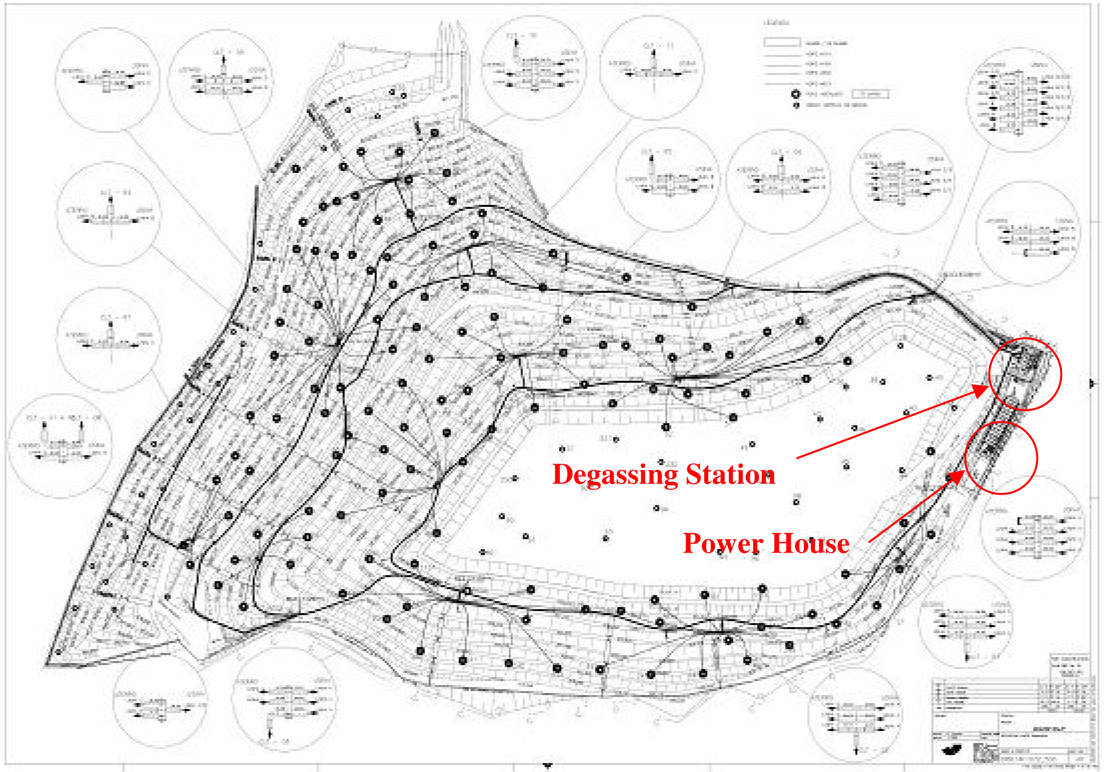

Figure -1: SJ Layout

Figure -2: Degassing Station (1) and Power House (2)

The pictures below illustrate the collecting system of the SJ project.

Figure -3: Wellhead

Figure -4: Wellhead and Collection Pipeline

Figure -5: Transmission Pipeline

Figure -6: Gas entrance in the Degassing Station

On the pressure side of the degassing station, all kinds of gas analyzing and gas measuring instruments are present. These instruments are very important for safety, process and operating purposes. SJ counts, actually, with three turbine flow-meters: one measures the total gas collected (tag FIR600) and the other two measures the gas sent to the flaring system and to the power house (tags: FIR500 and FIR800, respectively).

While the power house was not installed, SJ generated electricity through a diesel engine installed in the degassing station. The electricity produced was registered continuously by the PLC and the diesel consumed was registered via the contract between Biogás and the diesel supplier. This equipment was in stand-by in the time of the Monitoring Period, as the electricity consumed by the Degassing Station was supplied by the Power House; however, during electricity black-outs the generator is turned on in order to supply electricity to the Station (this source of project emissions was considered in the calculation of ERs).

The pictures below present the above mentioned installed equipment and the layout of the degassing station and power house, location of the measuring equipment.

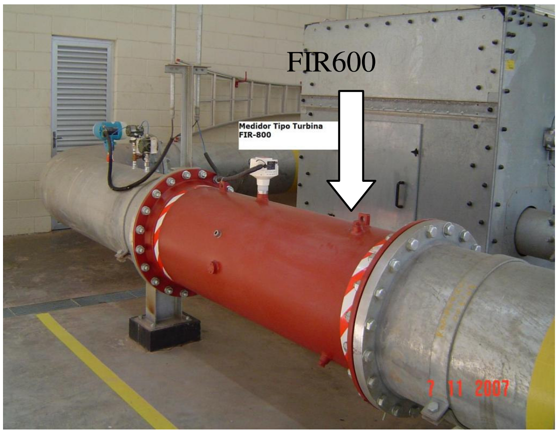

Figure -7: FIR600

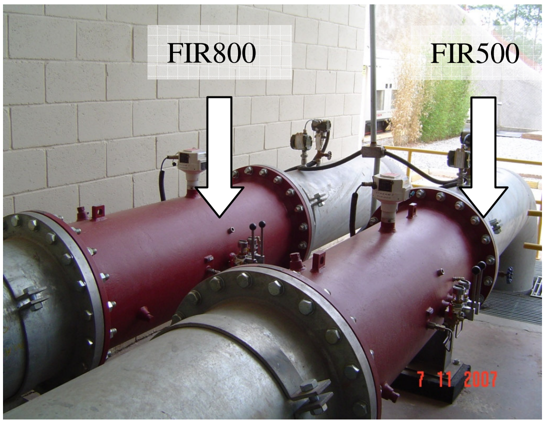

Figure -8: FIR500 and FIR800

Figure -9: Flares F520, F540 and F560

Figure -10: Blower

Figure -11: Detail of the blower

Figure -12: Chiller

Figure -13: Methane Analyzer A400

The Power House's construction was finished in January 2008. 14 gas engines were installed in February and March 2008 with a nominal capacity of 1.54 MW each, achieving a total installed capacity of 21.56 MW – 1.54 MW (or 1 engine) in stand-by. On October 23, 2008, 2 new engines were installed and total capacity installed was up graded to 24.64 MW – 1.54 MW (or 1 engine) in standby, what was equivalent to the implementation status during the whole given monitoring period. The electricity produced is sent to the substation located next to the power house and transported via two transmissions lines – 14 and 16 km[3], respectively - until the connection to the Brazilian Electric Grid. Two electricity-meters are installed to measure the net quantity of electricity exported to the grid, one for each bar, and there is another measuring point at the substation connected to the grid – this substation measures the electricity which is indeed exported, discounting the transmission losses. The monitoring system of net electricity export data is fully operational.

The pictures below presents the gas engines installed in the Power House, the substation, the electricity-meter and the transmission line from São João Landfill to the connection to the Brazilian Electric Grid.

Figure -14: Gas engine

Figure -15: Substation

[3] The 1st transmission line (14 km) is fully operational and the 2nd line with 16 km is scheduled to be operational in 2011

Figure -16: Electricity-meter

Figure -17: Transmission Line 1 (14 km) which is fully operational (green colored)

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

The project's name is "São João Landfill Gas to Energy Project" (SJ).

The methodology applied to SJ is **ACM0001 – version 02**, called "Consolidated baseline methodology for landfill gas project activities". The applicability conditions for ACM0001 have already been considered under the baseline section of the PDD. In fact, SJ is a project activity undertaken with the purpose of capturing and flaring methane from landfill operations, and also using this methane as fuel for a power plant, generating electricity that will avoid fossil fuelled plants at the margin of the Brazilian electricity system, therefore causing a reduction in GHG emissions. ACM0001 is therefore fully applicable to São João Landfill Gas to Energy Project.

The Monitoring Plan was developed based on **ACM0001 - version 02** of the **"Consolidated monitoring methodology for landfill gas project activities"**.

A.6. Registration date of the project activity:

The date of registration of the project is 02/07/2006.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

SJ is in the first crediting period that had started on 22/05/2007. This period will finish on 21/05/2013, because the project proponent has chosen a renewable crediting period of 7 years. The crediting period was changed from 30/06/2006-29/06/2013.

A.8. Name of responsible person(s)/entity (ies):

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SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

1) The starting date of operation of the project activity: the degassing station had started on 01/06/2007 and the power plant had started on 01/04/2008.

2) There were three special events registered during this monitoring period, described below

Event	Description	How the event was considered
1	On November 26th, the PP couldn´t generate energy because had problems in the substation.	The PP had problems with a gas leaking at the pole breaker SF6 located in the substation. For this reason it was necessary to realize an emergency maintenance. São João Energia Ambiental S/A solved the problem in two days and the power plant was restarted in 27/11/2010. It wasn't observed any impact related to the gas flow during the maintenance period; however a considerable impact occurred in the electricity production during the two days (26 and 27/11/2010). It wasn´t possible export the energy to the grid during these days.
2	On November 30th, the PP couldn´t generate energy because realized a general	The event occurred because the PP realized a preventive maintenance in the substation. The maintenance lasted all day long.

	preventive maintenance in the substation.	It wasn't observed any impact related to the gas flow during the maintenance period; however a small impact occurred in the electricity production.
3	From January 18th to January 20th, the PP couldn´t generate energy because AES had operational problems in the switch supply.	The event occurred because the AES Eletropaulo had operational problems in the switch supply and it was necessary to realize maintenance in their external net. On 18/01/2011 it rained a lot in São Paulo and there were 12 break points in the networks of AES Eletropaulo. They couldn´t solve the problem so fast and spent three days to solve it. It wasn't observed any impact related to the gas flow during the maintenance period; however a considerable impact occurred in the electricity production. It wasn´t possible export the energy to the grid during these days.

3) During this monitoring period, 01/11/2010 to 31/01/2011, an average of 6 Caterpillar engines worked in the power plant. This happens because the gas production in the landfill is lower than the estimated in the PDD. The 3 flares installed in the degassing plant were in operation during the monitoring period however usually did not operate at the same time or were on standby when all gas was combusted in the generators.

No other events or rule/policy changes have taken place that could have affected the normal operation of the project and the applicability of the methodology

B.2. Revision of the monitoring plan

The application of a new monitoring plan, as approved by the EB in 18/02/2008, including, among others:

- The use of a diesel generator to supply the project's electric needs from the beginning of the project's operation until January/2008, when the power house entered into operation. This source of project emission was considered in the calculation of emission reduction. However, this project emission source is in stand-by now as the electricity generated in the power house is used to supply the project's internal needs – the diesel generator is only turned on during black-outs of electricity generation. The diesel generator CO_2 emission factor was adopted based on a conservative value (1.3 tCO_2/MWh), according with the "Tool to calculate project emissions from electricity consumption (version 1)"

- Differently from Annex 4 – Monitoring Plan, 3 (three) flow-meters were installed instead of the 2 (two) mentioned: the first to measure the total flow, the second to measure the gas sent to the flares and the third to measure the methane sent to the power house, according with the revised Monitoring Plan approved by the EB;

- "The net quantity of electricity displaced" will be measured by an electricity meter. São João Landfill Gas to Energy Project will measure the total electricity fed into the grid (via an electricity-meter).

B.3. Request for deviation applied to this monitoring period

During this monitoring period, no request for deviation has taken place.

B.4. Notification or request of approval of changes

A.2., A.4.3. and E.4. of the registered PDD mentioned an installed capacity of 20 MW for renewable electricity generation. As during the 5th and 6th verification period (period from 01/04/2008 to 30/06/2008 and 01/07/2008 to 30/09/2008, respectively) the installed capacity was of 21.56 MW (14 engines of each 1.54 MW) and later on (from the 7th verification period (01/10/2008 to 30/11/2008) on), the installed capacity increased to 24.64 MW (16 engines of each 1.54 MW), what is equivalent to the nominal installed capacity today, the DOE together with the PPs submitted on January 28, 2010 a "Request for approval of changes from project activity as described in the registered PDD" to UNFCCC.

From the registered PDD, the following main changes were presented:

- The application of a revised monitoring plan, as approved by the EB in 18/02/2008, as mentioned above, in B.2.

- The SJ Project was implemented, according to PDD revised, in three phases: Degassing Stations, Power Plant (with 14 engines) and acquisition of 2 new engines (the same model and capacity);

- The project was implemented with a total installed capacity of 24.64MW for electricity generation (16 engines of 1.54 MW each). This was equivalent to the total installed capacity for the Monitoring Period under consideration and two transmissions lines of around 14 and 16 km length respectively, however the latter one is not operational yet.

São João Project had its PDD revised according to the EB48, Annex 66/67. The changes do neither affect the additionality nor scale of the project nor applicability of neither the methodology nor its contribution to the Brazilian sustainable development as described further on in the revised PDD. The SJ PDD version 03, dated on December, 29th, 2009, was approved on 28/05/2010.

SECTION C. Description of the monitoring system

Monitoring Instruments:

The following instruments were installed in the Degassing Station, as per the revised Monitoring Plan:

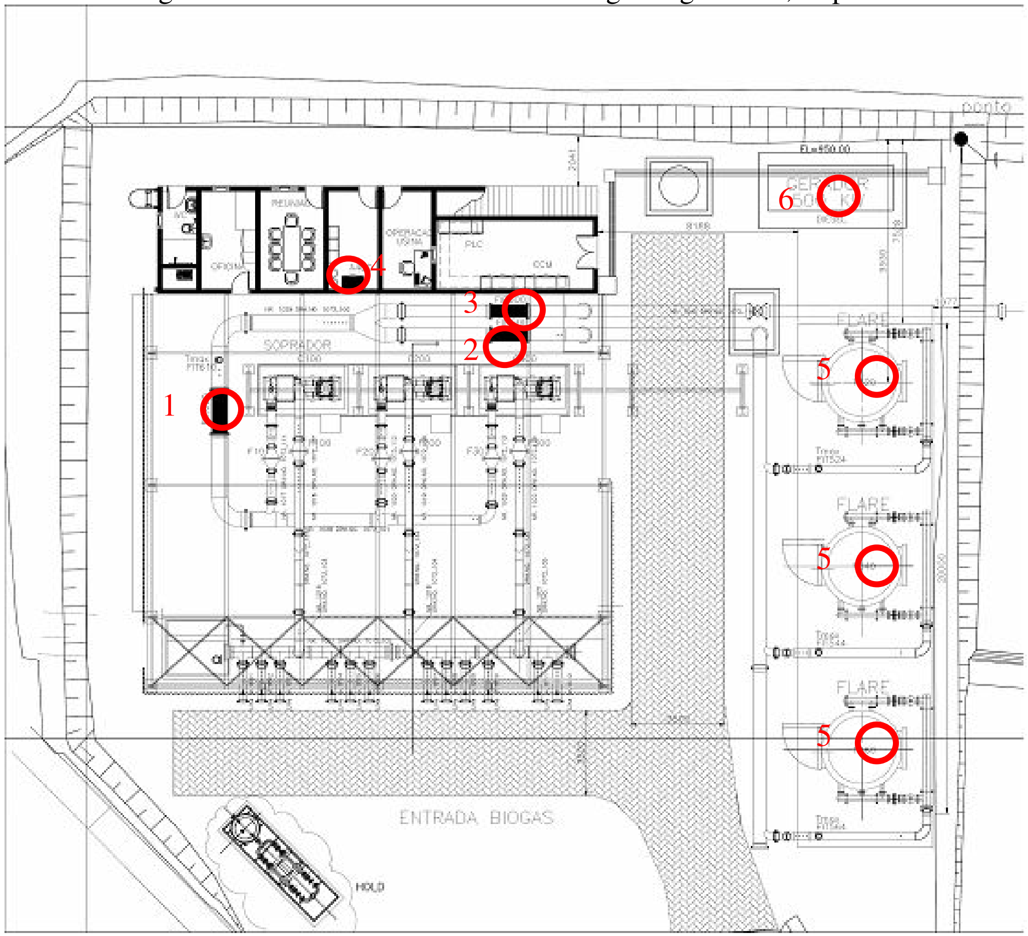

Figure -18. Lay-out of the Degassing Station

Figure -19. Lay-out of the Power House

1 – FIR600: Flow meter - Register the total amount of landfill gas captured;
2 – FIR500: Flow meter - Register the total amount of landfill gas flared;
3 – FIR800: Flow meter - Registered the total amount of landfill gas combusted in the Power plant
4 – Gas Analyzer: Measure the Methane fraction in the landfill;5 – Temperature meters of the exhaust gas - Flares: F520, F540 and F560, respectively
6 – Electricity meter - Diesel generator
7 - Electricity meter - Substation

Methodology ID	Equipment Number	Equipment	Location	TAG	Manufacturer	Model	Range	Serial Number	Error (%)
$LFG_{Total, y}$	1	Turbine Flow-meter [4]	Main Line	FIR600	Instromet	SM-RI-X-K	1,300–25,000 m^3/h	10508423	0.4800
$LFG_{Flare, y}$	2	Turbine Flow-meters[4]	Line to Flares	FIR500	Instromet	SM-RI-X-K	800–16,000 m^3/h	10508421	0.9800
$LFG_{Electricity, y}$	3	Turbine Flow-meter [4]	Line to the Power House	FIR800	Instromet	SM-RI-X-K	800–16,000 m^3/h	10508422	1.2800
FE	5	(1) Temperature transmitters (thermocouples) (2) Chromatographer – analysis made by a Third Party	Flares F520, F540 and F560	(1) TAC520, TAC540 and TAC560 (2) N/A	(1) Jumo (all thermocouples) (2) N/A	(1) type "S" L750 (all thermocouples) (2) N/A	(1) 0-1500°C (all thermocouples) (2) N/A	N/A	N/A
$w_{CH4, y}$	4	Methane Analyzer	Analysis Room	A100	NUK-Emerson-Rosemount	Binos 100	0-100%	120171639018	1.0000

[4] The Turbine flow-meters installed are connected to a pressure and temperature transmitters, which allows the device to use those variables to make the conversion automatically to Nm^3. Thus, readings from pressure and temperature were not monitored; however the errors from the transmitters were discounted from the final calculation (refer to E.1).

Methodology ID	Equipment Number	Equipment	Location	TAG	Manufacturer	Model	Range	Serial Number	Error (%)
EG_y [5]	7	Electricity Meters	Substation	N/A	Merlin Gerin	Power Logic - CM 4000	240V/300V - 96mA MAX.	32004234 32004233	1.0000
EC_y	6	Electricity Meter	Diesel Generator	N/A	Siemens	MMG 144	0-100 MWh	00400243415	0.5000

Depending on the parameter the, the frequency of the PLC's routine may vary, as presented in the table below:

Methodology ID	Equipment TAG	Reading Frequency	Transmition Frequency	Registration Frequency	Comments
$LFG_{Total, y}$	FIR600	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	– Data of instant gas-flow is registered every 5 minutes in the Supervisory System's hard disk, in Nm^3/h, using the readings from the pressure and temperature transmitters; – Data accumulated every 1 hour is registered in the Supervisory System's hard disk, in Nm^3, using the readings from the pressure and temperature transmitters; – Every 00:00, the PLC's counter is reseted; – The flow-computer installed in the flow-meter keeps registering the accumulated flow; – Every 3 hours, the accumulated flow (in Nm^3) is manually registered by the operators; – Every 1 hour, the operators perform a "Print-Screen" of the PLC Controlling System Panel, which presents the operational variables. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)
$LFG_{Flare, y}$	FIR500	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	
$LFG_{Electricity, y}$	FIR800	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	

[5] There are two electricity-meters installed at SJ – one in each bar. The electricity-meters are from the same manufacturer and are the same model.

Methodology ID	Equipment TAG	Reading Frequency	Transmition Frequency	Registration Frequency	Comments
FE	(1) TAC520, TAC540 and TAC560 (2) N/A	(1) Continuously (2) Every 3 months, by a specialized company on gas analysis	(1) Continuously (2) Every 3 months, by a specialized company on gas analysis	(1) Every 5 minutes (2) Every 3 months, by a specialized company on gas analysis	– Temperatures below 900°C indicates that the flare is running out of the specified combustion temperature range; – A sudden decrease of temperature indicates that the main valve of the flare is closed and no gas is being sent to the flare (please, refer to item 3.1.1) – The flare efficiency analysis is made according with internal procedures from the hired company
$w_{CH4, y}$	A100	Continuously	Continuously	Every 5 minutes	– By the end of the day, an average of CH_4 concentration (registered every 5 minutes) is calculated. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)
EG_y	EM100	Continuously	Continuously	Every 1 hour	– Data accumulated every 1 hour in the Power House's Supervisory System's hard disk, in MWh; – Every 00:00, the PLC's counter is reseted; – Responsibilities of the routine: PLC (continuously) and power plant supervisor (monthly)
EC_y	N/A	Continuously	Continuously	Every 1 hour (accumulated electricity consumption)	– The electricity-meter keeps accumulating the electricity consumed; – When the meter reaches 100 MWh, the count is reseted. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)

Involvement of Third Parties

SJ has four third parties involved (directly and indirectly):

- Specialized company on gas analysis, to perform the analysis of methane concentration in the exhaust gas. For this monitoring period, Biogás hired CORPLAB, a national certified laboratory.

- NEXT Automation, the company responsible for the automation of the system;

- Van der Wiel, one of Biogas's shareholders, is the only company who has external access to the data registered from the PLC.

- ARCADIS Tetraplan is the company responsible to develop the Monitoring Report and is part of the quality assurance/quality control procedures.

Quality assurance and quality control measures

Internal Procedures

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

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

Every week, the plant supervisor downloads all data registered from the PLC and makes a complete check to identify unconformities, such as unread registrations or troubles with the PLC (this unconformities happens mainly due to electricity black-outs). All unconformities raised are promptly compared with operational events, registered by the operators in the Operation Diary. The event is informed to the Production Manager of Biogás, which is responsible for taking the necessary actions to avoid it to happen again.

In order to avoid data loss, the operators are oriented to register all gas flow data manually in proper sheets every 3 hours, which are verified by the production manager weekly for legibility. Manual records are transferred to an Excel sheet (which is double-checked with a sheet developed by ARCADIS Tetraplan). Additionally, the operators are oriented to perform a "Print-Screen" of the PLC Controlling System Panel every hour. The picture printed presents all monitoring parameters and is saved in the computer's hard disk.

Also, the SJ count with a third-party, non-responsible for the project's monitoring: ARCADIS Tetraplan, which is the responsible for the development of the Monitoring Report. ARCADIS Tetraplan' role in the Project is to assure the quality of the registered data, through a double-check process, and to assure the quality of the calculation of ERs and is in constant contact with the Production Manager of Biogás.

Biogás has, until now, no intention to implement EMS such as ISO 14001 in SJ.

Other procedures developed at SJ are:

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

PO-002: Calibration of methane analyzer

PO-003: Calibration of valve (flare)

PO-004: Service orders and maintenance

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

PO-006: Procedure about internal monitoring of São João

PO-007: Procedure about workers control

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

PO-009: Procedure in emergency situations

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

PO-011: Procedure for manual data collection

PO-012: Instruction for Refueling the Diesel Device

PO-013: Identification of legal and other requirements

PO-014: Administrative Procedure

Organizational Structure, responsibilities and competencies

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

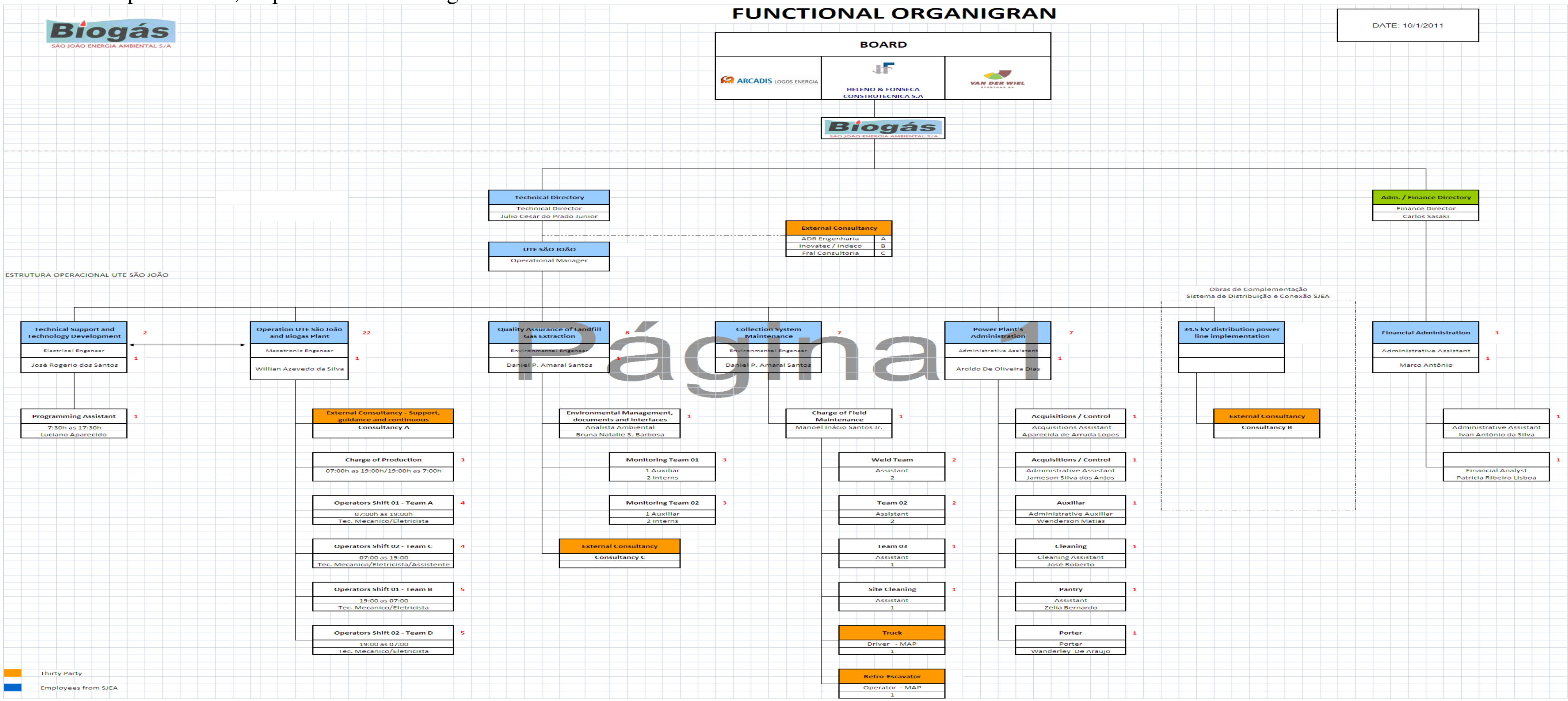

Figure -20. General Organogram of SJ

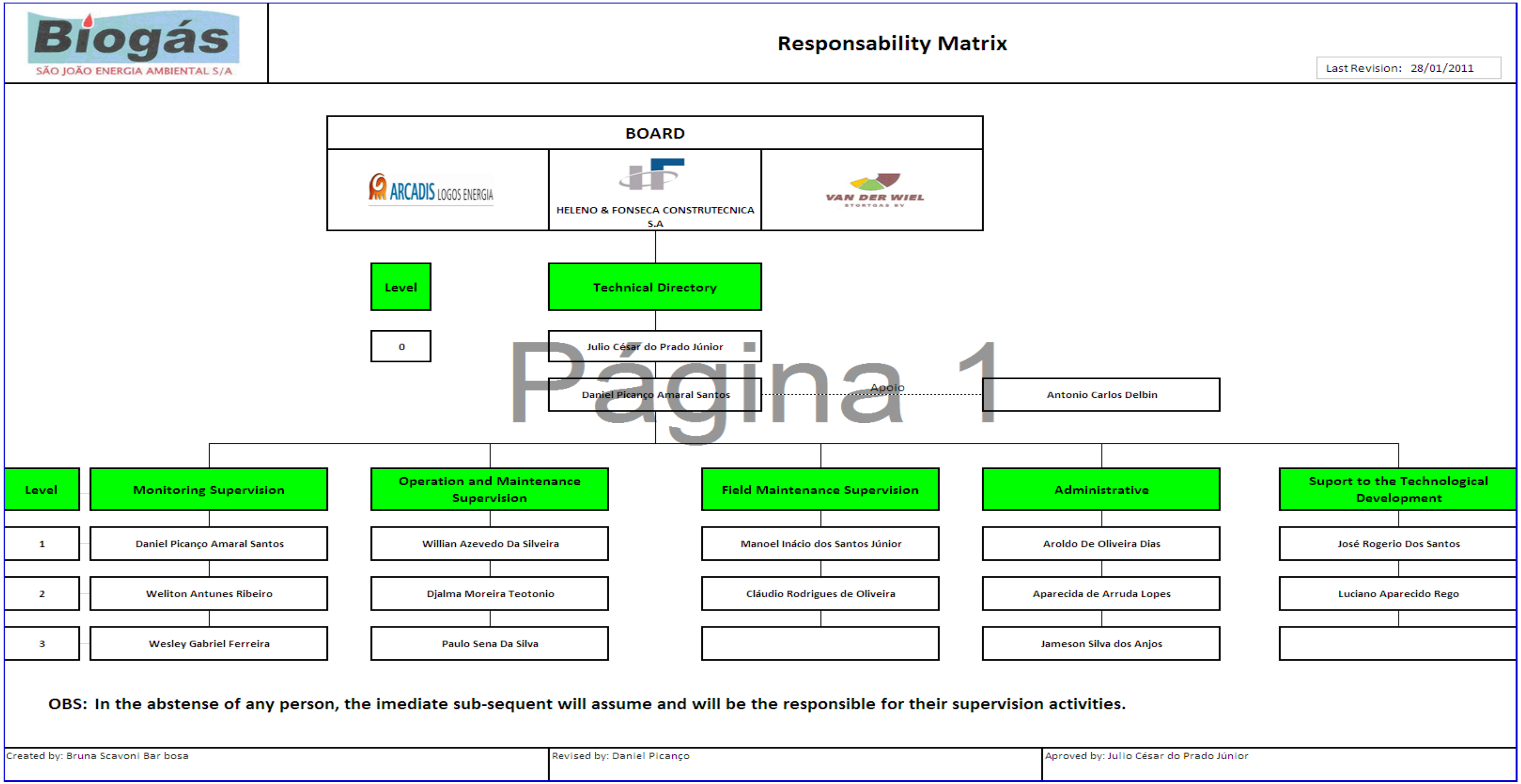

Figure -21. Responsibility Matrix of SJ

Trainings

All training was supplied to operators and technical assistants before the project's implementation. The training certificates were presented to the Verification Team.

For this monitoring period, three employees were hired: Wilton Severino de Souza and José Roberto Cordeiro as operator and Wanderley de Araujo as Porter. The intern Bruna Scavone was effected as Environmental Analyst, the young apprentice Wenderson Matias was effected as Administrative Auxiliary. The training of both operators was realized from 06/12/2010 to 15/12/2010.

The new operators before starts the job, realized the training, composed by:

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

As all data registered in the Supervisory System's hard disk is subjected to sabotage and technical failure, Biogás developed the following actions to protect the monitoring system:

- The PLC is not connected to the Internet, thus the risk of virus is minimized;
- Only defined persons have access to the data base of the system;
- Antivirus programs are installed at the system;
- Data backup:
  - A weekly CD backup of the Supervisory System's hard disk;
  - A weekly backup of the Supervisory System's hard disk is made by the server of Heleno & Fonseca (one of Biogás shareholders);
  - Van der Wiel (another Biogás shareholder) has radio access to the Supervisory System;
  - ARCADIS Tetraplan downloads regularly the primary data for the elaboration of the monitoring report.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential value for methane
Source of data used:	1996 IPCC Guideline for National Greenhouse Gas Inventory
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission	Baseline calculation

calculations)	
Additional comment:	N/A

Data / Parameter:	$\rho_{CH4,n,h}$
Data unit:	tCH_4/m^3CH_4
Description:	Density of methane gas at standard temperature and pressure
Source of data used:	1996 IPCC Guideline for National Greenhouse Gas Inventory
Value(s) :	0.0007168
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	**(ID - 10) EF_y**
Data unit:	**tCO2e/MWh**
Description:	Emission Factor of Diesel Engines
Source of data used:	Project participant
Value(s) :	1.3 tCO_2e/MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	**(ID – 8) CEF_y**
Data unit:	**tCO2e/MWh**
Description:	CO_2 emission intensity of the electricity
Source of data used:	Brazilian Grid
Value(s) :	0.2677 tCO_2e/MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	**AF**
Data unit:	%
Description:	Adjustment Factor
Source of data used:	PDD registered
Value(s) :	20%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

D.2. Data and parameters monitored

Data / Parameter:	(ID – 1) $LFG_{Total, y}$
Data unit:	Nm³
Description:	Total amount of landfill gas captured from the landfill site in normal cubic meters at standard temperature and pressure
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data flow generated from FIR600 is actually used to realize the cross-checking of the other flow meters. These values of the total gas flow are not used to calculate the amount of CERs.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	(see table below)
Measuring/ Reading/ Recording frequency:	Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The procedure PO – 005: Procedure of monitoring parameters (including calibration plan) explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipments/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
Turbine Flow-meters	FIR600	Instromet	SM-RI-X-K	10508423	0.480	23/05/2007	23/05/2012
Pressure Transmitter	FIR.600	Yokogawa	91G216023 – 2007	91G216023	0.030	15/05/2007	15/05/2012
Temperature Transmitter	FIR600	Yokogawa	C2F622018 – 2007	C2F6018	0.020	15/05/2007	15/05/2012

Data / Parameter:	(ID – 2) $LFG_{Flare, y}$
Data unit:	Nm³
Description:	Amount of landfill gas captured from the landfill site in normal cubic meters at standard temperature and pressure
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are	Baseline emission calculation

used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	(see equipment table below)
Measuring/ Reading/ Recording frequency:	Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The procedure PO – 005: Procedure of monitoring parameters (including calibration plan). This procedure explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipments/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
Turbine Flow-meters	FIR500	Instromet	SM-RI-X-K	10508421	0.980	23/05/2007	23/05/2012
Pressure Transmitter	FIR500	Yokogawa	EJA - 510A	91G216021 - 2007	0.010	15/05/2007	15/05/2012
Temperature Transmitter	FIR500	Yokogawa	YTA-110	C2G311000-2007	0.030	15/05/2007	15/05/2012

Data / Parameter:	**(ID – 3) $LFG_{Electricity, y}$**
Data unit:	Nm^3
Description:	Amount of landfill gas captured from the landfill site in normal cubic meters at standard temperature and pressure
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	(see equipment table below)

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
Turbine Flow-meters	FIR800	Instromet	SM-RI-X-K	10508422	1.280	23/05/2007	23/05/2012
Pressure Transmitter	FIR800	Yokogawa	EJA - 510A	91G216022 - 2007	0.010	15/05/2007	15/05/2012

	Temperature Transmitter | FIR800 | Yokogawa | YTA-110 | C2G311001 – 2007 | 0.100 | 15/05/2007 | 15/05/2012
Measuring/ Reading/ Recording frequency:	Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The procedure PO – 005: Procedure of monitoring parameters (including calibration plan). This procedure explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipments/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.

Data / Parameter:	**(ID – 4) $FE_{F520/F540/F560}$**
Data unit:	**(1)** **°C** **(2)** mg/Nm^3
Description:	(1) Temperature of the exhaust gas in the flares F520/F540/F560 (2) Methane content of flare exhaust gas.
Measured /Calculated /Default:	(1) Measured (2) Measured and Calculated
Source of data:	(1) PLC data records (2) Analyses made by a third party.
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	see table below
Measuring/ Reading/ Recording frequency:	(1) Data is measured by thermocouples installed in the flares and the reading frequency is continuously. Measurements of the temperature of the exhaust gas are recorded electronically by PLC at least each five minutes and once per hour. The data is archived electronically.

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
(1) Thermocouple	(1) TAC520 TAC540 TAC560	(1) Jumo	(1) type "S" L750	(1)1534-00 (1)3562-00 (1)4404-00	N/A	N/A	N/A
(2) Chromatographer – analysis made by a Third Party	(2)N/A	(2) N/A	(2) N/A				

	(2) The data is measured with a chromatographer each three months by a specialized lab – CORPLAB, as explained on item E.1.
Calculation method (if applicable):	(1) N/A (2) Flare Efficiency Spreadsheet.
QA/QC procedures applied:	Regular maintenance will ensure optimal operation of flares. Flare efficiency should be checked quarterly, with monthly checks if the efficiency shows significant deviations from previous values. This is mentioned in the procedure PO – 005: Procedure of monitoring parameters (including calibration plan) that explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipments/instruments, at least once a day. The calibration is not applicable; however the thermocouple respects the demands from Standard EN 60584.

Data / Parameter:	**(ID – 5) $W_{CH4,y}$**
Data unit:	**m^3CH4/m^3LFG**
Description:	Methane fraction in the landfill gas.
Measured /Calculated /Default:	Measured
Source of data:	PLC data records.
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Manufacturer: Rosemount - NUK Type: Binos 100 TAG: A100 Accuracy class: 1.0000% (error) Serial number: 120171639018 Calibration frequency: weekly calibration throughout the monitoring period with a standard gas Date of last calibration: 26/10/2010.Validity: Each calibration is valid for one week.
Measuring/ Reading/ Recording frequency:	The data is continuously measured by the gas analyzer and recorded electronically by PLC at least each five minutes and once per hour, instantaneously. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The gas analyzer will be subject to a regular maintenance and testing regime to ensure accuracy. This is mentioned in the procedure PO – 005: Procedure of monitoring parameters (including calibration plan) that explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipments/instruments, at least once a day. The operation team performs a daily check list of the instrument to detect leaks and other defects. The filter replacement is performed when the team deems

	necessary. The calibration is also performed to detect possible flaws in the gas analyzer.

Data / Parameter:	**(ID - 6) Regulatory requirements**
Data unit:	Test
Description:	Regulatory requirements relating to landfill gas projects
Measured /Calculated /Default:	N/A
Source of data:	National environmental legislation and data base “Green Solution”
Value(s) of monitored parameter:	Required for any changes to the adjustment factor (AF) or directly MDreg,y
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	The recording frequency is yearly.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Required for any changes to the adjustment factor (AF) or directly $MD_{reg,y}$

Data / Parameter:	**(ID – 7) EG_y**
Data unit:	**MWh**
Description:	Net quantity of electricity delivered to the grid which is produced by using LFG under the project activity.
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	See section E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Manufacturer: Merlin Gerin Type: Power Logic – CM4000 TAG: Not applicable Accuracy class: 1.0000% Serial number: 32004234 / 32004233 Calibration frequency: 2 years Date of last calibration: 03/08/2010 Validity: 03/08/2012

Measuring/ Reading/ Recording frequency:	The data is measured by electricity meter installed at the project site and the connected substation. The reading frequency from the electricity meter is continuously and the recording frequency is hourly. AES Eletropaulo sends the registered data for Biogás. Double-check by electricity generated is realized and the lower values between SJ PLC data records and AES Eletropaulo sales receipt data are used for the CER calculation.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	If Biogas operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated each 2 years. According to Biogas is very easy to identify if the instrument is not working because it can be checked by the daily registered data and the monthly production sheet.

Data / Parameter:	**(ID – 9) EC_y**
Data unit:	**MWh**
Description:	Electricity consumed from the diesel generator
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	See section E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Manufacturer: Siemens Type: MMGE 144 TAG: Not applicable Accuracy class: 0.5000% MWh Serial number: 220000226101 Calibration frequency: 5 years Date of last calibration: 23/05/2007 Validity: 23/05/2012
Measuring/ Reading/ Recording frequency:	Directly measured by electricity meter installed at the project site and the connected to the PLC. The data is registered every 15 minutes in the PLC's database. The data is monitored and archived electronically. The reading frequency from the electricity meter is continuously and the recording frequency is hourly.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	If Biogas operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated each five years. According to Biogas is very easy to identify if the instrument is not working because it can be checked by the daily registered data and the monthly production sheet.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

According with baseline methodology ACM0001 – version 02, Emission Reductions are calculated as follows:

$$ER_y = (MD_{project,\ y} - MD_{reg,\ y}) \times GWP_{CH4} + EG_y \times CEF + ET_y \times CEF_{thermal,\ y} \quad (1)$$

Where:

ER_y = Emission reduction achieved by the project activity during a given year y (tCO_2e);
$MD_{project,\ y}$ = Amount of methane actually destroyed/combusted during the year y (tCH_4);
$MD_{reg,\ y}$ = Amount of methane that would have been destroyed/combusted during the year y in the absence of the project activity (tCH_4);
GWP_{CH4} = Global Warming Potential value for methane (tCO_2e/tCH_4);
EG_y = Net quantity of electricity displaced during the year y (MWh)
$CEF_{electricity,\ y}$ = CO_2 emissions intensity of the electricity displaced (tCO_2e/MWh)
ET_y = Quantity of thermal energy displaced during the year y (TJ)
$CEF_{thermal,\ y}$ = CO_2 emissions intensity of the thermal energy displaced (tCO_2e/TJ).

$MD_{project,\ y}$ is calculated as the sum of methane flow destroyed in the flares, in the power house and in the heat generation, as follows:

$$MD_{project,\ y} = MD_{flared,\ y} + MD_{electricity,\ y} + MD_{thermal,\ y} \quad (2)$$

Where:

$MD_{flared,\ y}$ = quantity of methane destroyed in the flares in year y (tCH_4)
$MD_{electricity,\ y}$ = quantity of methane destroyed by the generation of electricity y (tCH_4);
$MD_{thermal,\ y}$ = quantity of methane destroyed for the generation of thermal energy in year y (tCH_4)

As São João Landfill Gas to Energy Project does not use the methane to generate thermal energy, $MD_{thermal,\ y} = 0$.

$MD_{flared,\ y}$ is calculated as follows:

$$MD_{flared,\ y} = LFG_{flared,\ y} \times w_{CH4} \times D_{CH4} \times FE \quad (3)$$

Where:

$MD_{flared,y}$ = Quantity of methane destroyed by flaring (tCH_4);
$LFG_{flare,y}$ = Quantity of landfill gas flared during the year measured in cubic meters (Nm^3);
$w_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3_{CH4}/m^3LFG)
FE = Flare efficiency (%);
D_{CH4} = Methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3_{CH4});

$MD_{electricity,\ y}$ is calculated as follows:

$$MD_{electricity,\ y} = LFG_{electricity,\ y} \times w_{CH4} \times D_{CH4} \quad (4)$$

Where:

$MD_{electricity,y}$ = Quantity of methane destroyed by generation of electricity (tCH_4);
$LFG_{electricity,y}$ = quantity of landfill gas fed into electricity generator (Nm^3);
$w_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3_{CH4}/m^3LFG)
D_{CH4} = Methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3_{CH4});

Thus, $MD_{project,\ y}$ is equal to:

$$MD_{project,\ y} = (LFG_{flared,\ y} \times w_{CH4} \times D_{CH4} \times FE) + (LFG_{electricity,\ y} \times w_{CH4} \times D_{CH4}) \quad (5.1)$$

$$MD_{project,\ y} = w_{CH4} \times D_{CH4} \times (LFG_{flared,\ y} \times FE + LFG_{electricity,\ y}) \quad (5.2)$$

The amount of methane that would have been destroyed/combusted during the year *y* in the absence of the project activity ($MD_{reg,\ y}$) is calculated adopting an "Adjustment Factor" (AF), as no regulatory or contractual requirements specifying a quantity of methane destruction exists. As will be presented below, the *AF* adopted for the 1st Crediting Period is equal to 20% of total gas collected. Thus, equation (1) is updated to:

$$ER_y = (MD_{project,\ y} - 0.2 \times MD_{project,\ y}) \times GWP_{CH4} + EG_y \times CEF + ET_y \times CEF_{thermal,\ y} \quad (6.1)$$

As São João Landfill Gas to Energy Project does not displace thermal energy, $ET_y = 0$ and equation 6.1 is updated to:

$$ER_y = (0.8 \times MD_{project,\ y}) \times GWP_{CH4} + EG_y \times CEF \quad (6.2)$$

Additionally, electricity consumption from the diesel generator times a conservative diesel CO_2 emission factor was subtracted from equation 6.2, resulting in:

$$ER_y = (0.8 \times MD_{project,\ y}) \times GWP_{CH4} + EG_y \times CEF - EC_y \times EF \quad (6.3)$$

Where:

EC_y = Electricity consumed from the diesel generator (MWh);
EF = Diesel CO_2 emission factor, based on a conservative value (tCO_2/MWh);

A description and consideration of measurement uncertainties and error propagation will be presented and detailed along this item.

Calculation of FE – Flare Efficiency

To calculate the Flare Efficiency, the following formulae were applied, based on the mass-balance (an Excel spreadsheet was evidenced to the Verification Team):

Calculate the volume of CH_4 sent to flares F_i ($Flow_{methane}$), measured by FIR500:

$$Flow_{methane} = Flow_{FIR500} \times \frac{\%_{methane}}{100}$$, where:

- Flowmethane = methane flow sent to the flare Fi (Nm3/h);
- FlowFIRi = total flow measured by the flow-meter FIR500 sent to the flare Fi (Nm3/h);
- % methane = methane measured by the gas analyzer (%);

Calculate the volume of other gases (residual gases) sent to flares ($Flow_{remaining}$):

$$Flow_{remaining} = Flow_{FIR500} - Flow_{methane}$$, where:

- Flow remaining = flow of residual gases sent to the flare Fi (Nm3/h);

Calculate the total flow entering the flare F_i ($Flow_{Total}$):

$$Flow_{Total} = Flow_{methane} + (Flow_{methane} \times air_{ratio}) + Flow_{remaining}$$,

Where:

- Flowtotal = total gas sent to the flare Fi (Nm3/h);
- air_{ratio} = theoretical air ratio[6];

Calculate the mass of methane in the exhaust gas ($M_{methane}$):

$$M_{methane} = Flow_{Total} \times \frac{CH_{4,eg}}{1000}$$, where:

- $M_{methane}$ = amount of methane remaining in the exhaust gas (g), calculated using the result of the analysis;
- $CH_{4,\,eg}$ = methane concentration in the exhaust gas (mg/Nm^3) – data acquired from the analysis form the specialized company;

Calculate the Flare Efficiency (FE):

$$FE = \frac{(Flow_{methane} \times 0.7168) - \frac{M_{methane}}{1000}}{(Flow_{methane} \times 0.7168)} \times 100$$, where:

- FE = Flare Efficiency (%);
- 0.7168 = density of methane, at STP (kg/Nm^3).

During this monitoring period, CORPLAB[7] performed two analyses of the methane content in the exhaust gas of the flares F520, F540 and F560 in the following days: 05 and 06/08/2010; and 04 and 05/11/2010.The table below presents the methane concentration results.

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[6] Air_{ratio} is equal to 5, as recommended by Hoffstetter, the flare manufacturer.

[7] Corplab could not perform the analyses of the exhaust gas in the three flares in only one day. For this reason, the analyses are performed on two consecutive days.

Flare	August/2010 (Report 25412010)	November/2010 (Report 25412010.01)
F520	1.3 mg/Nm^3	0.9 mg/Nm^3
F540	0.9 mg/Nm^3	0.4 mg/Nm^3
F560	0.5 mg/Nm^3	0.6 mg/Nm^3

Other parameters used to calculate the flare efficiency were:

Measurement	$Flow_{FIR500}$			$\%_{methane}$		
	F520	F540	F560	F520	F540	F560
August /2010	5,129.7846 Nm^3/h	4,265.2615 Nm^3/h	4,446.0923 Nm^3/h	45.41%	45.64%	43.37%
November/2010	4,998.76 Nm^3/h	4,152.03 Nm^3/h	3,862.28 Nm^3/h	46.11%	46.56%	45.74%

The results were:

Measurement	Flare Efficiency Calculated		
	F520	F540	F560
August/2010	99.9987%	99.9991%	99.9995%
November/2010	99.9991%	99.9996%	99.9994%

In order to adopt a conservative approach, the lowest efficiency calculated through the methane content among the three flares was adopted. The table below resumes the period and the flare efficiency considered.

Period		Flare Efficiency Adopted
From	To	
01/11/2010	04/11/2010	99.9987%
05/11/2010	31/01/2011	99.9991%

The flare efficiency assumed from 01/11/2010 to 04/11/2010 was 99.9987%; the flare efficiency from 05/11/2010 to 31/01/2011was 99.9991% (the lowest efficiencies calculated).

Monitoring of the operation time of the flares is made continuously by the PLC and every 5 minutes the instantaneously flare temperature is registered by the supervisory system. In order to guarantee the real destruction of the gas, the flares are equipped with an automatic system which can detect the existence of flame. The following operational procedure is applied:

– a signal of gas being collected is sent to the PLC, which sends a signal to a solenoid valve;
– the valve is opened and a small amount of gas is delivered to an ignition burner;
– the ignition burner ignites the gas;
– an UV-sond (part of the ignition burner) verifies the existence of an stable flame – if not, the flare is stopped;

- if the stable flame detection is successful, the UV-sond sends a signal to the PLC, which then opens the main valve, located in the entrance of the flare;
- the main burner is ignited and gas begins to be destroyed;
- after a few seconds, the ignition burner is switched off and UV-sond begins to monitor the existence of flame in the flare – if no flame is detected, the flare will be automatically stopped by a signal sent from the UV-sond to the PLC;

According with the manufacturer, if the temperature of the flare is higher than 1,350°C, the flare will be stopped automatically and if the temperature is below 900°C an alarm indicates to the operator that the flare is running out of the specified combustion temperature range.

If temperature decreases significantly from one registration to another (5 minutes interval), it means that the main valve is closed – the flare is stopped and no gas is being burned. It can be confirmed that no gas is being burned by the instant reading of gas flow from the flow-meter FIR500, installed right before the flares entrances.

However, in some readings it was detected that the flare accepted gas, but with a combustion chamber temperature below 900°C. It happened because between a 5 minutes interval the flare might have stopped and turned on again (e.g. the flare was stopped at 10:01 and turned on 10:04, not remaining enough time to register a temperature above 900°C). To discount the values below 900°C, the following procedure was applied:

- An hourly average of flares temperature was calculated, considering the temperature registers when the instant gas-flow was above 0 Nm^3/h (flares are accepting gas);
- Gas flow (FIR 500) is considered for the CER calculation only in the case when:
  a) all three flares´ temperature is above 900°C; or
  b) one flare´s temperature is above 900°C and the other two flares indicate temperature of 0°C;

Proper Excel sheets applying the above mentioned procedure were presented to the Verification Team.

Moreover, the flares are equipped with an hour-meter, which measures the accumulated operating hours of the flares. Despite of not being registered by SJ's computer supervisory system, Van der Wiel, one of Biogás shareholders, makes the registration of these accumulated operating hours of the flares every 00:01 via CARS, a system which allows Van der Wiel to have total access to the PLC of SJ.

PP has monthly worksheets to calculate the hourly average of the flares temperature (as detailed above) and for this monitoring period the worksheets were named "São João – PLC_2010.11", "São João – PLC_2010.12", "São João – PLC_2011.01". These monthly worksheets files are very large because contains data registered by PLC every 5 minutes.

For this reason and in order to maintain transparency and to comply with the reporting requirements, PP decided to include in the CER calculation spreadsheet only the values related to the hourly data of flow and the temperature of the flares. It was created one new worksheet for each month verified; named DATA_NOV_2010, DATA_DEC_2010 and DATA_JAN_2011 which were included into the CER excel calculation spreadsheet (tool). In order to clarify the process these data were pasted as a link from the monthly worksheets to the CER Calculation spreadsheet.

For the whole monitoring period, the following table presents all measured data and the calculation of methane destroyed.

	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Eletricity Consumed (MWh)
DATE	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
01/11/2010	192,930	45.9815	*88,712.1079*	99.9987%	71,861	*33,042.7657*	33,042.3361	121,057	*55,663.8244*	194.20	0.0000
02/11/2010	193,139	44.1969	*85,361.4506*	99.9987%	56,241	*24,856.7785*	24,856.4553	128,643	*56,856.2180*	205.51	0.0000
03/11/2010	199,174	45.4396	*90,503.8689*	99.9987%	68,616	*31,178.8359*	31,178.4305	130,468	*59,284.1373*	203.62	0.0000
04/11/2010	198,163	45.8141	*90,786.5949*	99.9987%	75,620	*34,644.6224*	34,644.1720	122,467	*56,107.1538*	192.95	0.0000
05/11/2010	195,753	46.3822	*90,794.5479*	99.9991%	77,590	*35,987.9489*	35,987.6250	103,955	*48,216.6160*	166.85	0.0000
06/11/2010	200,089	45.3824	*90,805.1903*	99.9991%	24,001	*10,892.2298*	10,892.1317	114,152	*51,804.9172*	181.89	0.0000
07/11/2010	195,602	46.3184	*90,599.7167*	99.9991%	82,914	*38,404.4381*	38,404.0924	112,632	*52,169.3402*	180.22	0.0000
08/11/2010	200,363	45.4464	*91,057.7704*	99.9991%	73,376	*33,346.7504*	33,346.4502	126,915	*57,678.2985*	199.81	0.0000
09/11/2010	199,726	45.8952	*91,664.6471*	99.9991%	74,621	*34,247.4571*	34,247.1488	124,870	*57,309.3362*	197.38	0.0000
10/11/2010	202,828	45.5873	*92,463.8088*	99.9991%	82,859	*37,773.1809*	37,772.8409	119,760	*54,595.3504*	171.17	0.0000
11/11/2010	201,942	45.7347	*92,357.5678*	99.9991%	75,826	*34,678.7936*	34,678.4814	126,056	*57,651.3334*	179.39	0.0000
12/11/2010	202,890	46.5036	*94,351.1540*	99.9991%	73,051	*33,971.3448*	33,971.0390	129,670	*60,301.2181*	198.90	0.0000
13/11/2010	202,509	46.7831	*94,739.9879*	99.9991%	71,606	*33,499.5065*	33,499.2050	130,808	*61,196.0374*	201.45	0.0000
14/11/2010	199,577	47.4811	*94,761.3549*	99.9991%	70,301	*33,379.6881*	33,379.3876	129,144	*61,318.9917*	201.16	0.0000
15/11/2010	199,963	47.2375	*94,457.5221*	99.9991%	60,783	*28,712.3696*	28,712.1111	139,074	*65,695.0807*	215.05	0.0000
16/11/2010	204,775	46.5340	*95,289.9985*	99.9991%	58,848	*27,384.3283*	27,384.0818	145,796	*67,844.7106*	225.94	0.0000
17/11/2010	201,313	45.7600	*92,120.8288*	99.9991%	59,311	*27,140.7136*	27,140.4693	141,934	*64,948.9984*	226.36	0.0000
18/11/2010	202,001	45.1757	*91,255.3657*	99.9991%	60,358	*27,267.1490*	27,266.9035	141,331	*63,847.2685*	226.15	0.0000
19/11/2010	198,388	45.4015	*90,071.1278*	99.9991%	57,784	*26,234.8027*	26,234.5665	140,103	*63,608.8635*	224.64	0.0000
20/11/2010	200,302	44.9918	*90,119.4752*	99.9991%	57,739	*25,977.8154*	25,977.5815	142,067	*63,918.5005*	225.62	0.0000

	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Eletricity Consumed (MWh)
DATE	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
21/11/2010	198,079	45.3323	*89,793.7665*	99.9991%	52,689	*23,885.1355*	23,884.9205	144,944	*65,706.4489*	231.45	0.0000
22/11/2010	197,693	45.3448	*89,643.4954*	99.9991%	44,664	*20,252.8014*	20,252.6191	152,497	*69,149.4596*	246.01	0.0000
23/11/2010	198,144	45.5520	*90,258.5548*	99.9991%	40,881	*18,622.1131*	18,621.9455	156,846	*71,446.4899*	254.04	0.0000
24/11/2010	199,975	46.9761	*93,940.4559*	99.9991%	40,822	*19,176.5835*	19,176.4109	158,338	*74,381.0172*	261.09	0.0000
25/11/2010	201,038	45.3588	*91,188.4243*	99.9991%	42,471	*19,264.3359*	19,264.1625	158,078	*71,702.2838*	249.96	0.0000
26/11/2010	191,715	46.6154	*89,368.7141*	99.9991%	133,424	*62,196.1312*	62,195.5714	55,745	*25,985.7547*	69.78	2.5365
27/11/2010	204,961	45.0124	*92,257.8651*	99.9991%	202,362	*91,087.9928*	91,087.1730	1,808	*813.8241*	3.89	3.8899
28/11/2010	197,603	44.9637	*88,849.6201*	99.9991%	91,281	*41,043.3149*	41,042.9455	104,030	*46,775.7371*	159.76	0.0000
29/11/2010	194,664	45.3097	*88,201.6744*	99.9991%	46,104	*20,889.5840*	20,889.3959	148,017	*67,066.0586*	234.97	0.0000
30/11/2010	195,363	45.9872	*89,841.9735*	99.9991%	146,098	*67,186.3794*	67,185.7747	41,913	*19,274.6151*	62.50	3.1672
01/12/2010	196,581	46.9100	*92,216.1471*	99.9991%	113,630	*53,303.8330*	53,303.3532	56,838	*26,662.7058*	96.66	0.9637
02/12/2010	200,326	46.5835	*93,318.8622*	99.9991%	43,931	*20,464.5973*	20,464.4131	155,780	*72,567.7763*	245.93	0.0000
03/12/2010	202,542	45.5527	*92,263.3496*	99.9991%	42,087	*19,171.7648*	19,171.5922	158,637	*72,263.4366*	246.83	0.0000
04/12/2010	201,588	45.8513	*92,430.7186*	99.9991%	25,966	*11,905.7485*	11,905.6413	173,469	*79,537.7915*	271.71	0.0000
05/12/2010	204,720	45.4952	*93,137.7734*	99.9991%	34,791	*15,828.2350*	15,828.0925	167,696	*76,293.6305*	258.26	0.0000
06/12/2010	199,720	46.5057	*92,881.1840*	99.9991%	29,883	*13,897.2983*	13,897.1732	169,170	*78,673.6926*	267.60	0.0000
07/12/2010	198,386	46.9052	*93,053.3500*	99.9991%	26,071	*12,228.6546*	12,228.5445	171,107	*80,258.0805*	274.22	0.2726
08/12/2010	201,536	46.3126	*93,336.5615*	99.9991%	37,330	*17,288.4935*	17,288.3379	163,055	*75,515.0099*	256.93	0.0000
09/12/2010	205,335	45.0164	*92,434.4249*	99.9991%	45,834	*20,632.8167*	20,632.6310	158,382	*71,297.8746*	244.04	0.0000
10/12/2010	197,465	46.2527	*91,332.8940*	99.9991%	25,547	*11,816.1772*	11,816.0708	170,712	*78,958.9092*	269.45	0.0000
11/12/2010	202,977	45.8294	*93,023.1412*	99.9991%	29,961	*13,730.9465*	13,730.8229	171,803	*78,736.2840*	269.58	0.0000

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Eletricity Consumed (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
12/12/2010	198,728	46.5620	*92,531.7313*	99.9991%	44,547	*20,741.9741*	20,741.7874	153,101	*71,286.8876*	243.48	0.0000
13/12/2010	201,666	45.9441	*92,653.6287*	99.9991%	50,939	*23,403.4650*	23,403.2543	147,958	*67,977.9714*	233.21	0.0000
14/12/2010	204,551	45.3993	*92,864.7221*	99.9991%	33,734	*15,314.9998*	15,314.8619	169,620	*77,006.2926*	266.31	0.0000
15/12/2010	204,381	45.6466	*93,292.9775*	99.9991%	48,860	*22,302.9287*	22,302.7279	154,431	*70,492.5008*	240.57	0.0000
16/12/2010	204,233	46.1363	*94,225.5495*	99.9991%	71,508	*32,991.1454*	32,990.8484	131,794	*60,804.8752*	206.30	0.0000
17/12/2010	204,556	46.1787	*94,461.3015*	99.9991%	75,568	*34,896.3200*	34,896.0059	128,084	*59,147.5261*	201.36	0.0000
18/12/2010	205,630	45.4289	*93,415.4470*	99.9991%	53,652	*24,373.5134*	24,373.2940	150,913	*68,558.1158*	235.62	0.0000
19/12/2010	203,079	45.6326	*92,670.2277*	99.9991%	65,200	*29,752.4552*	29,752.1874	136,912	*62,476.5053*	212.04	0.0000
20/12/2010	199,589	46.0402	*91,891.1747*	99.9991%	70,635	*32,520.4952*	32,520.2025	128,049	*58,954.0156*	200.50	0.0000
21/12/2010	205,056	45.1523	*92,587.5002*	99.9991%	73,108	*33,009.9434*	33,009.6463	131,023	*59,159.8980*	202.10	0.0000
22/12/2010	203,803	46.0354	*93,821.5262*	99.9991%	85,933	*39,559.6002*	39,559.2441	117,043	*53,881.2132*	180.44	0.0000
23/12/2010	209,748	44.9982	*94,382.8245*	99.9991%	81,177	*36,528.1888*	36,527.8600	127,670	*57,449.2019*	192.68	0.0000
24/12/2010	202,523	46.2084	*93,582.6379*	99.9991%	56,196	*25,967.2724*	25,967.0386	145,302	*67,141.7293*	226.58	0.0000
25/12/2010	204,565	45.5596	*93,198.9957*	99.9991%	51,587	*23,502.8308*	23,502.6192	151,905	*69,207.3103*	234.84	0.0000
26/12/2010	201,027	45.7552	*91,980.3059*	99.9991%	57,621	*26,364.6037*	26,364.3664	139,661	*63,902.1698*	216.39	0.0000
27/12/2010	201,442	46.1367	*92,938.6912*	99.9991%	56,091	*25,878.5363*	25,878.3033	144,332	*66,590.0218*	226.83	0.0000
28/12/2010	195,748	45.0255	*88,136.5157*	99.9991%	51,877	*23,357.8786*	23,357.6683	142,863	*64,324.7800*	220.71	0.0000
29/12/2010	202,624	45.0380	*91,257.7971*	99.9991%	75,058	*33,804.6220*	33,804.3177	126,671	*57,050.0849*	171.67	0.0000
30/12/2010	203,307	44.4728	*90,416.3154*	99.9991%	47,787	*21,252.2169*	21,252.0256	154,430	*68,679.3450*	206.24	0.0000
31/12/2010	201,667	44.2694	*89,276.7708*	99.9991%	43,930	*19,447.5474*	19,447.3723	156,631	*69,339.6039*	236.25	0.0000
01/01/2011	197,051	45.2001	*89,067.2490*	99.9991%	46,249	*20,904.5942*	20,904.4060	149,745	*67,684.8897*	231.66	0.0000

	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Eletricity Consumed (MWh)
DATE	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
02/01/2011	198,986	45.6327	*90,802.6844*	99.9991%	48,580	*22,168.3656*	22,168.1660	149,351	*68,152.8937*	233.85	0.0000
03/01/2011	207,238	45.1236	*93,513.2461*	99.9991%	69,266	*31,255.3127*	31,255.0314	137,004	*61,821.1369*	211.71	0.0000
04/01/2011	193,367	46.2330	*89,399.3651*	99.9991%	111,862	*51,717.1584*	51,716.6929	73,619	*34,036.2722*	112.74	1.1553
05/01/2011	203,100	44.9920	*91,378.7520*	99.9991%	80,812	*36,358.9350*	36,358.6077	121,431	*54,634.2355*	185.27	0.0000
06/01/2011	200,817	45.2140	*90,797.3983*	99.9991%	85,856	*38,818.9318*	38,818.5824	114,155	*51,614.0417*	177.32	0.0000
07/01/2011	199,381	45.1185	*89,957.7164*	99.9991%	75,276	*33,963.4020*	33,963.0963	123,234	*55,601.3322*	192.86	0.0000
08/01/2011	199,582	45.5802	*90,969.8747*	99.9991%	106,145	*48,381.1032*	48,380.6677	87,252	*39,769.6361*	132.03	1.0899
09/01/2011	201,936	45.3693	*91,616.9496*	99.9991%	134,824	*61,168.7050*	61,168.1544	696	*315.7703*	1.33	3.7349
10/01/2011	197,620	46.1271	*91,156.3750*	99.9991%	97,306	*44,884.4359*	44,884.0319	91,276	*42,102.9717*	150.95	0.0000
11/01/2011	199,027	45.8531	*91,260.0493*	99.9991%	81,370	*37,310.6674*	37,310.3316	116,833	*53,571.5523*	186.31	0.0000
12/01/2011	199,665	46.0015	*91,848.8949*	99.9991%	86,031	*39,575.5504*	39,575.1942	112,837	*51,906.7125*	175.16	0.0000
13/01/2011	200,287	45.8556	*91,842.8055*	99.9991%	89,188	*40,897.6925*	40,897.3244	110,320	*50,587.8979*	169.89	0.0000
14/01/2011	200,301	45.9972	*92,132.8515*	99.9991%	82,682	*38,031.4049*	38,031.0626	116,794	*53,721.9697*	177.92	0.0000
15/01/2011	198,236	46.3702	*91,922.4296*	99.9991%	77,700	*36,029.6454*	36,029.3211	119,691	*55,500.9560*	185.64	0.0000
16/01/2011	182,390	47.2953	*86,261.8976*	99.9991%	86,330	*40,830.0324*	40,829.6649	90,423	*42,765.8291*	146.34	0.0173
17/01/2011	199,193	45.7491	*91,129.0047*	99.9991%	85,171	*38,964.9659*	38,964.6152	110,193	*50,412.3057*	168.84	0.1838
18/01/2011	198,240	46.4957	*92,173.0756*	99.9991%	106,843	*49,677.4007*	49,676.9536	82,947	*38,566.7882*	127.46	1.1204
19/01/2011	208,268	45.0209	*93,764.1280*	99.9991%	207,586	*93,457.0854*	93,456.2442	0	*0.0000*	0.00	3.7023
20/01/2011	201,913	44.7149	*90,285.1960*	99.9991%	196,023	*87,651.4884*	87,650.6995	5,227	*2,337.2478*	9.05	3.1715
21/01/2011	197,822	45.5265	*90,061.4328*	99.9991%	89,665	*40,821.3362*	40,820.9688	103,669	*47,196.8672*	156.19	0.0000
22/01/2011	195,360	45.4595	*88,809.6792*	99.9991%	58,551	*26,616.9918*	26,616.7522	136,130	*61,884.0173*	208.14	0.0000

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm³)	Methane (%)	*Methane measured FIR600 (Nm³)*	Flares Efficiency (%)	LFG measured FIR500 (Nm³)	*Methane measured FIR500 (Nm³)*	*Methne Destroyed in Flares (Nm³)*	LFG measured FIR800 (Nm³)	*Methane measured FIR800 (Nm³)*	Eletricity Exported SJ (MWh)	Eletricity Consumed (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
23/01/2011	193,949	45.6248	*88,488.8433*	99.9991%	84,958	*38,761.9175*	38,761.5686	108,207	*49,369.2273*	162.15	0.0000
24/01/2011	191,511	45.8786	*87,862.5656*	99.9991%	83,901	*38,492.6041*	38,492.2576	102,131	*46,856.2729*	153.73	0.0000
25/01/2011	190,463	46.0171	*87,645.5491*	99.9991%	85,161	*39,188.6225*	39,188.2698	104,449	*48,064.4007*	158.43	0.0000
26/01/2011	190,002	45.6015	*86,643.7620*	99.9991%	62,454	*28,479.9608*	28,479.7044	126,764	*57,806.2854*	192.99	0.0000
27/01/2011	192,434	45.8816	*88,291.7981*	99.9991%	81,412	*37,353.1281*	37,352.7919	110,161	*50,543.6293*	165.97	0.0000
28/01/2011	190,787	46.2879	*88,311.2957*	99.9991%	57,429	*26,582.6780*	26,582.4387	130,188	*60,261.2912*	201.94	0.0000
29/01/2011	191,373	46.4741	*88,938.8793*	99.9991%	56,127	*26,084.5181*	26,084.2833	134,470	*62,493.7222*	210.42	0.0000
30/01/2011	191,554	46.6967	*89,449.3967*	99.9991%	52,543	*24,535.8470*	24,535.6261	138,196	*64,532.9715*	218.11	0.0000
31/01/2011	192,176	46.6260	*89,603.9817*	99.9991%	51,062	*23,808.1681*	*23,807.9538*	140,288	*65,410.6828*	221.03	0.0000

Obs.: the calculation of *methane measured* and *methane destroyed* was conservatively made, using Excel tool "ROUND DOWN" with four decimal rounds.

A consolidation of methane destroyed and electricity consumed/exported is presented in the table below:

Total Methane Destroyed in Flares (Nm^3), measured by FIR500	2,994,210.1959
Total Methane destroyed in the Power House (Nm^3), measured by FIR800	5,226,036.9308
Total electricity consumed from the diesel generator (MWh)	25.0053
Total Electricity Exported, measured at São João Landfill's substation (MWh)	17,872.4774

ERs from the electricity indeed exported are measured at Eletropaulo's substation (based on monthly electricity transaction notes), located around 14 km from São João Landfill. The values measured are lower than the one in the landfill's substation due to losses in the transmission line. The table below presents the electricity measured during the Monitoring Period and the comparison between the one measured in the landfill:

MONTH	Electricity Measured at São João Landfill (MWh)	Electricity Measured at Eletropaulo's Substation (MWh)[8]
November/2010	5,791.7220	5,644.4980
December/2010	7,055.3280	6,871.7810
January/2011	5,025.4274	4,863.3490
TOTAL	**17,872.4774**	**17,379.628**

As mentioned above, follows the description and consideration of measurement uncertainties and error propagation of the equipments. The readings from all equipments are subjected to internal errors from a standard value. These errors are measured and described in the Calibration Certificates, in terms of ± % from the standard adopted.

All calibrations usually have an expiration date, however the manufacturers of the flow-meters and pressure-temperature transmitters are Europeans and there are no rule in Europe specifying the calibration periodicity. Biogás decided to adopt a 2 years calibration frequency for the electricity meter of the grid, 5 years calibration frequency for the electricity meter of the diesel generator and 5 years for the others instruments. Regarding electricity meter, the manufacturer does not mention a specific calibration frequency of the meter. Besides, does not exist any standard or norm in Brazil indicating a specific calibration frequency.

The errors for each instrument will be presented in the formulae below.

Adopting a conservative approach on Emission Reduction calculation, the equivalent error calculated was discounted from the amount of methane calculated for each flow-meter, according to the equations below:

$$\varepsilon_{FIR500} = \sqrt{\left(\varepsilon_{\text{Gas Flow}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Temperature}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Pressure}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Methane Analysis}}\right)^2}$$

$$\varepsilon_{FIR600} = \sqrt{\left(\varepsilon_{\text{Gas Flow}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Temperature}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Pressure}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Methane Analysis}}\right)^2}$$

[8] Electricity measured based on monthly transaction notes.

$$\varepsilon_{FIR800} = \sqrt{\left(\varepsilon_{Gas\ Flow_{FIR800}}\right)^2 + \left(\varepsilon_{Temperature_{FIR800}}\right)^2 + \left(\varepsilon_{Pressure\ _{FIR800}}\right)^2 + \left(\varepsilon_{Methane\ Analysis}\right)^2}$$

Calculation of LFG$_{flared,\ y}$

The calculation of LFG$_{flared,\ y}$ is the measurement from FIR500 made during the monitoring period, minus the uncertainties of the flow-meters, as follows:

$$LFG_{flared,\ y,\ corrected} = FIR_{500} \times \left(1 - \frac{\varepsilon_{FIR500}}{100}\right)$$

Applying the errors from the table below in the equations previously presented:

$$\varepsilon_{FIR500} = \sqrt{0.980^2 + 0.030^2 + 0.010^2 + 1.000^2} = 1.4005\%$$

Calculation of LFG$_{electricity,\ y}$

The calculation of LFG$_{electricity,\ y}$ is measurement from FIR800 made during the monitoring period, minus the uncertainties of the flow-meter, as follows:

$$LFG_{electricity,\ y,\ corrected} = FIR_{800} \times \left(1 - \frac{\varepsilon_{FIR800}}{100}\right)$$

Applying the errors from the table below in the equations previously presented:

$$\varepsilon_{FIR800} = \sqrt{1.280^2 + 0.100^2 + 0.010^2 + 1.000^2} = 1.6275\%$$

Calculation of EG$_{y,\ corrected}$

The calculation of EG$_y$ is the sum of all measurements from the electricity-meter made during the monitoring period, minus the uncertainties of the electricity-meter due to conservativeness, as follows:

$$EG_{y,\ corrected} = \sum EG_y \times \left(1 - \frac{\varepsilon_{EG}}{100}\right)$$

$$\varepsilon_{EG} = 1.0000\%$$

Calculation of EC$_{y,\ corrected}$

The calculation of EC$_y$ is the sum of all measurements from the electricity-meter made during the monitoring period, plus the uncertainties of the electricity-meter due to conservativeness, as follows:

$$EC_{y,\,corrected} = \sum EC_y \times \left(1 + \frac{\varepsilon_{EC}}{100}\right)$$

$$\varepsilon_{EC} = 1.0000\%$$

Table providing the formulae used

	Variable	Description
Flaring System	A_{FIR500} (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Total methane destroyed in flares, measured by FIR500 (Nm^3)
	B_{FIR500}	Total error from FIR500 (%) – see item 4.4
	$C_{FIR500} = A_{FIR500} . (1- B_{FIR500}/100)$	**Total methane corrected destroyed at the flare (Nm^3)**
Power House	A_{FIR800} (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Methane flow to the power house measured by FIR800 (Nm^3)
	B_{FIR800}	Total measuring error from FIR800 (%) – see item 4.5
	$C_{FIR800} = A_{FIR800} . (1 – B_{FIR800}/100)$	**Total methane corrected destroyed at the power house (Nm^3)**
CO_2e Methane	$A = C_{FIR500} + C_{FIR800}$	Total methane destroyed in the period (Nm^3)
	B = 0.0007168	Density of Methane at the STPC (tCH_4/Nm^3)
	C = A . B	Total weight of methane destroyed (tCH_4)
	D = 21	CO_2 equivalency (tCO_2e/tCH_4)
	E = C . D	Total equivalent carbon (tCO_2e)
	F = 20%	Adjustment Factor (%)
	G = E . (1-F)	**Total equivalent carbon after consideration of Adjustment Factor (tCO_2e)**
CO_2e Electricity Exported	H (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Total electricity exported (MWh)
	I	Electricity-meter error (%)
	J = H . (1 – I/100)	Total electricity corrected (MWh)
	K = 0.2677	Emission Factor (tCO_2e/MWh)
	L = J . K	**Total CO_2e from the electricity exported (tCO_2e)**
CO_2e Electricity Consumed	M (see the table of consolidated methane destroyed and electricity	Total Electricity Consumed from the Diesel Generator (MWh)

	consumed/exported – last table from item 4.1)	
	N	Electricity-meter error (%)
	O = M . (1 + N/100)	Total electricity corrected (MWh)
	P = 1.3	Conservative Diesel CO_2 Emission Factor (tCO_2e/MWh)
	Q = O . P	**Total CO_2e from the electricity consumed (tCO_2e)**
TOTAL	**R = G + L – Q**	**TOTAL CREDITS DURING THE PERIOD (tCO_2e)**

E.2. Project emissions calculation

SJ have project emissions from the consumption of electricity from an emergency diesel generator during energy supply black-outs, as per stated in the revised monitoring plan. This source of emission will only be accounted during emergency situations and the electricity consumed by SJ will be from the Power Plant. Project emissions due to electricity consumption from the diesel generator are discounted of the total CERs generated.

E.3. Leakage calculation

No leakages under **ACM0001 – version 02**.

E.4. Emission reductions calculation / table

In accordance with the ACM0001 (version 2) and the registered PDD, emission reductions (ERy, expressed in tCO2) are calculated according to the following formula:

$ER_y = BE_y – PE_y – L_y$

Where:
ER_y = Emission reductions in year $_y$
BE_y = Baseline emissions in year $_y$
PE_y = Project emissions in year $_y$
L_y = Leakage in year $_y$

In SJ Project, there is no leakage calculation. For this reason we considered that:

$ER_y = BE_y - PE_y$

According to the above calculation of baseline emissions and project emissions, the project emission reductions are calculated as shown in the table below. The project totally generated 102,500 tCO2e during this monitoring period.

Period	Baseline Emissions	Project Emissions	Leakage	Emission Reductions
	tCO_2e	tCO_2e	tCO_2e	tCO_2e
01/11/2010 to 31/01/2011	102,533	33	-	102,500

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

The actual emission reductions during the monitoring period are: 102,500 tCO_2.

According to the registered PDD, the estimated value of emission reduction is averagely 794,288 tCO_2e/year for 2010, that is 66,190 tCO_2e per month on average in 2010, while the project activity actually generates totally 65,523tCO2e emission reductions during two months of this monitoring period – from 01/11/2010 to 31/12/2010 – with 61 days when the plants are in operation. That is about 32,761tCO2e per month; which is 50.50% lower than the estimated average value per month in 2010.

Furthermore according to the registered PDD, the estimated value of emission reduction is averagely 720,002 tCO_2e/year for 2011, that is 60,000 tCO_2e per month on average in 2011, while the project activity actually generates totally 36,977tCO2e emission reductions during the third month of this monitoring period – from 01/01/2011 to 31/01/2011 – with 31 days when the plants are in operation. That is about 36,977 tCO2e per month; which is 38.37% lower than the estimated average value per month in 2011.

The average predicted ERs for 2010 and 2011 is 757,145 tCO2e that is 63,095 tCO_2e per month on average for these two years. Considering that current monitoring period consists of 92 days and that the total ERs of this period is 102,500 tCO2e, that represents an equivalent average of 34,166 tCO2e emission reductions during this monitoring period, or 45.84% lower than the estimated average value per month in this monitoring period.

Therefore, the emission reductions in this monitoring period are not higher than the estimation in the PDD even when bearing in mind the monitoring period does not cover a full calendar year. The difference between the PDD estimate and the gas flow monitored is mainly due for two reasons: a) the landfill´s poor final layer cover, which increases the gas leakage through the landfill´s surface; b) many of the generators are out of operation waiting for maintenance due to missing spare parts for generators, thus a few of them have to be kept out of operation even though gas is available.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**189,286 (value in this monitoring period) 794,288 (value in year 2010) 720,002 (value in year 2011)**	**102,500**

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

Not applicable to this monitoring period.