



South Asia

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Verification and Certification Report

of the Registered CDM Project
“Bandeirantes Landfill Gas to Energy Project (BLFGE)”
UNFCCC reference number: **0164**
Monitoring Period 18¹: 23/12/2010 to 31/08/2012

Report No. 600501114

12 February 2014

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INDIA

¹ It is the 1st monitoring period under the 2nd crediting period.

Date of first issue of this report	20/12/2013
Revision No. of this report	03
PDD (renewal of crediting period)	version 03, dated 01-03-2012
Renewal date	27/07/2012
Methodology (number / version)	ACM0001, version 11
Start date of crediting period	23-12-2010
Published Monitoring Report (version/date)	Version 01 - 04/10/2012
Final Monitoring Report (version/date)	Version 07 - 11/12/2013
Scope	1, 13
Technical Area	1.1, 13.1
Location of the Project	The landfill possesses two access roads (Rua Mogeiro, 1580 and Bandeirantes highway km 25/26) and is located in the district of Perus, São Paulo, Brazil GPS coordinates (location of the powerhouse): -23.419758° Latitude (S23°25'11.13'') and -46.756025° Longitude (W46°45'21.69'') ²
Project Participant (contractor)	Biogás Energía Ambiental S/A
Project Documentation Link	http://cdm.unfccc.int/Projects/DB/DNV-CUK1134130255.56/view

VERIFICATION AND CERTIFICATION CONCLUSION

TÜV SÜD South Asia Pvt. Ltd. has performed the periodic verification of the aforementioned CDM project activity. The verification is based on the currently valid documentation of the United Nations Framework Convention on Climate Change (UNFCCC).

The managements of Biogás Energía Ambiental S/A and ARCADIS Logos is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's monitoring plan and the applied methodology.

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB; except for the following:
 - The quantity of diesel fired in the emergency captive diesel generator is not measured by a mass/volume meter as indicated in the monitoring plan of the PDD but PP applied the maximum hourly diesel consumption of the generator (44 l/h) as per the manufacturer's specifications in this given monitoring period. Since the deviation will be corrected for the next monitoring period, the DOE confirms that it is a temporary deviation as per project standard, Appendix 1, paragraph 3. Hence, no revision of the monitoring plan is necessary. For details see CR 7 and section 2.4.
 - PP has not calculated $PE_{flare,y}$ as per equation (21) of the PDD and has not applied step 6 indicated in section B.6.1. of the PDD for the determination of the hourly flare efficiency.

² Since the Google Earth print-screen in the PDD provides similar coordinates as the ones verified by Google Earth during verification, the DOE concludes that there is a typo in the PDD (instead of 46°45'21.69'', the coordinates are mentioned as W 45°45'21.69''), thus accepted by the DOE.

Since the steps for calculating project emissions from flaring as outlined in the PDD and 'Tool to determine project emissions from flaring gases containing methane' have not been followed, PP decided to conservatively disregard all the ERs from LFG burnt in flares. This is the most conservative assumption taken by the PP, hence accepted by the DOE. For details see CAR 4.

- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately; however the calibrations of gas flow meter FIR500 and electricity meters (Power Logic CM4000) measuring the electricity export were on delay. Regarding the weekly calibrations of the methane gas analyzer two calibrations were carried out with one day delay each. ER values were adjusted respectively in order to follow §238 and §239 of the VVS (for details see CR 3, 4 and 5).
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements;
- the monitoring plan in Monitoring Report is as per the PDD and monitoring plan approved by the EB;
- the monitoring plan is as per the applied methodology;
- there is an audit trail that contains the evidence and records that validate the stated figures.

Based on the information we have seen and evaluated, we confirm that the project activity achieved the verified amount of reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the project activity. The actual ERs reached during this monitoring period are lower than the ERs estimated in the ex-ante calculation of the approved PDD for the respective period mainly due to the landfill's poor final layer cover which increases the gas leakage through the landfill's surface.

Verified emission reductions in this monitoring period: 413,233 t CO₂e

Baseline emissions from methane destruction: 395,976 tCO₂e

Baseline emissions from electricity generation: 17,295 tCO₂e

Project emissions: 38 tCO₂e

Leakage: -- tCO₂e

Pune, 12/02/2014



Shivraj Sharma, Member
Certification Body "Environment and Energy"
TÜV SÜD South Asia

Abbreviations

ACM	Approved Consolidated Methodology
BLFGE	Bandeirantes Landfill Gas to Energy Project (BLFGE)
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CER	Certified Emission Reduction
CETESB	Environmental authority in the State of Sao Paulo (from the Portuguese: Companhia Ambiental do Estado de Sao Paulo)
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO₂e	Carbon dioxide equivalent
CR / CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
KP	Kyoto Protocol
LFG	Landfill Gas
MP	Monitoring Plan
MR	Monitoring Report
NGO	Non-Governmental Organisation
OM	Operational Margin
PCP	Project Cycle Procedure
PDD	Project Design Document
PLC	Programmable Logic Controller
PP	Project Participant
PS	Project Standard
TÜV SÜD	TÜV SÜD South Asia Pvt. Ltd
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation And Verification Standard

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Annex 1: List of Findings

Annex 2: Information Reference List

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1 METHODOLOGY

1.1 Objective

TÜV SÜD has been commissioned by the aforementioned client to perform an independent verification assessment.

The objective of the verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. According to this assessment TÜV SÜD shall:

- ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place,
- ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable CDM requirements,
- ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the applicable requirements.

1.2 Scope

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, previous verification reports (if any), the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity's resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance. Based on the requirements in the VVS, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions. The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

1.3 Verification Process

The information provided by the project participants is assessed by applying the means of verification specified in the VVS and in the absence of specific means of verification specified in the VVS the standard auditing techniques are applied.

Once TÜV SÜD receives the Monitoring Report and a confirmation from any PP to upload, the MR is made publicly available through a dedicated interface on the UNFCCC CDM website. A competent assessment team is selected prior to the start of the verification. The team is selected to cover the technical area(s), sectoral scope(s) and relevant host country experience for evaluating the CDM project activity. Additionally a competent Technical Reviewer or Technical Reviewer Team is appointed to conduct checks on quality and completeness.

The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a draft report and a list of findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the

verification report. This verification report and other supporting documents then undergo an internal quality control by the CB “climate and energy” before submission to the CDM-EB.

1.4 Appointment of the Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a assessment team in accordance with the appointment rules of the TÜV SÜD Certification body “Environment and Energy”.

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Verifier (V);
- Verifier Trainee (T);
- Technical Experts (TE);
- Country expert (CE);
- Technical review (TR).

It is required that the sectoral scope(s) and the technical area(s) (TA) linked to the methodology/ies and project have to be covered by the assessment team. Appointment certificates of the selected team members are attached to this report as Annex.

Assessment Team:

Name	Qualification	Scope	Technical Area	Host country experience	Onsite visit
Karin Wagner ³	ATL	-	-	-	-
Roberto Beducci	TE	☑	☑ (1.1)	-	☑
Johann Thaler	V	☑	☑ (13.1)	☑	☑

Technical Reviewer (s):

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect
Robert Mitterwallner	TR	☑	☑ (13.1, 1.1)	N/A

1.5 Review of Documents

Publication has been initiated before the verification activities started. Based on the published MR the assessment team performed a desk review to:

- verify the completeness of the data and the information presented in the MR,
- check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

³ Karin Wagner replaced Khalid Mahmood as ATL, since Khalid Mahmood left TÜV SÜD during the verification process.

A complete list of all documents reviewed is available in the Information Reference List attached as Annex 2 to this report.

1.6 On-site Assessment and follow-up Interviews

During on-site visit (25/10/2012 to 26/10/2012) TÜV SÜD performed a physical site inspection and interviewed project stakeholders to:

- confirm the implementation and operation of the project,
- review the data flow for generating, aggregating and reporting the monitoring parameters,
- confirm the correct implementation of procedures for operations and data collection,
- cross-check the information provided in the MR documentation with other sources,
- check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.,
- review the calculations and assumptions used to obtain the GHG data and ER,
- identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

A list of all persons interviewed is included in the IRL attached as Annex 2 to this report.

1.7 Resolution of Clarification and Corrective and Forward Action Requests

The objective of this phase of the verification is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD's conclusion on the achieved emission reductions. The CARs and CRs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the verification process, the concerns raised and responses that have been given are documented in detail in the List of Findings that is attached as Annex 1 to this report.

1.8 Internal Quality Control

Internal quality control within the team is assured by means of a technical review process that takes place after the on-site assessment and after closure of findings. The internal quality control in the verification process is given by the final decision (Verification and Certification Conclusion) made by the CB "Environment and Energy".

2 REPORTING REQUIREMENTS

In the following sections, the results of the verification are stated. The verification results relate to the project performance as documented and described in the Monitoring Plan and final Monitoring Report. The verification findings for each verification subject are presented below.

2.1 FARs from Validation / Previous Verification

The following FAR has been presented in the previous verification report:

FAR: The verification team assumes that the validating DOE will check the status of the environmental operational license at the re-validation process (renewal of crediting period). Nevertheless, the verification team leaves FAR 1 open. The new environmental operational licence should be presented when available. The issue will be checked in the next verification again.

DOE conclusion: According to bureaucratic delays by CETESB, the new environmental operational licence has only been issued in June 2013 (IRL 35). The license N° 29005600 clearly states that it is the renewal of the previous operational license N° 29004149, dated 22/12/2008. Even though the license N° 29004149 was valid until 31/05/2009 and the new license N° 29005600 was issued only on 19/06/2013, the solicitation for renewal of the environmental license on 28/04/2009 (IRL 36), i.e. prior to the expiration of license N° 29004149, several email communications (IRL 37, 38) between CETESB and the PP and a printout from CETESB website submitted to the verification team during on-site visit (IRL 39) demonstrate the efforts undertaken by the PP for renewal of the environmental license and that Bandeirantes landfill site was authorized to continue its usual operation even before the license N° 29005600 had been issued.

No manifestation, non conformity, fine or warning in this regard could be identified between the time of expiration of the license N° 29004149 and the issuance of the license N° 29005600.

Thus, the DOE concludes that the landfill site operated and operates in line with the environmental legislation before, during and after the monitoring period. Hence the FAR was closed.

2.2 Project Implementation in accordance with the Project Design Document

The project is fully implemented according to the description presented in the approved PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the PDD, except that no mass/volume meter is installed for monitoring the diesel consumption of the emergency diesel generator (for more details see section 2.4). The project activity is completely operational and the same has been confirmed during the on-site visit.

For this monitoring period, emission reductions are about 28% lower than estimated in the PDD⁴. The difference between the PDD estimate and the gas-flow monitored is mainly due to the landfill's poor final layer cover, which increases the gas leakage through the landfill's surface. Some further unexpected events stated in B.1. of the monitoring report also contributed to this difference in emission reductions between the estimated and actual values.

No permanent changes occurred after the project activity has been implemented in accordance with the description in the PDD and issuance of CERs has taken place.

⁴ The PDD value of 2012 of 307,960 tCO₂e was extrapolated to 244 days resulting in a total estimated value of 205,307 tCO₂e.

This value of 205,307 tCO₂e was summed up with the 2010 value of 9,534 tCO₂e and the 2011 value of 361,517 tCO₂e and the total value of 576,358 tCO₂e was compared with the actual emission reductions of 413,233 tCO₂e, resulting in about 28% lower actual emission reductions than estimated.

The project complies with the approved version of the PDD. The equipment configuration (flares, generators, blowers, diesel generator) has been the following during the monitoring period:

2 Flares (IRL 29,32)	Manufacturer	Hofstetter
	Manufacturing number	9351
	Commissioning date	01/01/2004
	Model	Hofgas Efficiency 2500
	Year of manufacturing	2003
	Minimum gas flow	500 Nm ³ /h
	Maximum gas flow	2,500 Nm ³ /h
	Lowest operational temperature	900°C
	Highest operational temperature	1350°C

24 generators (IRL 30,31)	Manufacturer	Caterpillar
	Model	G3516A ⁵
	Year of manufacturing	2003 and 2004 (CSZ00764)
	Serial numbers	CSZ00652, CSZ00653, CSZ00672, CSZ00644, CSZ00666, CSZ00668, CSZ00658, CSZ00664, CSZ00659, CSZ00651, CSZ00662, CSZ00657, CSZ00645, CSZ00646, CSZ00642, CSZ00643, CSZ00647, CSZ00654, CSZ00663, CSZ00671, CSZ00667, CSZ00648, CSZ00649, CSZ00764;
	Commissioning date	16/02/2004
	Installed capacity	925 kW (each), total installed capacity 22.2 MW

4 blowers (IRL 29,33)	Manufacturer	Aerzen
	Model	GM 130 L / DN 300
	Year of manufacturing	2003
	Serial numbers	820227, 820228, 820229, 820230
	Commissioning date	01/01/2004
	Capacity	4250 Nm ³

1 captive diesel generator (IRL 51)	Manufacturer	Cummins Brasil Ltda.
	Model	125DGEB-1297
	Serial number	E01T242850
	Commissioning date	21/12/2010
	Capacity	125 kW

⁵ This is the same model as indicated in the PDD; G stands for generator; 35 is the generator size; 16 is the number of cylinders and A specifies that the generator is driven by biogas.

	Power factor	0.8
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1 mini-blower (IRL 29,34)	Manufacturer	Hofstetter
	Model	2003
	Year of manufacturing	2002
	Serial number	02510090
	Commissioning date	01/01/2004
	Capacity	2500 Nm ³

According to bureaucratic delays by CETESB, the new environmental operational licence has only been issued in June 2013 (IRL 35). The license N° 29005600 clearly states that it is the renewal of the previous operational license N° 29004149, dated 22/12/2008. Even though the license N° 29004149 was valid until 31/05/2009 and the new license N° 29005600 was issued only on 19/06/2013, the solicitation for renewal of the environmental license on 28/04/2009 (IRL 36), i.e. prior to the expiration of license N° 29004149, several email communications (IRL 37, 38) between CETESB and the PP and a printout from CETESB website submitted to the verification team during on-site visit (IRL 39) demonstrate the efforts undertaken by the PP for renewal of the environmental license and that Bandeirantes landfill site was authorized to continue its usual operation even before the license N° 29005600 had been issued. No manifestation, non conformity, fine or warning in this regard could be identified between the time of expiration of the license N° 29004149 and the issuance of the license N° 29005600. Thus, the DOE concludes that the landfill site operated and operates in line with the environmental legislation before, during and after the monitoring period.

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. On the other hand, duties related to data management are determined in documented procedures, organizational flow-chart and environmental management system manual.

Operational procedures (IRL 6-11,41,42) have been presented in previous verifications as well as in this verification. These procedures include all CDM related essential information.

2.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The monitoring plan is in accordance with the approved methodology applied by this CDM project activity.

This verification is based on the monitoring plan approved by UNFCCC on 27/07/2012. All parameters were determined as prescribed. All documents have been presented during the verification process. Changes in the Monitoring Report, which were requested by the verification team, have been incorporated.

2.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the approved monitoring plan. All parameters except the parameters $FC_{ECDG,D,y}$ and $PE_{Flares,y}$ (see more detailed explanations in the following) were monitored and determined as per the Monitoring Plan.

-The quantity of diesel fired in the emergency captive diesel generator ($FC_{ECDG,D,y}$) is not measured by a mass/volume meter as indicated in the monitoring plan of the PDD but PP applied the maximum hourly diesel consumption of the generator (44 l/h) at full load as per the manufacturer's specifications (IRL 57) in this given monitoring period. The hours of operation of the diesel generator have been monitored through PLC records of electricity generated in the diesel engine (IRL 49). As soon as the PLC registers electricity generated by the diesel generator and even for a few minutes in a certain hour, the PP considers the diesel generator operating for the full hour at maximum capacity of 0.125 MW. The maximum consumption of the generator (44l/h) is then multiplied with the hours of a day in which the diesel generator was activated (even only for a few minutes) to determine the daily diesel consumption. The DOE confirms that the applied approach is conservative and in line with paragraph 3 of Appendix 1 of the project standard since PP consider the maximum hourly consumption of the diesel generator and the diesel generator operating at maximum capacity.

Since the deviation will be corrected for the next monitoring period, the DOE further confirms that it is a temporary deviation as per project standard, Appendix 1, paragraph 3. Hence, no revision of the monitoring plan is necessary. For further details see CR 7.

-PP has not calculated $PE_{flare,y}$ as per equation (21) of the PDD and has not applied step 6 indicated in section B.6.1. of the PDD for the determination of the hourly flare efficiency. Since the steps for calculating project emissions from flaring as outlined in the PDD and 'Tool to determine project emissions from flaring gases containing methane' have not been followed, PP decided to conservatively disregard all the ERs from LFG burnt in flares. This is the most conservative assumption taken by the PP, hence accepted by the DOE. For details see CAR 4.

The verification of the parameters required by the monitoring plan is provided as follows:

Data / Parameter:	LFG _{Total,y}
Data unit:	⁶ Nm ³
Description:	Total amount of landfill gas captured at Normal Temperature and Pressure; Gas flow (FIR 100 and FIR 700) is measured by thermal mass flow meters which do not require separate temperature and pressure measurements.
Source of data used:	PLC data The thermal mass flow meters send continuously signals to the PLC; every 5 minutes instantaneous gas flow data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered. The instruments used (thermal mass flow meters) have been calibrated according to the requirements of the monitoring plan. Calibration certificates (IRL15,16,22) have been presented to the verification team and were verified by the team. Endress+Hauser and FCI, responsible for the calibrations, are qualified for the calibration activities, hence the information can be considered verifiable (IRL 16,64,71).
Means of verification/Comments:	Total gas flow data (FIR 100 and FIR 700) in the CER excel calculation tool have been verified by PLC data during the on-site visit. Besides, the audit team checked the data for plausibility. It was also checked whether there are big outliers. Hereby data columns were filtered in the CER excel calculation tool. Filtering allows a quick overview whether the data are in a plausible

⁶ The methodology does not explicitly mention Nm³, however indicates the parameters temperature and pressure of the landfill gas as to be monitored in order to convert m³ into Nm³. The methodology further states that no separate monitoring of temperature and pressure is necessary, when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.

The MR states Nm³ already considering the fact that the flow meter is connected to a pressure and temperature transmitter, which allows the device to use those variables to make the conversion automatically to Nm³. Thus a separate monitoring from pressure and temperature is not necessary. The monitoring plan in "any comment" states that automatic readings of temperature and pressure will be made by sensors connected to the flow-meter – these data will be used to convert the gas-flow to Nm³, thus no separate monitoring of pressure and temperature will be necessary; hence it can be concluded that the information in the MR is consistent with that in the monitoring plan.

	<p>range. Concluding, all data are plausible. No errors have been identified for the total gas flow data. Verified data are complete.</p> <p>The information flow (data recording, transfer, calculation, reporting and archiving) has been verified by the documented procedures SGA IT 4.4.6-22 (IRL 10) and SGA IT 4.4.6-23 (IRL 9) and on-site interviews with BIOGAS. A procedure for regular maintenance exists and has been verified by the DOE (IRL 11).</p>
Cross-check	<p>The instantaneous value of the meter displays (FIR 100 and FIR 700) has been checked with the value of the PLC supervisory system during on-site visit and has been consistent.</p> <p>At the time when instantaneous values were checked during on-site visit all gas was sent to the generators, thus no gas was being flared. Consequently, the instantaneous value of FIR 700 was zero.</p>

Data / Parameter:	LFG_{Flare,y} / FV_{RG,h}
Data unit:	Nm ³
Description:	<p>Total amount of landfill gas flared at normal temperature and pressure; Gas flow (FIR 700) is measured by a thermal mass flow meter which does not require separate temperature and pressure measurements. Gas flow (FIR 200) is measured by a turbine flow-meter, which has internal temperature and pressure transmitters making the automatic conversion of the gas flow to Nm³. Hence, no separate temperature/pressure measurements are necessary.</p>
Source of data used:	<p>PLC data</p> <p>The gas flow meters send continuously signals to the PLC; every 5 minutes instantaneous gas flow data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered.</p> <p>The instruments used (gas flow meters) have been calibrated according to the requirements of the monitoring plan.</p> <p>Calibration certificates (IRL17,18,19,22) have been presented to the verification team and were verified by the team. IPT, ABSI, SALCAS Ltda. Laboratory and FCI responsible for the calibrations, are qualified for the calibration activities, hence the information can be considered verifiable (IRL 17,19,22,64,72).</p>
Means of verification/Comments:	<p>Gas flow data to flares (FIR 200 and FIR 700) in the CER excel calculation tool have been verified by PLC data⁸.</p> <p>Besides, the audit team checked the data for plausibility. It was also checked whether there are big outliers. Hereby data columns were filtered in the CER excel calculation tool. Filtering allows a quick overview whether the data are in a plausible range. Concluding, all data are plausible. No errors have been identified for the 'gas flow to flares' data. Verified data are complete.</p> <p>The information flow (data recording, transfer, calculation, reporting and archiving) has been verified by the documented procedures SGA IT 4.4.6-22 (IRL 10) and SGA IT 4.4.6-23 (IRL 9) and on-site interviews with BIOGAS. A procedure for regular maintenance exists and has been verified by the DOE (IRL 11).</p> <p>Since the residual gas temperature does not exceed 60°C during the monitoring period as verified by the DOE through PLC data records (IRL 49), the requirement that flow rate and methane content measurements have to be carried out with the same basis (dry or wet) is not applicable.</p>
Cross-check	Gas flow data to flares (FIR 200) has been cross checked with FIR 100 (total

⁷ Ibid.

⁸ Even though data verification of FIR 200 and FIR 700 (gas flow sent to flares) is actually not relevant since PP decided during the on-site visit not to claim ERs for the methane destroyed in the flares, the DOE decided to verify the FIR 200 and FIR 700 data in the CER excel calculation tool with PLC data. The main reason for the check of FIR 200 data is in order to be able to do the cross-check with the sum of FIR 100, FIR 300, FIR 400, FIR 500 and FIR 600 data.

	gas flow) minus the sum of FIR 300, FIR 400, FIR 500 and FIR 600. At the time when instantaneous values were checked during on-site visit all gas was sent to the generators, thus no gas was being flared. Consequently, the instantaneous value of FIR 200 and FIR 700 were zero.
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Data / Parameter:	LFG⁹Electricity.v
Data unit:	⁹ Nm ³
Description:	Amount of landfill gas combusted in power plant at Normal Temperature and Pressure; Gas flow (FIR 300, FIR 400, FIR 500, FIR 600), temperature and pressure are measured by turbine gas flow meters, temperature and pressure transmitters respectively. The PLC receives the signal of those three measurements and automatically makes the conversion to Nm ³ .
Source of data used:	PLC data The turbine gas flow meters send continuously signals to the PLC; every 5 minutes instantaneous gas flow data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered. The instruments used (gas flow meters (FIR 300, FIR 400, FIR 500, FIR 600), temperature and pressure transmitters) have been calibrated according to the requirements of the monitoring plan, however the calibration of gas flow meter FIR 500 was a few days on delay (for details see section 2.5). Calibration certificates (IRL 18,19,20) have been presented to the verification team and were verified by the team. The companies ABSI, SALCAS Ltda. Laboratory, Incontrol, responsible for the calibrations, are qualified for the calibration activities, hence the information can be considered verifiable (IRL 19,72,73).
Means of verification/Comments:	Gas flow data to the generators (FIR 300, FIR 400, FIR 500, FIR 600) in the CER excel calculation tool have been verified by PLC data during the on-site visit. Besides, the audit team checked the data for plausibility. It was also checked whether there are big outliers. Hereby data columns were filtered in the CER excel calculation tool. Filtering allows a quick overview whether the data are in a plausible range. Concluding, all data are plausible. No errors have been identified for the 'gas flow to generators' data. Verified data are complete. The information flow (data recording, transfer, calculation, reporting and archiving) has been verified by the documented procedures SGA IT 4.4.6-22 (IRL 10) and SGA IT 4.4.6-23 (IRL 9) and on-site interviews with BIOGAS. A procedure for regular maintenance exists and has been verified by the DOE (IRL 11).
Cross-check	Gas flow data to generators (sum of FIR 300, FIR 400, FIR 500 and FIR 600) has been cross checked with FIR 100 (total gas flow) minus FIR 200 (gas flow to the flares). Besides, gas flow data to the generators (sum of FIR 300, FIR 400, FIR 500 and FIR 600) has been cross-checked with the electricity generated. Instantaneous values of the meters display have been checked with the values of the PLC supervisory system during the on-site visit and have been consistent.

⁹ The methodology does not explicitly mention Nm³, however indicates the parameters temperature and pressure of the landfill gas as to be monitored in order to convert m³ into Nm³. The methodology further states that no separate monitoring of temperature and pressure is necessary, when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.

The MR states Nm³ already considering the fact that the flow meter is connected to a pressure and temperature transmitter, which allows the device to use those variables to make the conversion automatically to Nm³. Thus a separate monitoring from pressure and temperature is not necessary. The monitoring plan in "any comment" states that automatic readings of temperature and pressure will be made by sensors connected to the flow-meter – these data will be used to convert the gas-flow to Nm³, thus no separate monitoring of pressure and temperature will be necessary; hence it can be concluded that the information in the MR is consistent with that in the monitoring plan.

Data / Parameter:	$w_{CH_4} / fv_{i,h}$
Data unit:	m^3CH_4/m^3LFG (expressed in %)
Description:	Methane fraction in the landfill gas
Source of data used:	<p>PLC data</p> <p>The gas analyser sends continuously signals to the PLC; every 5 minutes data are registered in a data base (SQL-Server). Besides, every hour the instantaneous methane concentration data are registered.</p> <p>The methane gas analyzer has been weekly calibrated using a standard certified gas according to the requirements of the monitoring plan, however in 2 calibrations with one day delay each (for details see CR 4).</p> <p>Weekly calibration certificates (IRL 13) of the gas analyser have been presented to the verification team (however see CR 4) and were verified by the team. Certificates, that gas used for weekly calibrations of the gas analyser is according to Brazilian standards and norms (NBR ISO 17025 requirements), has been submitted to the verification team (IRL 14).</p>
Means of verification/Comments:	<p>Methane fraction data in the CER excel calculation tool were verified by PLC data during the on-site visit. Besides, the audit team checked the data for plausibility. It was also checked whether there are big outliers. Hereby data columns were filtered in the CER excel calculation tool. Filtering allows a quick overview whether the data are in a plausible range. No errors have been identified except on 2 days. However, on these 2 days the methane content values in the CER excel calculation tool were lower (thus more conservative) than the PLC data, hence no change was necessary. Verified data are complete.</p> <p>The information flow (data recording, transfer, calculation, reporting and archiving) has been verified by the documented procedures SGA IT 4.4.6-22 (IRL 10) and SGA IT 4.4.6-23 (IRL 9) and on-site interviews with BIOGAS. A procedure for regular maintenance exists and has been verified by the DOE (IRL 41).</p> <p>Since the residual gas temperature does not exceed 60°C during the monitoring period as verified by the DOE through PLC data records (IRL 49), the requirement that flow rate and methane content measurements have to be carried out with the same basis (dry or wet) is not applicable.</p>
Cross-check	Instantaneous value of the gas analyzer display has been checked with the value of the PLC supervisory system during the on-site visit and was found to be consistent.

Data / Parameter:	T_{flare}
Data unit:	°C
Description:	Temperature in the exhaust gas of the flare
Source of data used:	<p>PLC data</p> <p>The thermocouples send continuously signals to the PLC; every 5 minutes data are registered in a data base (SQL-Server). Besides, every hour the instantaneous exhaust gas temperature data are registered.</p> <p>The calibration of the thermocouples does not cover the whole monitoring period however the same has no impact for this monitoring period since no ERs are claimed for gas being sent to flares.</p>
Means of verification/Comments:	Data verification is not relevant since PP decided during the on-site visit not to claim ERs for methane destructed in the flares.
Cross-check	Not available

Data / Parameter:	$EL_{LFG,y}$
Data unit:	MWh
Description:	Net amount of electricity generated using LFG

Source of data used:	<p>PLC data, AES Eletropaulo daily electricity export data, AES Eletropaulo invoices;</p> <p>The instruments used (electricity meters) have been calibrated according to the requirements of the monitoring plan, however the 2nd calibration affecting the monitoring period was carried out with delay (for details see CR 5). Calibration certificates (IRL 23,24) from the SJ landfill electricity meters have been presented to the verification team and were verified by the team. The companies LACTEC and CAM Brasil Multiservicos Ltda responsible for the calibrations, are qualified for the calibration activities, hence the information can be considered verifiable (IRL 23,74).</p>
Means of verification/Comments:	<p>Net electricity export data (net amount of electricity)¹⁰ in the CER excel calculation tool have been verified by the SOTREQ PLC data during the on-site visit. No inconsistencies have been found except some insignificant differences in the 2nd decimals for the days 26/12/2010 and 29/12/2010 which however have no impact on the quantity of CERs. SOTREQ PLC data were not available for the days 23/12/2010 and 24/12/2010 and only partly available for the day 25/12/2010. PP decided to disregard the electricity export on the days 23/12/2010, 24/12/2010 and 25/12/2010 in the ER calculation which is the most conservative assumption, hence accepted by the DOE (for more details see CR 6).</p> <p>Electricity export data from AES Eletropaulo (stated in the CER excel calculation tool in column Q in the worksheet "DATA_EN") have been verified by AES Eletropaulo invoices (IRL 27) and daily AES electricity export data (IRL 28) for the month of December 2010 since December 2010 does not fully make part of the monitoring period (monitoring period starts on December 23, 2010) and thus the monthly value from the AES Eletropaulo invoice could not be used. No inconsistencies have been found except a slight inconsistency for the month of December 2010, in which the data in the CER excel calculation tool were not based on daily AES Eletropaulo data. The DOE confirms that this slight inconsistency was subsequently corrected by the PP.</p> <p>SOTREQ PLC data (IRL 48) has been compared with the monthly accumulated electricity export data in AES Eletropaulo invoices (IRL 27) (AES Eletropaulo is the electricity distributor) and the lower of both values has been conservatively used for the ER calculation. This is in accordance with the monitoring plan which mentions that "for sake of conservativeness, both records will be compared in a monthly basis and the lowest one will be applied to calculate ERs". For the month of December 2010 SOTREQ PLC data (IRL 48) has been compared with daily AES electricity export data (IRL 28), since December 2010 does not fully make part of the monitoring period (monitoring period starts on December 23, 2010) and thus the monthly value from the AES Eletropaulo invoice could not be used.</p> <p>Besides, the audit team checked the data for plausibility. It was also checked whether there are big outliers. Hereby data columns were filtered in the CER excel calculation tool. Filtering allows a quick overview whether the data are in a plausible range.</p> <p>The information flow (data recording, transfer, calculation, reporting and archiving) has been verified by the documented procedure SGA IT 4.4.6-22 (IRL 10) and on-site interviews with BIOGAS and SOTREQ.</p> <p>Electricity meters are subject to regular maintenance following ONS procedure (IRL 67). The meter supplier's (Merlin Gerin) specifications (IRL 59) mention that regular maintenance for the electricity meters (Power Logic CM4000) is not necessary.</p>
Cross-check	<p>Instantaneous value of the meter display has been checked with the value of the SOTREQ PLC supervisory system during the on-site visit and has been</p>

¹⁰ Net electricity export refers to the electricity exported after deducting electricity for auxiliary consumption.

	<p>consistent.</p> <p>AES Eletropaulo invoices (IRL 27) and daily AES electricity export data (IRL 28) (for December 2010 since monitoring period started on December 23, 2010 and thus the monthly value from the AES Eletropaulo invoice for December 2010 could not be used) have been used for cross-checking SOTREQ PLC electricity export data. The lower measurements made by BLFGE via SOTREQ were applied for the whole monitoring period in the emission reductions calculation as required by the monitoring plan.</p>
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Data / Parameter:	FC_{ECDG,D,y}
Data unit:	litres
Description:	Quantity of diesel fired in the emergency captive diesel generator in year y
Source of data used:	PLC data and maximum diesel consumption according to manufacturer's manual (44 l/h)
Means of verification/Comments:	<p>The 'quantity of diesel fired in the diesel generator' data indicated in the CER excel calculation tool were verified by PLC data (IRL 49) and manufacturer's manual stating the maximum diesel consumption and capacity (IRL 57). The quantity of diesel fired in the emergency captive diesel generator (FC_{ECDG,D,y}) is not measured by a mass/volume meter as indicated in the monitoring plan of the PDD but PP applied the maximum hourly diesel consumption of the generator (44 l/h) at full load as per the manufacturer's specifications (IRL 57) in this given monitoring period. The hours of operation of the diesel generator have been monitored through PLC records of electricity generated in the diesel engine (IRL 49). As soon as the PLC registers electricity generated by the diesel generator and even for a few minutes in a certain hour, the PP considers the diesel generator operating for the full hour at maximum capacity of 0.125 MW. The maximum consumption of the generator (44l/h) is then multiplied with the hours of a day in which the diesel generator was activated (even only for a few minutes) to determine the daily diesel consumption. The DOE confirms that the applied approach is conservative and in line with paragraph 3 of Appendix 1 of the project standard since PP considers the maximum hourly consumption of the diesel generator and the diesel generator operating at maximum capacity. Since the deviation will be corrected for the next monitoring period, the DOE further confirms that it is a temporary deviation as per project standard, Appendix 1, paragraph 3. Hence, no revision of the monitoring plan is necessary.</p> <p>The DOE by assessing the PLC data and the manufacturer's specifications of the diesel generator confirms that the quantity of diesel fired in the emergency diesel generator indicated in the final CER excel calculation tool is correctly and conservatively calculated. No inconsistencies between CER excel calculation tool and PLC data have been identified.</p>
Cross-check	Diesel generator was at maintenance at the time of the on-site visit and thus not at operation. Hence, no instantaneous data check was possible.

Data / Parameter:	Operation of the energy plant
Data unit:	Hours
Description:	Operation of the energy plant
Source of data used:	SOTREQ's (Biogeracao's) supervisory system (PLC data)
Means of verification/Comments:	<p>'Operation of the energy plant' data indicated in the final CER excel calculation tool were verified by SOTREQ PLC data (IRL 48). No inconsistencies between CER excel calculation tool and PLC data have been identified.</p> <p>SOTREQ confirmed in two Emails (IRL 61) that the run time meters are installed at each engine, thus are no separate equipments. Hence no</p>

	technical specifications for these run time meters are available. Besides, it was confirmed by SOTREQ that no calibration for these run time meters is necessary and possible. This can be confirmed by the DOE's sectoral expertise. The Emails provided as well information about the operation and data logging of these run time meters which is deemed to be appropriate by the DOE.
Cross-check	Instantaneous value of the meter display has been checked with the value of the SOTREQ PLC supervisory system during the on-site visit.

Data / Parameter:	CEF_{eley,BL,y} / EF
Data unit:	tCO ₂ e/MWh
Description:	Carbon emission factor of electricity
Source of data used:	Calculated using EF _{OM} and EF _{BM} from CIMGC ¹¹
Means of verification/Comments:	The combined carbon emission factor of electricity has been calculated by the following formula: $CEF_{eley,BL,y} = EF_{OM} \times 0.25 + EF_{BM} \times 0.75$ The DOE re-calculated the CEF _{eley,BL,y} for 2010, 2011 and 2012 and concludes that the CEF _{eley,BL,y} for each of the years indicated in the final CER excel calculation tool are correctly calculated.
Cross-check	Not available

Data / Parameter:	EF_{OM}
Data unit:	tCO ₂ e/MWh
Description:	Emission factor of the operating margin
Source of data used:	CIMGC
Means of verification/Comments:	The EF _{OM} for 2010, 2011 and 2012 indicated in the final CER excel calculation tool was verified through the website http://www.mct.gov.br/index.php/content/view/74689.html of the 'Comissão Interministerial de Mudanca Global do Clima' (Brazilian DNA) and were found to be consistent with the final CER excel calculation tool.
Cross-check	Not available

Data / Parameter:	EF_{BM}
Data unit:	tCO ₂ e/MWh
Description:	Emission factor of the build margin
Source of data used:	CIMGC
Means of verification/Comments:	The EF _{BM} for 2010, 2011 and 2012 indicated in the final CER excel calculation tool was verified through the website http://www.mct.gov.br/index.php/content/view/74689.html of the 'Comissão Interministerial de Mudanca Global do Clima' (Brazilian DNA) and were found to be consistent with the final CER excel calculation tool.
Cross-check	Not available

Data / Parameter:	Other flare operation parameters
Data unit:	N/A
Description:	Data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer's specifications
Source of data used:	PLC data and manufacturer's specifications regarding flare combustion temperature
Means of verification/Comments:	Since PP decided during on-site visit not to claim ERs from flaring, no further verification regarding this data is necessary.
Cross-check	Not applicable

¹¹ Comissão Interministerial de Mudanca Global do Clima (Brazilian DNA), <http://www.mct.gov.br/index.php/content/view/74689.html>

Data / Parameter:	NCV_{D,t}
Data unit:	GJ/l
Description:	Average net calorific value of the diesel used in the period t
Source of data used:	Brazilian Energy Balance 2013
Means of verification/Comments:	The DOE by assessing the Brazilian Energy Balance 2013 (IRL 68) and the conversion calculation confirms that the applied value of 0.05034 GJ/l has been correctly determined and is more conservative than the IPCC 2006 guidelines value (0.043 GJ/l) (IRL 78). This is in line with the monitoring plan which mentions that regional/national default values should be used prior to IPCC 2006 values.
Cross-check	The value determined from the Brazilian Energy Balance 2013 is similar to the IPCC 2006 default value thus in a plausible range.

Data / Parameter:	EF_{CO₂e}
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor of the diesel used in the period t
Source of data used:	IPCC 2006 guidelines
Means of verification/Comments:	The DOE by assessing the IPCC guidelines (IRL 78) confirms that the applied value of 0.0741 is in line with the IPCC 2006 guidelines. The IPCC value is more conservative than the value from the Energy Balance of the State of Sao Paulo 2013 (0.0704 tCO ₂ /GJ) (IRL 69), hence has been used by the PP in the PE calculation.
Cross-check	The value from the IPCC 2006 guidelines is very similar to the value of the Energy Balance of the State of Sao Paulo 2013. Since the IPCC 2006 guidelines is slightly more conservative than the value from the Energy Balance of the State of Sao Paulo 2013, the choice of using the IPCC 2006 guidelines value is appropriate.

Data / Parameter:	PE_{ec,y}
Data unit:	tCO ₂ e
Description:	Project emissions from electricity consumption by the project activity during the year y
Source of data used:	Calculated value
Means of verification/Comments:	The calculation of project emissions from electricity consumption by the emergency diesel generator has been verified by the DOE through the CER excel calculation spreadsheet (IRL 76). The DOE confirms that the calculation in the final CER excel calculation spreadsheet has been correctly carried out and the input parameters (FC _{ECDG,D,y} , EF _{CO₂e} , NCV _{D,t}) for the calculation have been chosen and calculated in a conservative manner.
Cross-check	Not applicable

Data / Parameter:	PE_{fc,y}
Data unit:	tCO ₂ e
Description:	Project emissions from fossil fuel combustion during the year y
Source of data used:	Calculated value
Means of verification/Comments:	It has been verified during the on-site visit that there is no on-site fossil fuel consumption due to the project activity other than for electricity generation. Thus, this source of PE is zero and in line with section B.3. of the PDD.
Cross-check	Not applicable

Data / Parameter:	PE_{Flares,y}
Data unit:	tCO ₂ e
Description:	Project emissions from flaring of the residual gas stream in year y
Source of data used:	Calculated

Means of verification/Comments:	Since PP decided during on-site visit not to claim ERs from flaring, no further verification regarding this data is necessary.
Cross-check	Not applicable

2.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

All the metering instruments are adequately calibrated however some of the calibrations were on delay. The gas flow meter FIR500 was calibrated on 14/12/2011 even though calibration would have been due on 11/12/2011. The electricity meters (Power Logic CM4000) were both calibrated on 16/04/2012 even though calibration would have been due on 29/10/2011. The calibrations of the thermocouples occurred on 24/08/2011 and 19/09/2011 and no calibration certificates after these dates have been presented to the DOE. The delayed calibration of the thermocouples had no impact on the ER calculation, since PP decided to disregard all ERs from gas being sent to the flare.

Weekly calibration records for the monitoring period for the gas analyzer have been presented to the verification team during the document review and on-site visit however 2 calibrations were carried out with one day delay each (for details see CR 4).

Since for all meters and the gas analyzer the maximum permissible error has been conservatively considered in the ER calculation and deducted from the ERs in order to comply with section B.7.2. of the monitoring plan and independently whether the calibration of the instruments was on delay or not, the DOE confirms that §238 and §239 of the VVS are correctly followed. In cases where the calibration result revealed a higher error than the maximum permissible error, the calibration error was conservatively considered in the ER calculation. The DOE checked the maximum permissible errors of the instruments through manufacturer's specifications (IRL 54,55,56,59,60,65,66) and the errors resulting from the calibrations through the submitted calibration certificates (IRL 15-25) and confirms that the higher of both errors has been conservatively applied for each meter and the gas analyzer in the ER calculation.

The reported data have been cross-checked against other sources available as explained above in chapter 2.4. On almost all of the days during the monitoring period, the total gas flow measured by FIR 100 is bigger than the sum of gas flow data to flare F100 (measured by FIR 200) and gas flow data to generators (measured by FIR 300, FIR 400, FIR 500 and FIR 600), and since it is the gas flow to generators¹² which enter into the ER calculation, conservativeness is assured. On some of the days, the total gas flow measured by FIR 100 is slightly smaller than the sum of gas flow data measured by FIR 200, FIR 300, FIR 400, FIR 500 and FIR 600. However, the difference is not considered to be significant since it is smaller than the root of the squares of the instruments' errors. However, on one of the days during the monitoring period, namely on 01/05/2011, the total gas flow measured by FIR 100 is significantly smaller than the sum of gas flow data measured by FIR 200, FIR 300, FIR 400, FIR 500 and FIR 600. In order to be conservative, PP decided to use the more conservative FIR 100 value in the ER calculation. Since there was no flaring on 01/05/2011, the DOE confirms through the check of PLC records (IRL 49) that the FIR 100 value is smaller than the sum of FIR 300, FIR 400, FIR 500 and FIR 600 and thus conservatism is ensured by using the FIR 100 value (instead of the sum of FIR 300, FIR 400, FIR 500, FIR 600) for the day 01/05/2011 in the ER calculation.

The following table illustrates the instruments used during the monitoring period:

¹² For the given monitoring period, PP has not claimed ERs for LFG which has been sent to the flares.

Measuring Instrument	Manufacturer/ Model	Serial Number	Location	Calibration dates applicable for this monitoring period.	Calibration frequency	IRL
Thermal mass flow meter (FIR 100 – total gas flow)	t-mass 65 Endress+Haus er ST51 FCI	9407D902000 (in operation from 23/12/2010 to 15/08/2011) 341992 (since 16/08/2011)	Main gas line	25/04/2007 29/04/2011	Every 5 years	15,16,47, 54,55
Thermal mass flow meter (FIR 700 – gas flow to flare F200)	ST51 FCI	328849	Gas line to flare F200	08/09/2010	Every 5 years	22,55
Turbine flow meter (FIR 200 – gas flow to flare F100)	VTGEX-200 Incontrol	VG15239	Gas line to flare F100	01/07/2009	Every 5 years	17,56
Temperature transmitter (FIR 200)	PT-100 ASTA	S377815	Gas line to flare F100	26/03/2009	Every 5 years	19
Pressure transmitter (FIR 200)	LD 291 SMAR	L 454793 / L42236	Gas line to flare F100	27/03/2009	Every 5 years	18
Turbine flow meter (FIR 300 – gas flow to powerhouse)	VTGEX200 Incontrol	VG083B6	Gas line to powerhouse	12/12/2006 03/11/2011	Every 5 years	20,56
Temperature transmitter (FIR 300)	PT-100 ASTA	S502986	Gas line to powerhouse	26/03/2009	Every 5 years	19
Pressure transmitter (FIR 300)	LD291 SMAR	33007-06	Gas line to powerhouse	06/05/2009	Every 5 years	18
Turbine flow meter (FIR 400 – gas flow to powerhouse)	VTGEX200 Incontrol	VG084B6	Gas line to powerhouse	12/12/2006 10/03/2011	Every 5 years	20,56
Temperature transmitter (FIR 400)	PT-100 ASTA	S502987	Gas line to powerhouse	26/03/2009	Every 5 years	19
Pressure transmitter (FIR 400)	Yokogawa, EJA-510A	L454794 / L 42237	Gas line to powerhouse	27/03/2009	Every 5 years	18
Turbine flow meter (FIR 500 – gas flow to powerhouse)	VTGEX200 Incontrol	VG086B6	Gas line to powerhouse	12/12/2006 14/12/2011	Every 5 years	20,56
Temperature transmitter (FIR 500)	PT-100 ASTA	S502988	Gas line to powerhouse	26/03/2009	Every 5 years	19
Pressure transmitter (FIR 500)	LD291 SMAR	33006-06	Gas line to powerhouse	23/06/2009	Every 5 years	18
Turbine flow meter (FIR 600 – gas flow to powerhouse)	Incontrol VTGEX200	VG085B6	Gas line to powerhouse	12/12/2006 14/09/2011	Every 5 years	20,56
Temperature transmitter (FIR 600)	PT-100 ASTA	S502989	Gas line to powerhouse	26/03/2009	Every 5 years	19
Pressure transmitter (FIR 600)	LD291 SMAR	33005-06	Gas line to powerhouse	17/04/2009	Every 5 years	18
Thermocouples (F100 and F200)	Type "S" L750 Jumo	32950/030 (F100) 32411/030 (F200)	Flare F100 and Flare F200	24/08/2011 (F-100) 19/09/2011 (F-200)	Every year	25,58
Methane (gas) analyzer	Binos-100 M Rosemount NUK	99965398	Analysis room	Weekly calibrations, last calibration in the monitoring period on 30/08/2012	Every week	13,60

Measuring Instrument	Manufacturer/ Model	Serial Number	Location	Calibration dates applicable for this monitoring period.	Calibration frequency	IRL
Electricity meters (grid export)	Power Logic CM4000 Merlin Gerin	0011001414 and 0011001426	Substation	Both meters on 30/10/2009 and 16/04/2012	Every 2 years	23,24,59

The verifier confirms that the methods and formulae used to obtain the baseline emissions, project emissions and emission reductions are appropriate. The same has been done in accordance with the methods and formulae described in the monitoring plan and applicable methodology.

The verifier confirms that the monitoring report includes all parameters and the monitored data at the intervals required by the methodology and PDD.

The verifier confirms that all the assumptions, emission factors and default values (ex-ante values from PDD) have been correctly justified. All the emission factors and default values are explicitly mentioned in the monitoring report. There are no regulatory requirements relating to landfill gas projects in the Host Country Brazil as confirmed through the legislation registry which is periodically updated by the 3rd party Green Solution (IRL 77) and the local/sectoral expertise of the assessment team.

Annex 1

List of Findings

List of Findings - Compilation and Resolutions

Project Title: Bandeirantes Landfill Gas to Energy Project (BLFGE) –

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Definitions contained in the Glossary of CDM terms and applied in the Standard		
Shall / Should / May	In addition to the definitions contained in the Glossary of CDM terms, the following terms apply in the VVS (VVS/10): <u>Shall</u> is used to indicate requirements to be followed; <u>Should</u> is used to indicate that among several possibilities, one course of action is recommended as particularly suitable; <u>May</u> is used to indicate what is permitted.	
CAR	The DOE shall raise a CAR if one of the following situations occur: (VVS/220) (a) Non-compliance with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants or if the evidence provided to prove conformity is insufficient; (b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants; (c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions; (d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.	
CL	The DOE shall raise a CL if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. (VVS/221)	
FAR	The DOE shall raise a FAR during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period. (VVS/223)	
Corrective Action Requests by verification team		
	Comments and Results	Conclusion and IRL
Issue	Missing parameters in the MR required by the registered monitoring plan	CAR is closed <input checked="" type="checkbox"/> IRL 75,76
Requirement	Project Standard, version 05.0, §197 and §198	
Corrective Action Request	<u>Corrective Action Request No 1</u> Some of the data and parameters to be monitored which are mentioned in the monitoring plan in section B.7.1. of the PDD are missing in section D.2. of the MR as well as its data collection and transfer procedures, in particular the parameters $FC_{ECDG,D,y}$, Operation of the energy plant, $CE-F_{elec,BL,y}/EF$, EF_{OM} , EF_{BM} , Other flare operation parameters, $NCV_{D,t}$, $EF_{CO2,e}$, $PE_{ec,y}$, $PE_{fc,y}$, $PE_{Flares,y}$, $fv_{i,h}$, $FV_{RG,h}$. Some of the aforementioned parameters are not reported in the CER excel calculation tool.	
Response	All the parameters mentioned above were included in the section D.2. of the MR and some of them were also included in the CER excel calculation tool.	
Assessment	2nd DOE Request:	

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Means of verification	<p>The parameters in question which were missing have been added in section D.2. of the MR. However, some of the parameters are still missing in section C. Besides, parameter specifications in section D.2. are partly not consistent with monitoring plan, complete or correct. Furthermore, the most recent MR form template is not fully followed. Some of the parameters (like e.g. EF_{OM}, EF_{BM}, $PE_{ec,y}$, $PE_{fc,y}$, $PE_{Flares,y}$) are not transparently reported yet in the CER excel calculation tool.</p> <p>2nd PP response:</p> <p>The parameters that were missing in section C were inserted. The parameters of Section D.2 of MR were corrected according to the most recent MR form. The parameters were identified in the spreadsheet calculation of CERs.</p> <p>3rd DOE Request:</p> <p>Even though the previously missing parameters have been added in section C, some of the parameter specifications in section D.2. are not consistent yet with the monitoring plan, complete or correct. Furthermore, the MR form template (version 03.2) is not fully followed yet. Besides, some of the parameters are not transparently reported yet in the CER excel calculation tool.</p> <p>3rd PP response:</p> <p>The parameters specifications in section D.2 are consistent with the monitoring plan and/or CER excel calculation tool. The MR form template was actualized to version 3.2. The parameters of CER excel calculation tool was actualized.</p> <p>DOE conclusion (after 3rd DOE Request):</p> <p>The DOE by assessing the final MR confirms that the parameter specifications in section D.2. are consistent with the monitoring plan, complete and correct. Besides, the most recent MR form template (version 03.2) has been fully followed. All parameters are transparently reported in the final CER excel calculation tool.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Missing values of monitored parameter in the CER excel calculation tool	CAR is closed

List of Findings - Compilation and Resolutions

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Requirement	Project Standard, version 05.0, §198 (a)	<input checked="" type="checkbox"/> IRL 48,75,76
Corrective Action Request	<p><u>Corrective Action Request No 2</u></p> <p>The CER excel calculation tool does not provide data of the quantity of hours the engines operated even though the parameter 'operation of the energy plant' is a parameter to be monitored as per B.7.1. of the PDD.</p>	
Response	It was included in the CER excel calculation tool the parameter "Operation of the energy plant", which provide data of the quantity of hours the engines operated.	
Assessment Means of verification	<p>The DOE by assessing the revised CER excel calculation tool confirms that the quantity of hours the engines operated are now indicated for every day of the monitoring period.</p> <p>The DOE verified the data of 'operation of the energy plant' indicated in the CER excel calculation tool through SOTREQ PLC data (IRL 48). No inconsistencies between CER excel calculation tool and PLC data have been identified, however see 2nd DOE Request.</p> <p>2nd DOE Request:</p> <p>The operation hours of the engines are in some cases constant over several days, like e.g. for the days between 23/12/2010 and 29/12/2010 (217 hours each) or between 29/03/2012 and 09/04/2012 (173 hours each), which seems not to be plausible. Clarity shall be provided.</p> <p>2nd PP response:</p> <p>Between the days 23 and 29/12/2010, the values are equal because the Sotreq PLC didn't register the data. In this way, the values were estimated and reported by Sotreq based on electricity production. Follow attached the spreadsheet with the values sent by Sotreq. Between the 29/03 and 09/04/2012 occurred the same.</p> <p>DOE conclusion (after 2nd DOE Request):</p> <p>SOTREQ explained that the PLC did not register operation hours of the engines in the periods between 23/12/2010 and 29/12/2010 and 29/03/2012 and 09/04/2012. Hence, the operation hours were estimated and reported by SOTREQ based on the electricity generation for which PLC registries are available (except for the days 23/12/2010, 24/12/2010 and 25/12/2010). The days 23/12/2010, 24/12/2010 and 25/12/2010 were thus conservatively excluded from the ER calculation. The DOE concludes that the missing PLC registries for the operating hours in the aforementioned time periods do not have any impact on the quantity or quality of emission reductions, since the operation hours of the engines do not enter into the ER calculation. On the other hand, electric-</p>	

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	ity export PLC registries which enter into the ER calculation are available for the days when the PLC did not register the operation hours (except for 23/12/2010, 24/12/2010 and 25/12/2010 as previously mentioned) and have been verified by the DOE to be consistent with the data mentioned in the ER excel spreadsheet.	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Inconsistencies in “Data and parameters to be monitored” and “data and parameters that are available at validation” between MR and registered monitoring plan	CAR is closed <input checked="" type="checkbox"/> IRL 75,76
Requirement	Project Standard, version 05.0, §197 and §198	
Corrective Action Request	<p><u>Corrective Action Request No 3</u></p> <p>1) According to the PDD (section B.6.2), the parameter “Regulatory requirements relating to landfill gas projects” belongs to the data and parameters that are available at validation. However, the MR states the same parameter in section D.2. “Data and parameters monitored”.</p> <p>2) According to the PDD (section B.7.1), the parameters EF_{OM} and EF_{BM} belong to the “Data and parameters to be monitored” however the MR states these parameters in section D.1. “Data and parameters fixed ex-ante or at renewal of crediting period”. Besides, the value of 0.121 tCO₂e/MWh applied for $CEF_{Elec,BL,y}$ in the ER calculation is not the yearly updated and calculated ex-post value published by CIMGC (as requested in the registered monitoring plan) but the EF for 2009 used in the PDD for ex-ante estimation.</p>	
Response	<p>1) The parameter “Regulatory requirements relating to landfill gas projects” were excluded from the section D.2. “Data and parameters monitored” and included in section “D.1. Data and parameters fixed ex-ante or at renewal of crediting period”.</p> <p>2) The parameters EF_{OM} and EF_{BM} were transferred from section D.1. “Data and parameters fixed ex-ante or at renewal of crediting period” to the D.2. “Data and parameters monitored”. The value of 0.121 tCO₂e/MWh applied for $CEF_{Elec,BL,y}$ in the ER calculation was updated in the MR and in the CER excel calculation tool.</p>	

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<p>Assessment Means of verification</p>	<p>2nd DOE Request:</p> <p>1) The DOE by assessing the revised MR confirms that the parameter “Regulatory requirements relating to landfill gas projects” has been removed from section D.2. and has been added to section D.1. “Data and parameters fixed ex-ante or at renewal of crediting period”. This is in line with the approved monitoring plan. However, the table in section C mentions the parameter still as a parameter to be monitored.</p> <p>2) The DOE by assessing the revised MR confirms that the parameters “EF_{OM} and EF_{BM}” has been removed from section D.1. and has been added to section D.2. “Data and parameters monitored”. This is in line with the approved monitoring plan which requires the grid emissions factor to be monitored ex-post. The yearly EF data is now indicated. However, it is not clear why the EF values for 2009 are indicated (since the monitoring period started on 23/12/2010). Besides, the 2012 EF data are not consistent with the most recent EF data published by CIMGC at http://www.mct.gov.br/index.php/content/view/338047.html#ancora. Besides, it is not clear according to the provided information in the CER excel calculation tool how the CEF_{elec,y,BL,y}/EF values indicated in the MR have been calculated for each of the years.</p> <p>2nd PP response:</p> <p>1) The parameter "Regulatory requirements Relating to landfill gas projects" was removed from the table in section C.</p> <p>2) In section D.2 parameter EF, the value for 2009 was removed. The value of 2012 for the same parameter was fixed according to the last publication by CIMGC EF. It was inserted the calculation formula in the "spreadsheet calculation of CERs".</p> <p>DOE conclusion (after 2nd DOE Request):</p> <p>1) The DOE by assessing the revised MR confirms that the parameter “Regulatory requirements relating to landfill gas projects” has been removed from the Table in section C which mentions all parameters to be monitored. This is correct once the parameter “Regulatory requirements relating to landfill gas projects” belongs according to the PDD to “Data and parameters fixed ex-ante or at renewal of crediting period”.</p> <p>2) The DOE by assessing the revised MR confirms that the EF values for 2009 have been removed from the EF parameters in section D.2. Besides, the 2012 EF data (both EF_{OM} and EF_{BM}) are now consistent with the most recent EF data published by CIMGC at http://www.mct.gov.br/index.php/content/view/338047.html#ancora. The revision of 2012 EF data in the CER excel calculation tool resulted in an increase of ERs since the previously used EF_{BM}</p>	
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	<p>and EF_{OM} were lower.</p> <p>3rd DOE Request:</p> <p>2) It is not clear yet according to the provided information in the CER excel calculation tool how the $CEF_{elec, BL, y}/EF$ values indicated in the MR has been calculated for each of the years. The CER excel calculation tool only indicates the final values in worksheet 'Consolidated_EN' (cells G77, G79, G81) however without the respective formulae behind.</p> <p>3rd PP response:</p> <p>2) was inserted the formula for calculation and references.</p> <p>4th DOE Request:</p> <p>Monthly raw data (for EF_{OM}) and annual EF_{BM} data (published by CIMGC) shall be provided in the CER excel calculation tool and respective formulae have to be transparently illustrated for the calculation of yearly $CEF_{elec, BL, y}/EF$ values.</p> <p>4th PP response:</p> <p>Monthly raw data (for EF_{OM}) and annual EF_{BM} data (published by CIMGC) and respective formulae were inserted in the CER excel calculation tool.</p> <p>DOE conclusion (after 4th DOE Request):</p> <p>The DOE by assessing the revised CER excel calculation tool confirms that monthly raw data (for EF_{OM}) and annual EF_{BM} data (published by CIMGC) as well as formulae for the calculation of yearly $CEF_{elec, BL, y}/EF$ values have been added in a proper worksheet in the CER excel calculation tool.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Calculation of $PE_{flare, y}$ and missing reference to formulae and methods used	CAR is closed <input checked="" type="checkbox"/> IRL 75,76
Requirement	Project Standard, version 05.0, §200(b)	
Corrective	<u>Corrective Action Request No 4</u>	

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Action Re-quest	It is not demonstrated (neither in the CER excel calculation tool or monitoring report) whether and how $PE_{flare,y}$ as per equation (21) of the PDD has been calculated and how step 6 (Determination of the hourly flare efficiency) indicated in section B.6.1. of the PDD has been followed.	
Response	By not have applied the correct methodology of calculation of the flare efficiency, for this monitoring period PP decided to disregard all the CERs from burning in flares. For the next monitoring period it will be followed step by step the Tool to determine project emissions from flaring gases containing methane.	
Assessment Means of verification	PP decided to disregard all the ERs from gas burnt in flares since the steps for calculating project emissions from flaring as outlined in the PDD and 'Tool to determine project emissions from flaring gases containing methane' have not been followed. This is the most conservative assumption taken by the PP, hence accepted by the DOE. The DOE by assessing the revised CER excel calculation tool and MR confirms that no emission reductions are claimed from flaring gas.	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Information in monitoring report not consistent, complete or transparent	CAR is closed <input checked="" type="checkbox"/> IRL 47,54,55,56, 61,70,75,76
Requirement	EB75, Annex 7, project standard, version 05.0, §194 and §16 (completeness), §17 (consistency), §19 (transparency)	
Corrective Action Re-quest	<u>Corrective Action Request No 5</u> 1) Information in the MR is in some cases not consistent within the MR or with other documents (in particular monitoring plan), like e.g. in section C which indicates that the electricity baseline EF is updated at the baseline renewal whereas the monitoring plan defines the emissions factor as parameter to be monitored; section D.2., parameter $LFG_{flare,y}$ stating "a flow meter" even though landfill gas sent to flare is measured by two flow meters (FIR200 and FIR700); in section E.4.: the emission reduction figures are not consistent within the same section; in section D.2., parameter $EL_{LFG,y}$: the information that electricity meter are installed at the project site and the connected substation whereas the monitoring plan informs that the substation has 2 measurement points and	

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	<p>parameter 'methane fraction in the landfill gas': the instrument type indicated in the MR (Binos 100) is different to the one found on-site (Binos 100-M); in section E.1., chapter 'Flare efficiency': the information regarding the procedure to discount the values below 900°C is not consistent with the proper excel sheets submitted to the DOE; as per the MR (section C) SOTREQ's PLC registers the accumulated electricity sent to the grid every 0:00 whereas in previous verification it was communicated that these registries happen at 23:59; etc.</p> <p>2) Information in the MR is in some cases not complete, like e.g. in section B.1. on some days with significantly lower gas flow or much higher gas flow and/or much lower electricity export than the average, no special event is mentioned in B.1., in section C, in the diagram some monitoring points are missing; in section D.2., parameter T_{flare}: the indicated calibration date for each of the 2 thermocouples does not cover the whole monitoring period and calibration certificates of thermocouples covering the whole monitoring period have not been submitted to the DOE yet; in section E.1. the formulae for the calculation of $PE_{\text{flare},y}$ and equation (25) of the monitoring plan are missing; in section D.2., parameter $EL_{\text{LFG},y}$: the monitoring plan informs about the existence of electricity meters whereas the MR just indicates the specifications of one meter; the commissioning date of the diesel generator is not mentioned in the MR and not supported by any documentation etc.</p> <p>3) Information in the MR is in some cases not transparent enough, like e.g. the wording in section B.1. (special events); in section D.2., parameter $LFG_{\text{electricity},y}$, the sentence 'these flow meters were removed to calibration and were installed' is not clear enough and the reference to the worksheet 'BLFGE 18th verification calculation spreadsheet V01' not specific enough; in parameter $EL_{\text{LFG},y}$, the maintenance procedure is not described in a transparent way; regarding gas flow parameters: it is not clear whether regular maintenance follows the general guidelines from the manufacturer as stated in the monitoring plan; in section E.1., chapter 'calculation of $LFG_{\text{electricity},y}$' it is not clear what is meant by 'First Monitoring Period before calibration of the flow meters' and 'Second Monitoring Period before calibration of the flow meters'; in section E.5., it is not clear how the annual, monthly and daily PDD averages have been calculated and the relevance of the sentence "....even when bearing in mind the monitoring period does not cover a full calendar year" since the monitoring period is more than one year; the relationship between SOTREQ and Biogeração is not clear; etc.</p> <p>4) The MR does not always use the internationally recognized format for the presentation of values (in particular in section D.2.), i.e. decimal points should be marked with a dot (.) as per EB75, Annex 7.</p>	
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Response	<p>1) Information on MR item C about the parameter EF was corrected in accordance with the monitoring plan; In section D.2., the parameter LFGflare stating “a flow meter” was fixed for the meters FIR 200 and FIR700; In section E.4., the emission reduction values were corrected; In section D.2., the data of the ELLFG, y parameter were corrected according to the monitoring plan and the information about Binós 100-M instrument was also corrected; information about the burned gas below 900° C were removed from the MR. According to Sotreq clarification the records occur at 00:00 – the evidence was sent by e-mail to the verification team.</p> <p>2) In section B.1 of the MR it was inserted cases where the production is about 25% of the average daily production of the month, as explained to the Verification team; In Section C, it was inserted diagram points missing; In order to be conservative, in Section D.2 - parameter T_{flare}, the calibration date indicated for the thermocouples do not meet the deadlines calibration due an internal fault in the calibration process. In order to be conservative, PP has chosen to disregard the whole production in the period concerning the two burners (F100 e F200); In section E.1 the formulae for the calculation of $PE_{flare,y}$ and equation (25) of the monitoring plan were included in MR; The $EL_{LFG,y}$ was according to the monitoring plan; PP is sending to verification team an evidence of the commissioning date of the diesel generator.</p> <p>3) In section B.1 all the information about special events have been corrected; At the Section D.2 the phrase "these flow meters were removed for calibration and were installed" has been changed for a better clarity of information; the maintenance of the $EL_{LFG,y}$ parameter is not made in the company, inside the company is made only operation test, performed by Sotreq. This instrument is sent for calibration every 2 years, following the standards of the monitoring plan, the calibration certificates were presented during the visiting of the verification team; In the section E.5 greater clarification of how the media were made have been inserted in MR ; clarification about the relationship Sotreq Biogeração were best described in MR.</p> <p>4) All the values were checked in the MR in order to use the internationally format.</p>	
Assessment Means of verification	<p>DOE conclusion (after 1st DOE Request):</p> <p>1) The information in question has been revised in the MR like in section C which indicates now that EF is calculated according to the ex-post monitoring of EF_{OM} and EF_{BM} by the CIMGC. Section D.2., parameter $LFG_{flare,y}$ states now that the landfill gas sent to flare is measured by two flow meters (FIR200 and FIR700); in section E.4.: the emission reduction figures are consistent now; in section D.2., parameter $EL_{LFG,y}$: the MR informs now (like the monitoring plan) that the substation has 2 measurement points (one belongs to Biogeração (manager of the power plant) and the other</p>	

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	<p>belongs to Eletropaulo (electric utility); regarding the parameter 'methane fraction in the landfill gas': the instrument type indicated in the MR is now consistent with the one found on-site (Binos 100-M); in section E.1., chapter 'Flare efficiency': the information regarding the procedure to discount the values below 900°C has been removed from the MR since the information is not relevant – the PP decided not to claim ERs for gas being flared; SOTREQ's PLC registers the accumulated electricity sent to the grid every 0:00 o'clock. This was confirmed in an Email sent by SOTREQ (IRL 61).</p> <p>2) The information in question has been revised in the MR like In section E.1. the formulae for the calculation of $PE_{flare,y}$ and equation (25) of the monitoring plan have been added in the MR, however PP decided not to claim ERs from LFG being sent to flares; thus the formula for calculating $PE_{flare,y}$ is actually not relevant for this monitoring period; in section D.2., parameter $EL_{LFG,y}$: the MR indicates now the details of both electricity meters, thus is in compliance with the monitoring plan;</p> <p>3) The QA/QC procedures (including maintenance) for the parameter $EL_{LFG,y}$ have been revised in the MR and are now consistent with the monitoring plan.</p> <p>4) The DOE by assessing the revised MR confirms that the internationally recognized format for the presentation of values i.e. decimal points marked with a dot (.) and thousands marked with a comma (,) as per EB75, Annex 7 is correctly applied now.</p> <p>2nd DOE Request:</p> <p>2) The criterion chosen by the PP is not clear yet. B.1. mentions events in which the gas flow was less than 25% different from the average daily production, on the other hand days with significant lower gas flow than the average are not mentioned in section B.1. of the MR. Clarity shall be provided; some monitoring points are still missing in section C (diagram), like e.g. operation hours of the energy plant, electricity generated; information regarding the delayed calibration of the thermocouples and why the same has no impact (since no ERs are claimed for gas sent to flares) is missing in the MR; nothing about the diesel generator and its commissioning date is mentioned in section A.1. and/or section B of the MR.</p> <p>3) Missing transparency in the wording like e.g. in section B.1. (special events) persists; regarding parameter $LFG_{electricity,y}$ ambiguity persists on how gas flow has been measured during the time when the meters were removed for re-calibration; regarding gas flow parameters: it is not clear yet whether regular maintenance follows the general guidelines from the manufacturer as stated in the monitoring plan; no PP answer has been provided regarding section E.1., chapter 'calculation of</p>	
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	<p>LFG_{electricity,y}, it is not clear what is meant by 'First Monitoring Period before calibration of the flow meters' and 'Second Monitoring Period before calibration of the flow meters'; in section E.5., it is not clear yet how the annual, monthly and daily PDD averages have been calculated and the relevance of the sentence “....even when bearing in mind the monitoring period does not cover a full calendar year” since the monitoring period is more than one year; the relationship between SOTREQ and Biogeração has been described in a footnote, however it has not been clearly described yet that SOTREQ is the responsible company for operating the power plant.</p> <p>2nd PP response:</p> <p>2) The criterion used was: it is considered as special event when the loss of daily production is greater than 25% of the average production for the same month the day in question, excluding the value of this day, for example: if in January / 11 one day of production is below than the normal, we took the average of the month disregarding this day and if this value has a production smaller than 25%, it is considered a special event. The days with loss bigger than 25% are described in section B.1 of MR. Information about the operating hours were included in the table in section C of MR. Information about the emergency generator were inserted in item A of the MR. The technical commissioning of emergency generator was realized on 21 December 2010 and started its operation on January 1st 2011.</p> <p>3) It was corrected the text and inserted the in Section B and in the parameter LFG_{electricity, y} of the MR. As the errors of the instruments used were the maximum and the same before and after the calibration, information about these errors after calibration were taken off from MR, in Section E.1. In section E.5 the text was amended to provide more clarity in the calculation forms. It was clarified that Sotreq is the company responsible for operating the Biogeração - a company owned by Itau-Unibanco.</p> <p>DOE conclusion (after 2nd DOE Request):</p> <p>2) -The commissioning date of the emergency diesel generator is mentioned in the MR (section A.1.) now and is consistent with the submitted supporting documentation (IRL 70).</p> <p>3) -regarding parameter LFG_{electricity,y}, it has been clarified that there are 4 different gas flow lines each one having one meter. The line of the meter in calibration was closed until the meter returned, whereas in the other lines gas flow continued.</p> <p>-one of the footnotes of the MR clearly describes now that SOTREQ is the responsible company</p>
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	<p>for operating the power plant and BIOGERACAO is an ITAU-UNIBANCO company which is responsible to administrate the power plant.</p> <p>3rd DOE Request:</p> <p>2) -The explanation given in the aforementioned PP response regarding the criterion for special events chosen by the PP is not transparently and sufficiently clear enough explained.</p> <p>-Some monitoring points continue to be missing in section C (diagram), like e.g. operation hours of the energy plant, electricity generated;</p> <p>-Information regarding the delayed calibration of the thermocouples and why the same has no impact (since no ERs are claimed for gas sent to flares) is still missing in the MR;</p> <p>3) -Missing transparency in the wording still persists in the MR in some sections;</p> <p>-regarding gas flow parameters: it is not clear yet whether regular maintenance follows the general guidelines from the manufacturer as stated in the monitoring plan – besides, no PP answer has been provided regarding this item;</p> <p>-section E.1., chapter 'calculation of LFG_{electricity,y}' still mentions 'error applied before' what is not clear to the DOE;</p> <p>- Even though the sentence “....even when bearing in mind the monitoring period does not cover a full calendar year” in question has been removed from E.5., the annual, monthly and daily PDD averages are not based on 2010, 2011 and 2012 estimated emission reduction figures as per the PDD but on the average estimate of the whole crediting period; this is not plausible since the monitoring period is from 23/12/2010 to 31/08/2012.</p> <p>3rd PP response:</p> <p>2) PP considers a special event, when the production of a determined day is more than 25% superior or inferior than the highest daily production of the month. Those special events are mentioned in section B.1 of the MR. Example: the maximum April daily production was 173,25MWh. If we consider 25% loss or more, the limit to be characterized as an special event would be 129,9 MWh. In the same month, only day 24 had a production below the minimum, therefore it's considered an special event.</p> <p>The diagram in section C was replaced to evidence the monitoring point.</p>	
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	<p>Information regarding the delayed calibration of the thermocouples was inserted in MR.</p> <p>3) -In section E.1., chapter 'calculation of $LFG_{electricity,y}$' the text was corrected; -The estimate of the whole monitoring period was changed in the MR section E.5.; -More transparency in the wording was inserted in the MR in some sections; -The flow meters follow the regular maintenance as the general guidelines from the manufacturer (copy of the general guidelines from the manufacturer was sent).</p> <p>DOE conclusion (after 3rd DOE request):</p> <p>2) -Information regarding the delayed calibration of the thermocouples has been added; -PP transparently explained what is considered as special event. The explanation is deemed to be appropriate. Special events have been cross-checked by the DOE through the daily occurrence book (IRL 47).</p> <p>3) -Section E.1., chapter 'calculation of $LFG_{electricity,y}$' has been revised and is finally clear now.</p> <p>-The estimated daily PDD average is now based on 2010, 2011 and 2012 estimated emission reduction figures as per the PDD. This estimated daily PDD average of emission reductions is compared with the actual daily average of emission reductions during the monitoring period. The DOE concludes that the applied approach in the final MR is plausible and the calculated difference between estimated and actual emission reductions is correct. Actual emission reductions for the monitoring period are significantly lower than those estimated in the PDD.</p> <p>-The DOE by assessing the revised MR confirms that the wording has been revised where it was not clear.</p> <p>-It has been confirmed by the PP that regular maintenance is carried out as per the general guidelines from the manufacturer. The manuals of the gas flow meters (IRL 54, 55, 56) have been submitted to the DOE and were verified by the same.</p> <p>4th DOE Request:</p> <p>2) -Revised diagram in Section C is not legible.</p> <p>4th PP response:</p> <p>2) The diagram in section C of the MR was revised.</p>	
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	DOE conclusion (after 4th DOE Request): 2) The DOE by assessing the revised MR confirms that the diagram in section C has been revised and is consistent with the diagram of the registered PDD.	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	

Clarification Requests by verification team		
	Comments and Results	Conclusion and IRL
Issue	Application of standard errors of each instrument as per B.7.2. of the registered PDD	CR is closed <input checked="" type="checkbox"/> IRL 15-25, 54,55,56,59,60,6 5,66, 75,76
Requirement	VVS, version 05.0, §225(c)	
Clarification Request	<u>Clarification Request No 1</u> Section B.7.2. of the PDD states that “in order to assure conservatism, the standard errors of each equipment will be subtracted from the readings”. PPs applied as error for the flow meters the maximum error found in each flow meter’s calibration. However, it has not been transparently shown yet whether this applied error is more conservative than the maximum accuracy limit (defined by the manufacturer of the instrument) of each flow meter. Supporting documentation for the maximum accuracy limit (of each instrument used in the monitoring period) shall be submitted to the DOE and conservatism shall be assured as per the monitoring plan when applying the error for each instrument.	
Response	It was considered in MR and ER calculation the correct maximum error for each instrument, considering the manufacturer orientation. The supporting documentation was presented during the audit and was sent to the conference.	

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Clarification Requests by verification team		
Assessment Means of verification	<p>2nd DOE Request:</p> <p>Relevant sections of the MR have not been updated yet mentioning the (applied) maximum error for each instrument, even though PP mentioned in the answer that the maximum error for each instrument has been considered in the ER calculation and supporting documentation for the maximum accuracy of the instruments has been submitted to the DOE. Besides, standard errors (maximum accuracy limits) for FIR200 to FIR600 temperature and pressure transmitters have not been applied in the ER calculation, but the maximum error resulting from the calibration. Clarity shall be provided.</p> <p>2nd PP response:</p> <p>The sections of the MR were updated with the Maximum accuracy for each instrument. In the spreadsheet calculate the Maximum accuracy of the instruments was also applied.</p> <p>3rd DOE Request:</p> <p>The MR has not been fully updated yet mentioning the (applied) maximum error for each instrument. Besides, standard errors (maximum accuracy limits) for FIR200 to FIR600 temperature and pressure transmitters have not been applied in the ER calculation, but the maximum error resulting from the calibration. Clarity has not been provided yet.</p> <p>3rd PP response:</p> <p>The maximum error (maximum accuracy limits) for all the instruments were corrected in the MR and ER calculation.</p> <p>4th DOE Request:</p> <p>Maximum accuracy limits for all instruments applied now. However, regarding the temperature transmitters: the higher error from the calibration (since the error from the calibrations are higher than the error indicated by the manufacturer 0.15) shall be applied in the ER calculation; PP shall explain in the MR that the higher error from the calibration was used (since the error from the calibration is higher than the maximum accuracy limit).</p> <p>4th PP response:</p> <p>For the temperature transmitters PP used the higher error from the calibration, because are</p>	

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Clarification Requests by verification team		
	<p>higher than the error indicated by the manufacturer. This information was inserted in MR and the values were changed in the ER calculation.</p> <p>DOE conclusion (after 4th DOE Request):</p> <p>The DOE by assessing the revised MR and revised CER excel calculation tool confirms that for all meters and the gas analyzer the maximum permissible error has been conservatively considered in the ER calculation and deducted from the ERs in order to comply with section B.7.2. of the monitoring plan. In cases where the calibration result revealed a higher error than the maximum permissible error, the calibration error was conservatively considered in the ER calculation. The DOE checked the maximum permissible errors of the instruments through manufacturer's specifications (IRL 54,55,56,59,60,65,66) and the errors resulting from the calibration through the submitted calibration certificates (IRL 15-25) and confirms that the higher of both errors has been conservatively applied for each meter and the gas analyzer in the ER calculation.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Unclear information about the measurement principle of thermal mass flow meter	CR is closed <input checked="" type="checkbox"/> IRL 55
Requirement	Project Standard, version 05.0, §198(c)	
Clarification Request	<p><u>Clarification Request No 2</u></p> <p>Regarding the FCI thermal mass flow meters, PP shall provide clarity and supporting documentation from the manufacturer for the pressure/temperature settings at which mass flow rate is converted to volumetric flow rate.</p>	
Response	PP provided to the Verification team the manufacturer's clarification (FCI), explaining on how the calculations are performed for conversion to volumetric flow rate.	
Assessment	<p>2nd DOE Request:</p> <p>According to the explanation submitted by the manufacturer, it has not been clarified yet what</p>	

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Clarification Requests by verification team		
Means of verification	<p>are the pressure/temperature settings (standard conditions of pressure and temperature (0°C, 1.013 bar) or any other pressure/temperature setting?) at which mass flow rate is converted to volumetric flow rate.</p> <p>2nd PP response: It was submitted a manufacturer document with information about the operation mode, explaining how the instrument works by difference of the temperature. The Document follows attached ("FCI ST 51 TEORIA DE FUNCIONAMENTO.ppt").</p> <p>3rd DOE request: PP response and the submitted documentation do not answer the 2nd DOE request yet, hence the finding remains open.</p> <p>3rd PP response: The flow meter FCI, measures fluid velocity, temperature and the quantity of molecules that pass, so it's mass flow meter, they measure in KG or normalized volumetric flow.</p> <p>DOE conclusion (after 3rd DOE Request): The DOE by assessing the submitted documentation (meter 's data sheet, email from the manufacturer and explanation about the functioning of the meter (IRL 55,64)) concludes that the mass flow meter FCI measures the gas flow either in mass (kg) or in normalized volumetric flow (Nm3), i.e. uses standard conditions of pressure and temperature (0°C, 1.013 bar) to determine the normalized volumetric flow.</p>	
Changes in the monitoring report or supporting annexes	No changes in MR or supporting annexes related to this CR.	
Issue	Delayed calibration of flow meter FIR500 (referring to parameter LFG _{electricity,y}) and information about calibration	CR is closed <input checked="" type="checkbox"/> IRL
Requirement	VVS, version 05.0, §238, §239, §240 and Project Standard, version 05.0, §198(b)	

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Clarification Requests by verification team		
Clarification Request	<p><u>Clarification Request No 3</u></p> <p>1) The calibration of FIR500 dated 14/12/2011 was on delay bearing in mind a 5 years calibration frequency as indicated in the monitoring plan. It is not clear according to the description in the monitoring report whether and how paragraph 238 of the VVS has been followed.</p> <p>2) Supporting documentation shall be provided that demonstrates that all entities/companies (in particular Incontrol, FCI) carrying out calibrations of instruments are accredited/qualified to do such calibrations.</p> <p>3) According to calibration certificates submitted by Incontrol it is not clear how the error in % has been determined if comparing 'Q ref. real' and 'Q turb.'. Clarity shall be provided.</p>	14,16,17,19,20,21-23,25,56,71-74
Response	<p>1) The calibration of FIR500 delayed a few days and did not generate any impact, because the value of the new calibration (0.4300% error) is lower than assumed before the calibration (0.6320%). In this way and to be according to the monitoring plan, it was applied the maximum error of the instrument, established by the manufacturer - 1%.</p> <p>2) The documentation submitted by the FCI demonstrates that they have traceability NIST standard, one of the largest laboratories in the USA. Besides this email was sent from the supplier with this information (attached). The Incontrol presented the accreditation certificate INMETRO, following attachment ("LAB Accreditation INCONTROL_Certificado Inmetro 2011").</p> <p>3) Incontrol submitted the document explaining how the errors for meters FIR 300, FIR 400, FIR 500 and FIR 600 were calculated. The evidence was sent to the verification team on 23/11/2012. According to the evidence presented by Incontrol, the value "Qref. real" value is measured by their instrument (reference), so the expected value as a result. The "Qturb" is the value measured by our meter sent for calibration. These two values are compared with the goal of providing the instrument error. The way of calculation is described in the file attachment sent by Incontrol ("VG083B6").</p>	
Assessment Means of verification	2) Supporting documentation has been submitted to the DOE (IRL 14,16,17,19,21-23,25,71-74) that demonstrates that all entities/companies carrying out calibrations of instruments are accredited/qualified to do such calibrations. The submitted documentation has been checked	

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Clarification Requests by verification team		
	<p>by the DOE.</p> <p>3) It has been clarified by INCONTROL how the error in % has been determined (IRL 20) and the DOE due to its sectoral expertise confirms that the explanation is appropriate.</p> <p>2nd DOE Request:</p> <p>1) Even though the PP explained in the answer that the maximum accuracy (error) of the instrument was applied, it has not been described in the monitoring report yet whether and how paragraph 238 of the VVS has been followed.</p> <p>2nd PP response:</p> <p>1) As the maximum error of the instrument used is bigger than the error shown in calibration certificate, the delay calibration doesn't generate impact on the amount of CER's of this period. Comment was inserted in MR , section D.2, parameter LFGElectricity , y.</p> <p>3rd DOE Request:</p> <p>1) It has not been described in the monitoring report yet whether and how paragraph 238 of the VVS has been followed.</p> <p>3rd PP response:</p> <p>1) According paragraph 238 of the VVS as the error of 1% adopted by the PP is greater than the maximum error of the last calibration, was adopted this error of 1% for this period. Information was inserted in the MR.</p> <p>DOE conclusion (after 3rd DOE Request):</p> <p>1) The DOE by assessing the revised MR confirms that PP explains in the final MR how paragraph 238 of the VVS due to the delayed calibration of FIR500 has been followed. The DOE confirms by checking the meter's manual (IRL 56) and calibration certificates (IRL 20) that the maximum permissible error is higher than the error resulting from the calibration, hence PP</p>	

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Clarification Requests by verification team		
	applies the maximum permissible error in the ER calculation. This is in line with paragraph 238 of the VVS.	
Changes in the monitoring report or supporting annexes	MR has been revised.	
Issue	Delayed calibration of methane gas analyzer (referring to parameter $w_{CH_4,y}$)	CR is closed <input checked="" type="checkbox"/> IRL 13,14,75,76
Requirement	VVS, version 05.0, §238, §239, §240	
Clarification Request	<u>Clarification Request No 4</u> The weekly calibration of the gas analyzer was carried out with delay on 23/12/2010 (the calibration before was performed on 15/12/2010) and 14/06/2012 (the calibration before was performed on 06/06/2012). It is not clear according to the description in the monitoring report whether and how paragraph 238 of the VVS has been followed.	
Response	It was inserted into the CER excel calculation tool a sheet called “CH ₄ _calculation” to identify any irregularities in the days when the calibration was late. Even with delay in calibrations, there was no significant difference in error and this delay did not generate impact.	
Assessment Means of verification	2nd DOE Request: It has not been described in the monitoring report yet whether and how paragraph 238 of the VVS has been followed. Besides, according to the PP response it is not clear what procedure has been applied for the delayed calibration. 2nd PP response: It was created a new tab in the spreadsheet calculations to verify the impact generated by the delayed calibration, as it was identified that there was no impact, values were maintained. Explanation of how this calculation was considered in the same tab Spreadsheet calculations. 3rd DOE Request: Even though a new worksheet has been added in the ER excel calculation tool, it is not clear yet how paragraph 238 of the VVS has been followed. No information is provided yet in the MR	

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Clarification Requests by verification team		
	<p>respectively.</p> <p>3rd PP response: According to new worksheet added in the ER excel calculation tool the values indicated in the gas analyzer during the delay calibration were the same, the values were then maintained. This information was inserted in the MR.</p> <p>DOE conclusion (after 3rd DOE Request): As the responsible operators failed on some moments during this monitoring period to calibrate the analyzer within one week, BIOGAS decided to apply the following conservative approach for the days 22/12/2010 and 13/06/2012: In the case that the actual measured sample value (taken during calibration) is higher than the analysis result from the standard gas in the cylinder (as per the certificates, IRL 14), the error (which is calculated as the difference in % between the value of the standard gas and actual measured sample value) is discounted from the daily average CH₄ PLC measurement. If the actual measured sample value is smaller or the same than/as the value of the standard gas, the daily (average) PLC value will be kept (unchanged) for conservatism as CH₄ concentration in the CER calculation. For details of the calculation procedure, see worksheet "CH₄_Calculation" of the CER excel calculation tool (IRL 76). The verification team checked the analysis results from the standard gas in the cylinder (IRL 14), weekly calibration records (IRL 13) and revised CER calculation tool and revised MR (IRL 75 and 76). The verification team confirms that the approach chosen by BIOGAS is acceptable and conservative bearing in mind that besides discounting an error for the days in which calibration was delayed (see procedure described above), the maximal accuracy limit of the gas analyzer of 1% is considered for the whole data of the monitoring period independently whether the calibration was delayed or not. The DOE concludes that paragraphs 238 and 239 of the VVS are appropriately followed.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	

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Clarification Requests by verification team		
Issue	Delayed calibration of electricity meter and missing information about electric utility's electricity meter (referring to parameter EL _{LFG,y})	CR is closed <input checked="" type="checkbox"/> IRL 23,24,59,75
Requirement	VVS, version 05.0, §238, §239, §240 and project standard, version 05.0, §198(b)	
Clarification Request	<u>Clarification Request No 5</u> The calibrations of the electricity meters (Power Logic CM4000, serial numbers 0011001414 and 0011001426) were on delay bearing in mind a 2 years calibration frequency as indicated in the monitoring plan. It is not clear according to the description in the monitoring report whether and how paragraph 238 of the VVS has been followed.	
Response	The calibration of the electricity meters (Power Logic CM4000, serial number 0011001414 and 0011001426) was on delayed and did not generate any impact, because the value of the new calibration is lower than assumed before the calibration (1%).	
Assessment Means of verification	2nd DOE Request: It has not been described in the monitoring report yet whether and how paragraph 238 of the VVS has been followed. 2nd PP response: A comment was inserted in section D.1, parameter ELLFG,y , explaining that the delay in the calibration did not impact the production because the adopted error is higher than shown in the calibration certificate. 3rd DOE Request: Some information has been added in the MR however the wording is not transparent enough to understand the meaning and it is not clear yet according to the wording how paragraph 238 of the VVS has been followed. 3rd PP response: This information was inserted in the section D.2 parameter ELLFG,y of the MR. Conclusion (after 3rd DOE Request):	

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Clarification Requests by verification team		
	Wording has been revised and it is clear in the final MR how paragraph 238 of the VVS has been followed. The DOE confirms by checking the meter's manual (IRL 59) and calibration certificates (IRL 23,24) that the maximum permissible error is higher than the error resulting from the calibration, hence PP applies the maximum permissible error in the ER calculation. This is in line with paragraph 238 of the VVS.	
Changes in the monitoring report or supporting annexes	MR has been revised.	
Issue	Missing raw data (PLC data) and request for clarification of provided values	CR is closed <input checked="" type="checkbox"/> IRL 61,75,76
Requirement	Project standard, version 05.0, §18 (Accuracy and conservativeness), §198(a) and (c)	
Clarification Request	<p><u>Clarification Request No 6</u></p> <p>1) Regarding SOTREQ electricity export data, clarity shall be provided how values in the CER excel calculation tool have been determined for the days 23/12/2010, 24/12/2010 and 25/12/2010 even though on these days no PLC data was available or only partly available (for the day 25/12/2010). PP shall ensure that the applied data in the CER excel calculation tool is conservative.</p> <p>2) Regarding electricity export data, clarity shall be provided why there is a difference of around 1% between SOTREQ's PLC registries and AES Eletropaulo data.</p>	
Response	<p>1) According to Sotreq the Supervisory System had some problems and was out of operation. The electricity meters installed in the substation continued to take measurements, storing the measures in their internal memories. When the Supervisory System was re-established, the Schneider technician used a system tool that can download all stored measurements in the electricity meters, generating the files.</p> <p>So what it was made by Sotreq was calculate the measures of Active Energy Exported meter for each day (each bar has its meter), add them up and put them in standard spread sheet. All the applied values are conservative. The e-mail with this explanation was sent to the verification team.</p> <p>2) Sotreq sent an e-mail explaining that the difference regarding electricity export data can be</p>	

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Clarification Requests by verification team		
	related to 2 main points: how the instruments have different brands, the errors are also different; and they are connected in two different points in the net. The e-mail with this explanation was sent to the verification team.	
Assessment Means of verification	<p>DOE conclusion (after 1st DOE Request): 2) SOTREQ provided an explanation (IRL 61) about the difference regarding electricity export data between SOTREQ's PLC registries and AES Eletropaulo data. The difference is caused by the use of two different models of electricity meters (Logic CM4000 meter and Landis GYR meter) and two different connection points. The explanation is plausible and hence accepted by the DOE. The lower of both values (SOTREQ's PLC registries) is used in the ER calculation, hence conservatism is ensured.</p> <p>2nd DOE Request: 1) The submitted documentation does not allow the DOE to conclude that the data in the excel files were the ones which the Schneider technician downloaded from the internal memories of the electricity meters. Besides, the excel files are not protected thus allow any change in the data and are therefore not credible. It has not been demonstrated yet that the data for the days 23/12/2010, 24/12/2010 and 25/12/2010 are applied in the CER excel calculation tool in a conservative manner.</p> <p>2nd PP response: 1) To be more conservative, the "PP" chose to disregard energy production for these days (23/12/10, 24/12/10 and 25/12/10).</p> <p>DOE conclusion (after 2nd DOE Request): 1) PP decided to disregard the electricity export on the days 23/12/2010, 24/12/2010 and 25/12/2010 in the ER calculation which is the most conservative assumption, hence accepted by the DOE. The DOE by assessing the ER excel calculation tool confirms that the electricity export data (for the days 23/12/2010, 24/12/2010 and 25/12/2010) has been conservatively excluded from the ER calculation.</p>	
Changes in the	MR and CER excel calculation tool have been revised.	

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Clarification Requests by verification team		
monitoring report or supporting annexes		
Issue	Deviations from the registered monitoring plan	CR is closed <input checked="" type="checkbox"/> IRL 49,57,75,76
Requirement	VVS, version 05.0, §251	
Clarification Request	<p><u>Clarification Request No 7</u></p> <p>Clarity shall be provided how the electricity meter installed at the diesel generator (measuring the electricity generated by the diesel engine) is in line with the monitoring plan of the PDD which describes the parameter 'FC_{ECDG,D,y}' as the 'quantity of diesel fired in the emergency captive diesel generator' continuously measured by a mass/volume meter and which mentions under QA/QC procedures that 'the metered fuel consumption quantities are based on purchased quantities and stock changes'.</p> <p>Besides, clarity shall be provided how it is in line with the PDD to calculate project emissions resulting from the diesel generator not as per equation 25 of the PDD but through the electricity generated by the diesel engine.</p>	
Response	To meet the monitoring plan, during this verification period, PP adopted the maximum consumption fuel for the diesel generator (according to the manufacturer's manual - 44L / h). It was created in the CER excel calculation tool a column that records the power generation by diesel generator. This column was used to identify the number of operating hours of the generator and thus assigning the consumption of diesel generator per hour, whereas 44L / h.	
Assessment Means of verification	<p>2nd DOE Request:</p> <p>PP does not explain in the MR the procedure applied for the calculation of PE from diesel consumption. Besides, it is not clear according to the PP response whether the deviation from the monitoring plan is temporary or a permanent change (as per project standard, Appendix 1).</p> <p>2nd PP response:</p> <p>It was inserted in the MR an explanation about how it was applied to this period the calculation of PE from diesel consumption and also that this is a temporary deviation, which will be corrected for the next period.</p>	

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Clarification Requests by verification team		
	<p>3rd DOE Request: The MR explains now that the deviation from the monitoring plan is temporary as per project standard, Appendix 1, paragraph 3. However, the procedure applied for the calculation of PE from diesel consumption is not sufficiently well explained yet, in particular it is not clear how the operation hours of the diesel generator are monitored.</p> <p>3rd PP response: The hours of operation of the diesel generator (for this monitoring period) were monitored through records of energy extracted from the PLC (column "Electricity Generated in the diesel engine (MWh)" of spreadsheet calculation). When the PLC register the electricity generated by the diesel generator, the PP considers one hour of operation of the diesel generator, even though it works for a few minutes in this same time. As the maximum consumption of the generator is 44L / h, multiply the running time of the generator for this consumption.</p> <p>4th DOE Request: PP is requested to provide the aforementioned explanation in the monitoring report. Explain as well why the electricity generated in the diesel engine is indicated in 0.125 MWh intervals.</p> <p>4th PP response: Information about consumption of diesel generator was inserted in MR. The electricity generated in the diesel engine is indicated in 0.125 MWh because is the maximum consumption of the diesel engine in one hour of operation.</p> <p>DOE conclusion (after 4th DOE Request): The 'quantity of diesel fired in the diesel generator' data indicated in the CER excel calculation tool were verified by PLC data (IRL 49) and manufacturer's manual stating the maximum diesel consumption and capacity (IRL 57). The quantity of diesel fired in the emergency captive diesel generator ($FC_{ECDG,D,y}$) is not measured by a mass/volume meter as indicated in the monitoring plan of the PDD but PP applied the maximum hourly diesel consumption of the generator (44 l/h) at full load as per the manu-</p>	

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Clarification Requests by verification team		
	<p>facturer's specifications (IRL 57) in this given monitoring period. The hours of operation of the diesel generator have been monitored through PLC records of electricity generated in the diesel engine (IRL 49). As soon as the PLC registers electricity generated by the diesel generator and even for a few minutes in a certain hour, the PP considers the diesel generator operating for the full hour at maximum capacity of 0.125 MW. The maximum consumption of the generator (44l/h) is then multiplied with the hours of a day in which the diesel generator was activated (even only for a few minutes) to determine the daily diesel consumption. The DOE confirms that the applied approach is conservative and in line with paragraph 3 of Appendix 1 of the project standard since PP considers the maximum hourly consumption of the diesel generator and the diesel generator operating at maximum capacity.</p> <p>Since the deviation will be corrected for the next monitoring period, the DOE further confirms that it is a temporary deviation as per project standard, Appendix 1, paragraph 3. Hence, no revision of the monitoring plan is necessary. The DOE by assessing the PLC data (IRL 49) and the manufacturer's specifications of the diesel generator (IRL 57) confirms that the quantity of diesel fired in the emergency diesel generator indicated in the final CER excel calculation tool is correctly and conservatively calculated.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	
Issue	Missing information regarding monitoring instrument and information flow	CR is closed <input checked="" type="checkbox"/> IRL 61
Requirement	Project standard, version 05.0, §196 and §198(b)	
Clarification Request	<p><u>Clarification Request No 8</u></p> <p>The specifications (like manufacturer, model, calibration requirements etc) of the run time meters have not been submitted to the DOE so far.</p> <p>Besides, no procedure for the data flow (in particular data registries, data transfer, archiving) of operating hours of the energy plant has been submitted to the DOE.</p>	
Response	There are not specifications of the run time meters. This instrument is only used to register the hours for knowing when maintenance is due. Sotreq sent some information about the operation	

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Clarification Requests by verification team		
	and data logging, that was sent to the verification team. Sotreq also informs the PP that they have a private document only for internal use, without the possibility of transmission. Sotreq can show personally the document, if the DOE deemed necessary. See e-mail sent by Guilherme Bressan – Sotreq's Manager, in 01/11/2012.	
Assessment Means of verification	2nd DOE Request: Clarity shall be provided why the manufacturer of the engines cannot provide specifications of the run time meters or (if this is the case) confirm that there are no specifications (including calibration requirements) of the run time meters, since the run time meters are installed at each engine. 2nd PP response: The representative of Sotreq made a brief explanation about the functioning of the engines hour meters, both by email as personally. According to him, this instrument does not need to be calibrated as part of the generator system, the addition of this data is used to monitor the uptime of each engine in order to assist the planning of maintenance. DOE conclusion (after 2nd DOE request): SOTREQ confirmed in two Emails (IRL 61) that the run time meters are installed at each engine, thus are no separate equipments. Hence no technical specifications for these run time meters are available. Besides, it was confirmed by SOTREQ that no calibration for these run time meters is necessary and possible. The Emails provided as well information about the operation and data logging of these run time meters which is deemed to be appropriate by the DOE.	
Changes in the monitoring report or supporting annexes	No changes in MR or supporting annexes related to this CR.	
Issue	Plausibility and conservativeness check of gas flow data and relationship of electricity generation data to gas flow data.	CR is closed <input checked="" type="checkbox"/> IRL 49,62,75,76
Requirement	Project standard, version 05.0, §18 Accuracy and conservativeness and §19 Transparency	
Clarification Request	<u>Clarification Request No 9</u>	

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Clarification Requests by verification team		
	<p>1) On 01/05/2011, the sum of gas flow data to generators (FIR 300, FIR 400, FIR 500 and FIR 600) and gas flow data to flare F100 (measured by FIR 200) is bigger than the total gas flow data (FIR 100), i.e. bigger than the root of the squares of the flow meter errors. Clarity has to be provided about the plausibility of the data and how conservativeness is ensured using FIR 200, FIR 300, FIR 400, FIR 500 and FIR 600 values in the ER calculation.</p> <p>2) If doing the cross-check of the quantity of electricity generated in MWh by one Nm³, one can observe some outliers (in particular on the days 16/10/2011 and 16/04/2012). Clarity shall be provided.</p>	
Response	<p>1) There is no explanation for the difference in data flow (about 6%) between FIR100 and the sum of FIR300, FIR400, FIR500, FIR600 and FIR200. However, on 01/05/2011, there were some falls in the plant and this fact may be related to such a difference. The PP understands this difference as an isolated incident, as there had never happen before. This evidence was sent to the verification team.</p> <p>2) Due to the change of daylight saving time, the PLC did not record the data of 00:59. This schedule change in PLC probably occurred before the database (SQL) reset at 23:59, with this time the records started to be accumulated over the last register on 15/10/2011. This mistake led to a record flow accumulated over one day with normal flow; however the hourly flow records kept within the standards. The PP held a simulation data in a spreadsheet that has been sent to the verification team. This worksheet values considers the hourly flow by subtracting the final time by the previous (e.g.: 23:59 minus 22:59 ...). The final value found is consistent with the flow of 23 working hours of the FIR100, because there was a reduction of daylight in an hour. The spreadsheet has been sent to the Verification Team.</p>	
Assessment Means of verification	<p>2nd DOE Request:</p> <p>1) It is not clear as per the explanation given by the PP how the event on 01/05/2011 has been conservatively addressed in the ER calculation.</p> <p>2) PP answer does not mention anything regarding the outlier (on 16/04/2012). The wording of the following part of the PP response shall be revised since the same is not understandable: “This schedule change in PLC probably occurred before the database (SQL) reset at 23:59, with this time the records started to be accumulated over the last register on 15/10/2011. This mistake led to a record flow accumulated over one day with normal flow; however the hourly</p>	

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Clarification Requests by verification team		
	<p>flow records kept within the standards”.</p> <p>3rd DOE Request: PP response (regarding the 2nd DOE Request) is still missing.</p> <p>3rd PP response: 1) To be more conservative PP opted to use the lowest amount of biogas collected. Value of flow-meter FIR100 (102,589). 2) On 16/04/12 BIOGAS stopped the operation (power plant) to do a maintenance in the electric system. Copy of operation book has been sent as evidence. Due to the change to daylight savings time that occurred at the turn of the 15th to 16th of October 2011, the supervisory system did not reset data accumulated as usually occurs at 23:59:59 and this generated an accumulation of data on 16/10/2011, generated a record of accumulated flow, which is actually the flow of the two days (15/10/2011 and 16/10/2011) of operation.</p> <p>DOE conclusion (after 3rd DOE Request): 2) The DOE by assessing the daily occurrence book (IRL 47) and through interviews during the on-site visit confirms that on 16/04/2012 BIOGAS stopped the operation of the power plant to carry out a maintenance in the electric system. Thus, the electricity exported on this day is considerably lower than on other days. Due to the change of daylight saving time from 15/10/2011 to 16/10/2011, the PLC did not record the data of 00:59. The accumulated gas flow was recorded over two days, thus indicating for 16/10/2011 a much higher gas flow for FIR100, FIR400, FIR500 and FIR600 than for other days. The DOE by assessing the revised CER excel calculation tool confirms that the PP corrected the gas flows for FIR 100, FIR400, FIR500 and FIR600 on 16/10/2011 by using the hourly PLC data. The DOE checked the hourly PLC data on 15/10/2011 and 16/10/2011 (IRL 62) and confirms that the revised values in the final CER excel calculation tool are correct.</p> <p>4th DOE Request: 1) Even though PP states in the 3rd response that the lower value of 102,589 Nm3 has been used, the same is not applied in the ER calculation for the day 01/05/2011. PP shall revise the ER calculation.</p>	

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Clarification Requests by verification team		
	<p>4th PP response: 1) The lower value (102,589 Nm3) was used in the ER calculation for the day 01/05/2011.</p> <p>DOE conclusion (after 4th DOE Request): 1) The DOE by assessing the revised CER excel calculation tool and MR confirms that the lower value of 102,589 Nm3 has been used for the day 01/05/2011. Since there was no flaring on 01/05/2011, the DOE confirms through the check of PLC records (IRL 49) that the FIR 100 value is smaller than the sum of FIR 300, FIR 400, FIR 500 and FIR 600 and thus conservatism is ensured by using the FIR 100 value (instead of the sum of FIR 300, FIR 400, FIR 500, FIR 600) for the day 01/05/2011 in the ER calculation.</p>	
Changes in the monitoring report or supporting annexes	MR and CER excel calculation tool have been revised.	

Forward Action Requests by the assessment team		
	Comments and Results	
Issue		
Requirement		
Forward Action	Not applicable	

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Forward Action Requests by the assessment team		
Request		
Response		
Means of verification		
Any resulting changes in the monitoring report or supporting annexes		

Annex 2

Information Reference List


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Interviewed Persons during onsite assessment on 25/10/2012 to 26/10/2012:

Name	Function	Company
Douglas Ramponi	Environmental Engineer	Biogás Energía Ambiental S/A
Anderson Alves da Silva	Landfill Coordinator	Biogás Energía Ambiental S/A
Willian Azevedo da Silveira	Maintenance Coordinator	Biogás Energía Ambiental S/A
Juliana Justi	Project consultant	ARCADIS Logos
Vinicius Bergamin	Technical Auxiliary	Biogás Energía Ambiental S/A
Guilherme Bressan	Contract Supervisor	SOTREQ
Luiz Claudio Benotti	Operator	SOTREQ

Other Interviewed Persons (not during onsite assessment): Not applicable


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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
1.	UNFCCC Webpage	“Bandeirantes Landfill Gas to Energy Project (BLFGE)” http://cdm.unfccc.int/Projects/DB/DNV-CUK1134130255.56/view?cp=2	N/A	
2.	UNFCCC webpage	Registered Project Design Document “Bandeirantes Landfill Gas to Energy Project (BLFGE)” (2 nd crediting period), version 03	01/03/2012	
3.	Biogás Energía Ambiental S/A	Monitoring Report, version 01, monitoring period 23/12/2010 to 31/08/2012	04/10/2012	
4.	TUEV SÜED	17 th verification Report “Bandeirantes Landfill Gas to Energy Project (BLFGE)” in Brazil, N° 600500560, version N° 1.1	15/06/2011	
5.	UNFCCC	Consolidated baseline and monitoring methodology for landfill gas project activities, ACM0001, version 11 Tools as per section B.1. of the PDD CDM Project standard, version 05.0 CDM Validation and verification standard, version 05.0 CDM project cycle procedure	EB47, Annex 6 EB75, Annex 04 EB75, Annex 04 EB75, Annex 04	
6.	Biogás Energía Ambiental S/A	Procedure about competences, consciousness, training, SGA PR 4.4.2-01, rev. 07, (competencia, conscientizacao e treinamento)	06/02/2012	
7.	Biogás Energía	Procedure related to emergency cases of operation of the biogas plant, SGA IT 4.4.6-18,	30/08/2011	


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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Ambiental S/A	rev. 03 (Manual de Operação para partida da planta de gas)		
8.	Biogás Energía Ambiental S/A	Procedure about the elaboration of the monthly report, SGA IT 4.4.6-24 (Procedimentos de elaboração do relatório operacional mensal, rev. 03	06/06/2011	
9.	Biogás Energía Ambiental S/A	Procedure Data backup of the supervisory system, SGA IT 4.4.6-23, rev. 3 (Backup dos dados do sistema supervisorio da usina),	06/06/2011	
10.	Biogás Energía Ambiental S/A	Procedure of monitoring parameters, SGA IT 4.4.6-22 (Procedimento dos parametros de monitoramento da usina), rev. 08	28/07/2012	
11.	Biogás Energía Ambiental S/A	Procedure about the operation team and plant maintenance, SGA IT 4.4.6-29 (Procedimentos e rotina da equipe de operacao da usina), rev. 03	08/06/2011	
12.	Biogás Energía Ambiental S/A	CER excel calculation tool, "BLFGE_18 th _Verification_Calculation SpreadsheetV01", excel file, version 01	04/10/2012	
13.	Biogás Energía Ambiental S/A	Weekly calibration records of the gas analyzer for the monitoring period (manually filled in registration sheet and excel file)	Monitoring period (23/12/2010 to 31/08/2012)	
14.	LINDE	<p>Certificates that gas used for weekly calibrations of the gas analyser is according to the NBR ISO 17025 requirements:</p> <ul style="list-style-type: none"> -Certificate N° 798/10, dated 31/03/2010 (used in weekly calibrations from 09/12/2010 to 16/05/2011) -Certificate N° 3471/10, dated 29/12/2010 (used in weekly calibrations from 17/05/2011 to 10/10/2011) -Certificate N° 797/10, dated 31/03/2010 (used in weekly calibrations from 11/10/2011 to 27/02/2012) -Certificate N° 2029/11, dated 11/08/2011 (used in weekly calibrations from 28/02/2012 to 	See in column "Title/Type of Document. Publication Place"	


Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		25/05/2012) -Certificate N° 548/12, dated 01/03/2012 (used in weekly calibrations from 04/06/2012 to 21/09/2012) Each of the aforementioned certificates ensures a shelf life of the standard gas of 36 months.		
15.	Endress+Hauser	Calibration certificate, FIR 100, serial N° 9407D902000, model t-mass 65, calibration dated 25/04/2007.	26/11/2009	
16.	FCI (Fluid Components International LLC)	Calibration certificate (showing NIST traceability), FIR 100, serial N° 341992, model ST51 flow-meter, calibration dated 29/04/2011	Certificate without date	
17.	IPT	Calibration certificate (indicating as well the accreditation of IPT) for turbine gas flow meter FIR 200, serial N° VG15239, model VTGEX200, calibration dated 01/07/2009,	02/07/2009	
18.	ABSI	Calibration certificates for pressure transmitters, SMAR, model LD291: FIR 200, serial N° L454793/L42236, calibration dated 27/03/2009, certificate dated 30/03/2009 FIR 300, serial N° 33007-06, calibration dated 06/05/2009, certificate dated 10/06/2009 FIR 400, serial N° L454794/L42237, calibration dated 27/03/2009, certificate dated 10/06/2009 FIR 500, serial N° 33006-06, calibration dated 23/06/2009, certificate dated 24/06/2009 FIR 600, serial N° 33005-06, calibration dated 17/04/2009, certificate dated 04/05/2009	See in column "Title/Type of Document. Publication Place"	
19.	SALCAS Ltda. Laboratory	Calibration certificates (indicating as well the accreditation of SALCAS) for temperature transmitters, ASTA, model PT-100: FIR 200, serial N° S377815 FIR 300, serial N° S502986	See in column "Title/Type of Document. Publication	

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		FIR 400, serial N° S502987 FIR 500, serial N° S502988 FIR 600, serial N° S502989 all calibrations dated 26/03/2009 and all certificates dated 30/03/2009.	Place"	
20.	Incontrol	-Calibration certificates for turbine flow meters, model VTGEX-200: FIR 300, serial N° VG083B6 FIR 400, serial N° VG084B6 FIR 500, serial N° VG086B6 FIR 600, serial N° VG085B6, all calibrations dated 12/12/2006 -Explanation given by Incontrol how calibration errors have been determined, submitted on 07/12/2012.	Certificate without date	
21.	IPT	Calibration certificates (indicating as well the accreditation of IPT) for turbine flow meters, model VTGEX-200: FIR 300, serial N° VG083B6, calibration dated 03/11/2011, certificate dated 08/11/2011 FIR 400, serial N° VG084B6, 10/03/2011, certificate dated 06/04/2011 FIR 500, serial N° VG086B6, 14/12/2011, certificate dated 21/12/2011 FIR 600, serial N° VG085B6, 14/09/2011, certificate dated 22/09/2011	See in column "Title/Type of Document. Publication Place"	
22.	FCI (Fluid Components International LLC)	Calibration certificate (showing NIST traceability), FIR 700, serial N° 328849, model ST51 flow-meter, calibration dated 08/09/2010	Certificate without date	
23.	LACTEC	Calibration certificate (indicating as well the accreditation of LACTEC), electricity meter (Power Logic CM4000, serial numbers 0011001414 and 0011001426), calibration dated	17/11/2009	

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		30/10/2009		
24.	CAM Brasil Multiservicos Ltda.	Calibration certificate, electricity meter (Power Logic CM4000, serial number 0011001414 and 0011001426), calibration dated 16/04/2012	25/04/2012 (calibration certificate date 0011001414) 26/04/2012 (calibration certificate date 0011001426)	
25.	IPT	Calibration certificates (indicating as well the accreditation of IPT) of thermocouples F-100 and F-200	24/08/2011 (F-100) 19/09/2011 (F-200)	
26.	AES Eletropaulo	Calibration certificates of AES Eletropaulo meters, LANDIS GYR, Model: SAGA1000 (main meter, serial N° 11002910, stand-by meter, serial N° 11002905, calibrations dated 26/05/2009 and 04/06/2012.	26/05/2009 04/06/2012	
27.	AES Eletropaulo	Monthly invoices for the whole monitoring period for dispatched electricity	Monitoring period (December 2010 to August 2012)	
28.	AES Eletropaulo	Daily AES electricity export data for December 2010	December 2010	
29.	Van der Wiel	Document about the start up of the degassing station on 01/01/2004	23/02/2004	
30.	SOTREQ	Letter about the commissioning date of generators on 16/02/2004	10/10/2004	

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
31.	CATERPILLAR	Technical Specifications of the generators G3516 and TAGs of the generators.	N/A	
32.	Hofstetter	Operation description for flares	N/A	
33.	AERZEN	Work certificate blowers, order N° 61-157544-00, indicating serial numbers 820227, 820228, 820229, 820230 and TAGs of the blowers 1 to 4.	27/11/2003	
34.	Hofstetter	Technical specifications, mini-blower	11/2003	
35.	CETESB	Environmental operational licence, N° 29004149, presented during the 12 th verification, valid until 31/05/2009.	22/12/2008	
		Environmental operational licence, N° 29005600, valid until 19/06/2018	19/06/2013	
36.	CETESB	Solicitation for renewal of the environmental operational licence, protocol N° 29/01126/08	28/04/2009	
37.	CETESB	Email communication from the CETESB manager of the environmental agency in Santana (Celso Machado), confirming that the environmental licensing renewal process is in analysis at CETESB.	07/02/2011	
38.	CETESB	Email communication from environmental agency in Santana (Fabio F. Ferling) confirming that Bandeirantes landfill site is authorized to continue its usual operation even if the new environmental operational license is not issued yet.	07/12/2011	
39.	CETESB	Information from CETESB website about on-going analysis of the environmental operational license process, print out	04/10/2012	
40.	Biogás Energía Ambiental S/A	Functional Organigram of Bandeirantes landfill, rev. 11	24/08/2012	
41.	Biogás Energía Ambiental S/A	Procedure about maintenance of equipment (Manutencao de equipamentos criticos), SGA IT 4.4.6-10, rev. 04 and checklist	25/07/2011	

Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
42.	Biogás Energía Ambiental S/A	Procedure about data collection of flow meters, SGA IT 4.4.6-25, rev. 04, ("Procedimento para coleta de dados de medidores de vazão"),	25/07/2011	
43.	CETESB	Inspection Report, N° 1203650	01/03/2012	
44.	Biogás Energía Ambiental S/A	Environmental Management System Manual, revision 09, presented during document review, no update since the last verification.	06/07/2011	
45.	Biogás Energía Ambiental S/A	Training certificates of new operators hired during the monitoring period Period of training (02/04/2012 to 12/04/2012 for Luciano Eulalio de de Freitas) and (01/05/2012 to 11/05/2012 for Antonio Carlos Nascimento de Moraes)	N/A	
46.	Biogás Energía Ambiental S/A	Procedure about working rules, SGA IT 4.4.6-27 ("Registro de ponto e faltas ao trabalho"), presented in previous verifications, updated since the last verification (general revision)	25/07/2011	
47.	Biogás Energía Ambiental S/A	Daily occurrence book (12/11/2010 installation of FIR700 gas flow meter, 24/04/2011 electrical maintenance, 16/08/2011 change of FIR100 meter from N° 9407D902000 to N° 341992, 23/02/2012 Problem with computer which registers PLC data, 13-14/03/2012 Problems with PLC, 16/04/2012 electrical maintenance, 19/05-23/05/2012 Problems with main manifold, 31/07/2012 Grid problems AES Eletropaulo)	Various dates (see left column)	
48.	SOTREQ	PLC data (Electricity production sheets for the whole monitoring period indicating gross electricity (total electricity generation), exported electricity, internally consumed electricity, operation of the energy plant (hours))	Monitoring period 23/12/2010 to 31/08/2012	
49.	Biogás Energía Ambiental S/A	PLC data (gas flow, methane content, LFG temperature, flare temperature data, electricity consumption diesel generator)	Monitoring period 23/12/2010 to 31/08/2012	
50.	SOTREQ	Procedure related to operation of the biogas plant, UTB-STQ-003 ("Manual de operacao	17/03/2008	

Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		para partida da planta de gas”), rev. 01, Sotreq		
51.	Cummins Brasil Ltda.	Photo of the TAG of the diesel generator	N/A	
52.	Biogás Energía Ambiental S/A	Annual operational report 2010, Bandeirantes power plant confirming the installation of gas flow meter FIR700 in November 2010.	07/02/2011	
53.	Google Earth	Print-screen indicating the GPS coordinates of power house (S 23°25’11.13” W 46°45’21.69”)	29/10/2012	
54.	Endress+Hauser	Manual Thermal Mass Flow meter t-mass 65 I	11/06	
55.	FCI (Fluid Components International LLC)	-FCI ST51 Mass flow meter installation and operation guide (without date) and -FCI ST 51 mass flow meter data sheet (2006) -FCI ST51 Operation theory, PPT presentation (without date) -Email dated 14/11/2013	See in column “Title/Type of Document. Publication Place”	
56.	Incontrol	Operation and Installation Manual for VTG turbine gas flow meters	Without date	
57.	Cummins Power Generation	Manual of diesel generator set, 125 kW, 60 Hz confirming the fuel consumption at full load of 44 l/hr.	2007	
58.	JUMO	Manual, thermocouples (flares)	Without date	
59.	Merlin Gerin	Instruction Manual, Power Logic CM4000	12/2005	
60.	Rosemount Emerson	Instruction Manual Binos 100 M	02/2004	
61.	SOTREQ	Email (dated 25/10/2012) sent from Guilherme Bressan (CAR 2) Email (dated 01/11/2012) sent from Guilherme Bressan (CAR 5 and CR 8) Email (dated 04/11/2012) sent from Guilherme Bressan (CR 6) Email (dated 22/08/2013) sent from Guilherme Bressan (CR 8)	Different dates (see left column)	

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		Email (dated 14/11/2013) sent from Guilherme Bressan (CR 8)		
62.	Biogás Energía Ambiental S/A	Excel sheet ('Dia 16-10-2011 – Calculados a partir dos dados registrados pelo PLC') with calculations of gas flow values for day 16/10/2011 based on recorded PLC values.	Without date	
63.	INMETRO	Accreditation certificate ISO 17025:2005, N° 0432, issued 27/05/2011, valid until 29/06/2013		
64.	FCI (Fluid Components International LLC)	Brochure 'FCI flow calibration laboratory'	2006	The brochure confirms that FCI calibrations are performed utilizing only NIST National Institute for Standards and Technology traceable equipment and instrumentation
65.	ASTA	Manual of temperature transmitter, PT 100	Without date	
66.	SMAR	Manual of pressure transmitter, LD291	03/2012	
67.	ONS (National System Operator)	Maintenance of the measurement system for invoicing, sub-module 12.3	18/06/2010	
68.	Ministry of Mines and Energy	Brazilian Energy Balance (https://ben.epe.gov.br/ , accessed on 15/10/2013)	2013 (base year 2012)	

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	EPE			
69.	Sanitation and Energy State Secretary	BESP (Energy Balance of the State of Sao Paulo)	2013 (base year 2012)	
70.	BIOGAS	Commissioning report about the emergency diesel generator	21/12/2010	
71.	Endress Hauser	ISO17025 accreditation http://www.us.endress.com/eh/sc/america/us/en/home.nsf/#page/id/8FCE83BD9B9FD296C12577F3005C5742 (last accessed on 15/11/2013)	Without date	
72.	ABSI	INMETRO accreditation, N° 56, valid until 01/01/2016 http://www.inmetro.gov.br/laboratorios/rbc/detalhe_laboratorio.asp?num_certificado=56&area=PRESS%C3O (last accessed on 15/11/2013)	Without date	
73.	INCONTROL	ISO 17025 accreditation http://www.incontrol.ind.br/noticias.php?id=41 (last accessed on 15/11/2013)	Without date	
74.	CAM Brasil Multiservicos Ltda.	INMETRO accreditation, N° 0294, valid until 19/02/2016 http://www.inmetro.gov.br/laboratorios/rble/detalhe_laboratorio.asp?nom_apelido=CAMBR%2FML%2FCEAR%C1 (last accessed on 15/11/2013)	Without date	
75.	Biogás Energía Ambiental S/A	Final Monitoring Report, version 07	11/12/2013	
76.	Biogás Energía Ambiental S/A	Final CER excel calculation tool, "BLFGE_18 th _Verification_Calculation SpreadsheetV07", excel file, version 07	11/12/2013	
77.	Green Solution	Legislation update periodically provided to BIOGAS	11/2013	
78.	IPCC	IPCC guidelines	2006	

Annex 3

Appointment Certificates



South Asia

CERTIFICATE OF APPOINTMENT

Ms. Wagner, Karin fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12	21.11.12	21.11.12	1.2

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12					
Further countries						
Financial Expertise						
Date	21.11.12					

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0048/002.

Date	Signature
01.03.2013	



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Beducci, Roberto fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date						1.1, 4.10

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date		21.11.12				
Further countries						
Financial Expertise						
Date						

Qualification in technical areas	
Technical Area	Date
1.1_Thermal energy generation...	21.11.12
4.10_Thermal energy generation...	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0008/002.

Date	Signature
01.03.2013	



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Thaler, Johann fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12			1.2, 3.1, 13.1

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12	21.11.12				
Further countries						
Financial Expertise						
Date	21.11.12					

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	21.11.12
13.1_Waste handling and disposal	21.11.12
3.1_Energy demand	01.03.13

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "EnVironment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0044/002

Date	Signature
01.03.2013	



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Mitterwallner, Robert fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	VER	Other
Date	21.11.12				

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		21.11.12	21.11.12	21.11.12	21.11.12	1.1, 4.10, 1.2, 4.1, 4.3, 13.1

Other qualification						
Country Expertise						
Region	1	2	3	4	5	Other
Date	21.11.12		21.11.12			
Further countries						
Financial Expertise						
Date						

Qualification in technical areas	
Technical Area	Date
1.1_4.10_Thermal energy generation	01.03.13
1.2_Energy generation from renewable energy source	21.11.12
4.1_Cement sector	21.11.12
4.3_Iron and steel sector	21.11.12
13.1_Waste handling and disposal	21.11.12

This appointment is valid until 28.02.2014 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0030/003.

Date	Signature
01.03.2013	
31.07.2013	