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Verification Report

BIOGÁS ENERGIA AMBIENTAL S/A

Periodic Verification of the Registered CDM Project

“São João Landfill Gas to Energy Project (SJ)” in Brazil

UNFCCC 0373-CDMP

Monitoring period 5: 01-04-2008 to 30-06-2008

Report No. 1201549

30 April 2009

TÜV SÜD Industrie Service GmbH
Carbon Management Service
Westendstrasse 199 - 80686 Munich - GERMANY

PERIODIC VERIFICATION

“São João Landfill Gas to Energy Project (SJ)”



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Report No.	Date of first issue	Version:	Date of this revision	No. of pages
1201549	27-04-2009	1	30-04-2009	16
Subject:			5 th Periodic Verification	
Executing Operational Unit:				
TÜV SÜD Industrie Service GmbH, Carbon Management Service Westendstrasse 199 - 80686 Munich, Federal Republic of Germany				
Project Participant (client):				
Biogas Energía Ambiental S/A, Rua Guararapes, 1909 – 4o.andar –cj 41, Brooklin, Sao Paulo, Brazil				
Registration number / Project Title			0373-CDMP / São João Landfill Gas to Energy Project (SJ)	
Monitoring period:			01-04-2008 to 30-06-2008	
First Monitoring Report (version/date)			Version 1 / 02-07-2008	
Final Monitoring Report (version/date)			Version 2 / 20-04-2009	
Summary:				
<p>TÜV SÜD Industrie Service GmbH has performed the 5th periodic verification of the registered CDM project: “São João Landfill Gas to Energy Project (SJ)”. The project consists of capturing landfill gas produced at São João landfill site and subsequent combustion in engines to generate electricity and flaring if necessary. Through combustion and flaring of the landfill gas by an active recovery system, methane emissions released to the atmosphere are avoided. CERs are claimed both for methane avoidance and displacement of fossil fuel based grid electricity.</p> <p>The managements of Biogas Energía Ambiental S/A and Arcadis Tetraplan S/A. are responsible for the preparation of the GHG emissions data and the reported GHG emission reductions.</p> <p>A document review, followed by a site visit was conducted to verify the information submitted by the project participant regarding the present verification period. Based on the assessment carried out, the verifier confirms:</p> <ul style="list-style-type: none"> • that the project has been implemented and operated in accordance with the description given in the registered PDD (version 2b dated 21-12-2005, registration date 02-07-2006) and revised monitoring plan, approved on 18-02-2008, however see the comments regarding installed capacity in chapter 3.2. of this report. • that the project is completely implemented as described in registered PDD and revised monitoring plan. • that the revised monitoring plan complies with the applied methodology (ACM0001, version 2) and the monitoring has been carried out as exactly following the revised monitoring plan. • Installed equipments essential for generating emission reductions run reliably and the meters are calibrated appropriately. The project is generating emission reductions as a CDM project. <p>The verifier can confirm that the GHG emission reductions are calculated without material misstatements. Our opinion refers to the project’s GHG emissions and resulting GHG emission reductions reported, both determined due to the valid and registered project’s baseline, its revised monitoring plan and its associated documents.</p> <p>Based on the information we have seen and evaluated we confirm that the implementation of the project resulted in 171,603 tCO_{2e} of emission reductions during the verification period 01-04-2008 to 30-06-2008</p>				
Verification team: Johann Thaler (Assessment Team Leader) Wilson R. Tomao (Auditor)			Internal Quality Control: Thomas Kleiser	

Abbreviations

ACM	Approved Consolidated Methodology
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO_{2e}	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
FSR	Feasibility Study Report
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
PDD	Project Design Document
PLC	Programmable Logic Controller
PP	Project Participant
SJ landfill	São João landfill
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

Main Documents (referred to in this report)

Methodology (name / version)	Consolidated baseline methodology for landfill gas project activities, ACM0001, version 2	
Registered PDD:	version 2b dated 21-12-2005	
Revised Monitoring Plan:	http://cdm.unfccc.int/Projects/DB/DNV-CUK1145141778.29/view	
	Version N/A	Date: Approved on 18-02-2008
Published Monitoring Report	Version 1	02-07-2008
Revised Monitoring Report	Version 2	20-04-2009
Project documentation link:	http://cdm.unfccc.int/Projects/DB/DNV-CUK1145141778.29/view	

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Annex 1: Verification Protocol

Annex 2: Information Reference List

1 INTRODUCTION

1.1 Objective

Biogas Energía Ambiental S/A has commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its registered CDM project: “São João Landfill Gas to Energy Project (SJ)”.

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 “São João Landfill Gas to Energy Project (SJ)”, version 2b dated 21-12-2005, 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 and verifiable and in accordance with applicable CDM requirements,
- ensure that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the revised monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the Consolidated baseline methodology for landfill gas project activities, ACM0001, version 2.

1.2 Scope

The verification scope is defined as 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 revised monitoring plan and validation report, the verification report from the 4th periodic verification, 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.

TÜV SÜD has, based on the requirements in the VVM applied a rule-based approach. The principles of accuracy and 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 GHG Project Description

Project activity:	“São João Landfill Gas to Energy Project (SJ)”
UNFCCC registration number:	0373-CDMP
Project Participants:	1. Biogas Energia Ambiental S.A. 2. Prefeitura Municipal de Sao Paulo – the Municipality of São Paulo
Location of the project:	Av. Sapopemba, km 33, Bairro Jardim Rodolfo Pirane, São Paulo, Brazil, GPS coordinates: 23°38’10,37” S, 46°24’51,91” W (location of the powerhouse)

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Date of registration: 02-07-2006

Starting date of the crediting period: 22-05-2007

São João Landfill Gas to Energy Project is a project designed to explore the landfill gas produced in São João landfill, one of the biggest landfills in Brazil, situated in Sao Paulo metropolitan region. Besides avoiding the release of methane into the atmosphere, the project activity generates renewable electricity. SJ landfill site had at the time of the 5th monitoring period an installed capacity of 22.4 MW (14 engines per 1,6 MW, whereas 1 engine of 1,6 MW was kept as standby) and an installed operative capacity of 21.56 MW (14 engines per 1.54 MW). Nowadays, SJ landfill site has an installed capacity of 25.6 MW (16 engines per 1,6 MW, whereas 1 engine of 1,6 MW is kept as standby) and an installed operative capacity of 24.64 MW.

Generators are of model 3520 and were manufactured by Caterpillar in 2007. In the time when landfill gas is not used for electricity generation, the same is flared in 3 enclosed flares of model Hofgas Efficiency 5000, manufactured by Hofstetter in 2007.

At the time of the 5th verification, 3 blowers with a capacity of each 6000 m³/h have been used for transportation of the landfill gas from the landfill to the gas engines and flare. Nowadays, 4 blowers are in use. The blowers (model: 151A.05) were manufactured by Continental Industrie in 2007. A diesel generator (model 3406) with a capacity of 400 kW, manufactured by Caterpillar is still installed at the degassing station, had supplied electricity to SJ landfill until the electricity generation started and is nowadays used as stand-by equipment in case of emergency as e.g. power shortages.

2 METHODOLOGY

2.1 Verification Process

The verification process is based on the approach depicted in the Validation and Verification Manual.

Standard auditing techniques have been adopted. The verification team performs first a desk review, followed by an on-site visit which results in a protocol including all the findings. The next step is to close out the findings through direct communication with the PPs and finally prepare 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.

2.2 Verification Team

The appointment of the team takes into account the coverage of the technical area(s), sectoral scope(s) and relevant host country experience for verifying the ER achieved by the project activity in the relevant monitoring period for this verification.

The verification team was consisting of the following members:

Name	Qualification	Coverage of technical scope	Coverage of sectoral expertise	Host country experience
Johann Thaler	ATL	p	p	p
Wilson R. Tomao	A	p	p	p

Johann Thaler graduated as Master of environmental Economy at the University of Augsburg. During his study he got first experiences in environmental management systems. His master thesis was about a fuel switch program in Brazil as a CDM project. Based in Brazil he has been working for TÜV SÜD as a GHG auditor on freelance basis since March 2005. He attended and successfully finished a ISO 14001 Environmental Management Internal Auditing Training.

Wilson R. Tomao is lead auditor for environmental management systems. He is familiar with local laws and regulations and the assessment of technical installations. He has been working for TÜV SÜD as a GHG auditor since March 2002.

2.3 Review of Documents

The Monitoring Report version 1 was submitted by the PP which was made publicly available on the UNFCCC website before the verification activities started. The published MR was assessed based on all the relevant documents as listed earlier. The aim of the assessment in the desk review was to verify the completeness of the data and the information presented in the MR. The compliance check of the MR with respect to the monitoring plan depicted in the registered PDD and 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. The evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions was also carried out. A complete list of all documents reviewed is available in Annex 2 of this report.

2.4 On-site Assessment and follow-up Interviews

On July 11, 2008, TÜV SÜD performed a physical site inspection and on-site interviews with 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 (raw data),
- check the monitoring equipments 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 the persons interviewed during this verification activity is included in Annex 2.

2.5 Quality of Evidence to Determine Emission Reductions

Among many others the following relevant and reliable evidences have been used by the audit team during the verification process:

- Excel calculation sheets for the average flare temperature when the instant gas-flow is higher than zero for every hour of the monitoring period (excel sheet processing PLC data) (IRL 32)
- CER calculation tool (IRL 27)
- PLC data (IRL 36) in order to verify gas flow data (FIR500, FIR600, FIR800), methane content in the residual gas and electricity exported data.
- Calibration certificates and records (IRL 14, 19, 31, 33, 34, 39-48)
- Exhaust gas reports (IRL 15) and flare efficiency calculation sheets (IRL 16)
- AES Eletropaulo electricity export transaction notes (IRL 37)
- Monthly electricity export data and graphics from website AES Eletropaulo (IRL 38)

Sufficient evidence covering the full verification period in the required frequency is available to validate the figures stated in the final MR. The source of the evidences will be discussed in chapter 3 of this report. Specific cross-checks have been done in cases that further sources were available. All figures in the monitoring report were cross-checked by the audit team against the raw data. The data collection system meets the requirements of the monitoring plan as per the methodology.

2.6 Resolution of Clarification and Corrective and Forward Action Requests

The objective of this phase of the verification process was to resolve any outstanding issues which needed to be clarified for TÜV SÜD's positive conclusion on the GHG emission reduction calculation. The findings raised as Forward Action Requests (FARs) (if any) indicated in previous reports (validation/verification) were clarified during communications between the PP and TÜV SÜD.

To guarantee the transparency of the verification process, the concerns raised, based on the desk review and subsequent on-site audit assessment and follow up interviews, together with the responses given are documented in Annex 1 (verification protocol).



A Corrective Action Request is raised where TÜV SÜD identifies:

- non-conformities in monitoring and/or reporting with the monitoring plan and/or methodology;
- that the evidence provided is not sufficient to prove conformity;
- mistakes in assumptions, data or calculations that impair the ER;
- FARs stated during validation that are not solved until the on-site visit.

A Clarification Request is raised where TÜV SÜD does not have enough information or the information is not clear in order to confirm a statement or data.

A Forward Action Request is raised where TÜV SÜD identifies that monitoring and/or reporting required special attention or adjustments for the next verification period.

Information or clarifications provided as response to a CAR, CL or FAR could also lead to a new CAR.

2.7 Internal Quality Control

As an ultimate step of verification the final documentation including the verification report and the protocol have to undergo an internal quality control by the Certification Body (CB) “climate and energy”, i.e. each report has to be finally approved either by the Head of the CB or the Deputy. In case one of these two persons is part of the assessment team the approval can only be given by the other one. If the documents have been satisfactorily approved, the Request for Issuance is submitted to the CDM-EB along with the relevant documents.

3 VERIFICATION RESULTS

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 final Monitoring Report (20-04-2009, version 2). The verification findings for each verification subject are presented below:

3.1 FARs from Validation / Previous Verification

One Forward Action Request was defined in the previous (4th verification). FAR 1 from the 4th verification was converted to CAR 2 of this 5th verification and has been adequately resolved (see chapter 4 of this report and Annex 1).

3.2 Project Implementation in accordance with the registered Project Design Document

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 registered PDD. The project activity is completely operational and the same has been confirmed on-site.

No data and/or variables presented in the MR differ significantly from the stated in the registered PDD, which would to cause an increment of the ER in this period or in future periods in relation to the estimates in the registered PDD.

Regarding the installed capacity, SJ landfill site had at the time of the 5th monitoring period an installed capacity of 22.4 MW (14 engines à 1,6 MW, whereas 1 engine à 1,6 MW was kept as standby) and an installed operative capacity of 21.56 MW (14 engines à 1.54 MW). Nowadays, SJ landfill site has an installed capacity of 25.6 MW (16 engines à 1,6 MW, whereas 1 engine à 1,6 MW is kept as standby) and an installed operative capacity of 24.64 MW.

The registered PDD mentions an installed capacity of 20 MW for electricity generation. However, it is not clearly stated in the PDD whether the installed capacity of the project activity must be 20 MW physical installation. Thus, the project participants together with TÜV SÜD decided to submit a Request for Clarification in September 2008 to the CDM EB to clarify, whether the wording presented in the PDD “20 MW installed capacity” is to be taken as fix maximum physical installed capacity or whether it can be understood as the equivalent average capacity displacing energy from the grid.

The CDM-EB in an Email response on April 02, 2009 explained the following: “Regarding the content itself, the request for clarification is how to interpret the capacity defined in the PDD. Unfortunately there is no further information as to the cause of this discrepancy. During verification, the DOE should seek further clarification from the project participants on this discrepancy and to see whether a request for deviation can be used to fit this purpose, as currently it is the only means to communicate with the Board on such issues.”

For this monitoring period, the actual electricity production (36,221 MWh) has not reached the capacity stated in the PDD considering 91 days in the given monitoring period (38,309 MWh (154,080 MWh / 366 days¹ x 91 days)). The actual electricity production is based on AES Eletropaulo monthly electricity export data and graphics (IRL 38), which has been cross-checked with the electricity transaction notes (IRL 37). AES Eletropaulo electricity export data are finally used for the CER calculation in a conservative way, as the same are lower than the SJ landfill electricity export data due to transmission losses between the landfill and the

¹ 2008 was a leap year

substation. Besides, the AES Eletropaulo data indicates the amount of electricity which is effectively dispatched to the Brazilian grid.

As for this monitoring period the capacity stated in the PDD has not been reached, no Request for Deviation is submitted, however FAR 2 is raised to verify in the next verification(s) whether the actual electricity generation is higher than the capacity stated in the PDD. In the case this would happen, a Request for Deviation would be submitted to the CDM-EB.

For the sake of clarity, it should be mentioned that the amount of emission reductions can be different to the amount calculated in a year period in the PDD in "SECTION E - Estimation of GHG emissions by sources". For this monitoring period, emission reductions are about 28% lower than estimated in the PDD². The difference between the PDD estimatives 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.

All the metering instruments are adequately calibrated according to the calibration plan. The procedure PO-005 indicates the calibration dates of all flow-meters and the electricity meter (Merlin Gerin Power Logic CM4000). Weekly calibration records (for the period from 25/03/2008 to 08/07/2008) for the gas analyser have been presented to the verification team during the on-site visit.

It has to be emphasized that there are no international general rules on how often to recalibrate the meters. A letter issued by Elster Instromet (IRL 19) and information provided by Schneider Electric - Merlin Gerin (IRL 31) evidence this information. In the case of the São João landfill, Biogas Energia Ambiental S.A. choose an calibration interval of 5 years.

3.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The revised monitoring plan is in accordance with the approved methodology, ACM0001, Version 2, applied by the proposed CDM project activity. A Request for revision of the monitoring plan was submitted on November 09, 2007 to TUEV SÜED and approved by the EB on February 18, 2008. The major changes compared to the monitoring plan of the registered PDD, version 2b, dated 21-12-2005 are the followings:

1. The amount of landfill gas sent to the powerhouse will be measured by an own flow meter, instead of being calculated as difference between total landfill gas captured and the amount of landfill gas sent to flares. Thus, 3 flow-meters are installed instead of the two mentioned in the initial monitoring plan.
2. Besides, it was explained that "the net quantity of electricity displaced" will be measured by an electricity meter. SJ will measure the total electricity fed into the grid (via an electricity-meter).
3. The use of a diesel generator to supply the project's electric needs from the beginning of the project's operation until January/2008, when the power house entered into operation. This source of project emission was considered in the calculation of emission reduction. However, this project emission source is in stand-by now as the electricity generated in the power house is used to supply the project's internal needs – the diesel generator is only turned on during black-outs of electricity generation.
4. The diesel generator CO₂ emission factor was adopted based on a conservative value (1.3 tCO₂/MWh), according with the "Tool to calculate project emissions from electricity consumption (version 1)".

² The annual value of 2008 of 960,678 tCO₂ was converted to a value considering the time of the monitoring period



- Starting date of the project activity was moved from 30/06/2006 to 22/05/2007 due to the bureaucratic process of Environmental Licensing and due to the negotiation aiming the electricity sale (PPA), which delayed the start of the project's civil works.

This verification is based on the revised monitoring plan. All parameters were determined as prescribed. All documents have been presented during the verification process. Changes in the Monitoring Report, which were demanded by the verification team, have been realized.

3.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the revised monitoring plan. All parameters were monitored and determined as per the revised Monitoring Plan.

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

Data / Parameter:	LFG_{Total}
Data unit:	Nm ³ (Gas flow (FIR 600), temperature and pressure are measured by a turbine gas flow meter, temperature and pressure transmitter respectively. The PLC receives the signal of those three measurements and automatically makes the conversion to Nm ³ . Even though temperature and pressure are not separately monitored, errors from the transmitters are conservatively considered in the CER calculation).
Description:	Total amount of landfill gas captured
Source of data used:	PLC data The turbine flow meter sends continuously signals to the PLC; every 5 minutes data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered. The equipment used (gas flow meter, temperature transmitter and pressure transmitter) has been calibrated according to the requirements of the revised approved monitoring plan. Calibration certificates (IRL 39, 40, 41) have been presented to the verification team. Nederlands Meetinstituut (http://nmi.nl/index.php?pageld=536&lg=en , consulted in 17/12/2008) is a qualified company to do calibrations.
Means of verification/Comments:	Total gas flow data (FIR 600) in the CER excel calculation tool have been verified by PLC data during the on-site visit.
Cross-check	Data of the total flow metered by FIR 600 have been compared with the sum of FIR 500 and FIR 800.

Data / Parameter:	LFG_{Flare}
Data unit:	Nm ³ (Gas flow, temperature and pressure are measured by a turbine gas flow meter, temperature and pressure transmitter respectively. The PLC receives the signal of those three measurements and automatically makes the conversion to Nm ³ . Even though temperature and pressure are not separately monitored, errors from the transmitters are conservatively considered in the CER calculation).
Description:	Amount of landfill gas to flares
Source of data used:	PLC data The turbine flow meter send continuously signals to the PLC; every 5 minutes data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered. The equipment used (gas flow meter (FIR 500), temperature transmitter and



	pressure transmitter) has been calibrated according to the requirements of the revised approved monitoring plan. Calibration certificates (IRL 42, 43 and 44) have been presented to the verification team. Nederlands Meetinstituut, (http://nmi.nl/index.php?pagelid=536&lg=en , consulted in 17/12/2008) is a qualified company to do calibrations.
Means of verification/Comments:	Gas flow data to flares (FIR 500) in the CER excel calculation tool have been verified by PLC data and excel sheet processing PLC data (IRL 32) during the on-site visit. For details see chapter 3.5.
Cross-check	Data of the total flow metered by FIR 600 have been compared with the sum of FIR 500 and FIR 800.

Data / Parameter:	LFG_{Electricity}
Data unit:	Nm ³ (Gas flow, temperature and pressure are measured by a turbine gas flow meter, temperature and pressure transmitter respectively. The PLC receives the signal of those three measurements and automatically makes the conversion to Nm ³ . Even though temperature and pressure are not separately monitored, errors from the transmitters are conservatively considered in the CER calculation).
Description:	Amount of landfill gas to powerhouse
Source of data used:	PLC data The turbine flow meter send continuously signals to the PLC; every 5 minutes data are registered in a data base (SQL-Server). Besides, every hour the accumulated data are registered. The equipment used (gas flow meter (FIR 800), temperature transmitter and pressure transmitters) has been calibrated according to the requirements of the revised approved monitoring plan. Calibration certificates (IRL 45, 46 and 47) have been presented to the verification team. Nederlands Meetinstituut, (http://nmi.nl/index.php?pagelid=536&lg=en , consulted in 17/12/2008) is a qualified company to do calibrations.
Means of verification/Comments:	Gas flow data to the generators (FIR 800) in the CER excel calculation tool have been verified by PLC data during the on-site visit.
Cross-check	Data of the total flow metered by FIR 600 have been compared with the sum of FIR 500 and FIR 800.

Data / Parameter:	wCH4
Data unit:	m3 CH4/m3 LFG expressed in %
Description:	Methane fraction in the landfill gas
Source of data used:	PLC data 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. Weekly calibration certificates (IRL 14) of the gas analyser have been presented to the verification team and were verified by the team. A certificate, that gas used for weekly calibrations of the gas analyser is according to Brazilian standards and norms, has been submitted to the verification team (IRL 48).
Means of verification/Comments:	The data in the CER excel calculation tool were verified by PLC data during the on-site visit.
Cross-check	Not applicable

Data / Parameter:	Flare efficiency
Data unit:	%
Description:	Flare/combustion efficiency
Source of data used:	Quarterly exhaust gas analysis reports provided by the laboratory Bioagri,

	<p>accredited according to ISO 17025. Calibration of the flare temperature meter is not required according to the revised monitoring plan.</p>
Means of verification/Comments:	<p>The flare efficiency is calculated using data from the methane content in the exhaust gas and methane content in the residual gas by applying a mass balance. The verification team verified the flare efficiency calculation by using the data of methane content in the exhaust gas of the quarterly exhaust gas analysis reports provided by the accredited laboratory Bioagri (analyses done on 04/01/2008 and 04/04/2008) and the methane content of the residual gas measured instantaneously by São João operational personnel when exhaust gas analyses were done. The verification team can confirm that the operation time of the flares is continuously monitored by the PLC and every 5 minutes the instantaneous temperature is registered by the supervisory system. In order to guarantee the real destruction of the gas, the flares are equipped with an automatic system which can detect the existence of the flame.</p>
Cross-check	Not applicable

Data / Parameter:	Net quantity of electricity displaced during the year
Data unit:	MWh
Description:	Net electricity exported to the grid
Source of data used:	<p>PLC data, AES Eletropaulo monthly electricity export transaction notes and monthly electricity export data and graphics from website AES Eletropaulo. The equipment used (electricity meters) has been calibrated according to the requirements of the revised approved monitoring plan. Calibration certificate at factory (IRL 34) have been presented to the verification team. Schneider Electric is a qualified company to do calibrations.</p>
Means of verification/Comments:	<p>Electricity export data in the CER calculation tool were verified by PLC data provided by SJ landfill site, and the monthly values were compared with AES Eletropaulo³ electricity export transaction notes and monthly electricity export data and graphics from AES Eletropaulo website. The lower of both (SJ and AES Eletropaulo) values was conservatively used in the CER calculation.</p>
Cross-check	<p>As explained above, electricity export data from SJ landfill site were cross-checked with AES Eletropaulo data and the lower of both values was conservatively used in the CER calculation.</p>

Data / Parameter:	Electricity consumption from the diesel generator
Data unit:	MWh
Description:	Electricity consumption from the diesel generator
Source of data used:	<p>PLC data The equipment used (electricity meter) has been calibrated according to the requirements of the revised approved monitoring plan, even though according to the manufacturer, this type of electricity-meter does not require regular calibration. Meter tests (IRL 26) have been presented to the verification team.</p>
Means of verification/Comments:	<p>Electricity consumption from the diesel generator in the CER calculation tool was verified by excel sheet processing PLC data (IRL 32) during the on-site visit.</p>
Cross-check	Not applicable

Data / Parameter:	Regulatory requirements relating to landfill gas projects
Data unit:	-

³ AES Eletropaulo measures the electricity exported at the substation connected to the grid.

Description:	Regulatory requirements relating to landfill gas projects
Source of data used:	Legislation
Means of verification/Comments:	There are no regulatory requirements for methane destruction of landfill gas in Brazil according to the best knowledge of the verification team.
Cross-check	Interview with Eduardo Cardoso Filho (Arcadis), who periodically checks whether regulatory requirements for landfill gas in Brazil have been elaborated.

3.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

All data have been available and all the parameters have been monitored in accordance with the approved revised monitoring plan.

The reported data have been cross checked against other sources when available as explained above in chapter 3.4.

Monitoring of the operation time of the flares is made continuously by the PLC and every 5 minutes the instantaneous temperature is registered by the supervisory system. In order to guarantee the real destruction of the gas, the flares are equipped with an automatic system which can detect the existence of flame. According to the manufacturer, if the temperature of the flare is higher than 1,350°C, the flare will be stopped automatically and if the temperature is below 900°C, an alarm indicates the operator that the flare is running out of the specified combustion temperature range. If temperature decreases significantly from one registration to another (5 minutes interval), the main valve is closed, that means that the flare is stopped and no gas is being burnt. Confirmation that no gas is being burnt can be obtained by the instant reading of gas flow from the three thermal-mass flow-meters ⁴.

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

- an hourly average of flares temperature was calculated, considering the temperature registers when the instant gas-flow was above 0 Nm³/h (flares are accepting gas);
- If the average temperature is below 900 °C, the gas-flow registered during this certain hour is considered equal to zero and excluded from CERs calculation.

Proper excel sheets (here called “excel sheet processing PLC data”) applying the above mentioned procedure were presented to the verification team and have been cross-checked. The verification team confirms, that the procedure is correctly applied and ensures a realistic and conservative emission reduction calculation.

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

The verifier confirms that all the assumptions, emissions factors and default values (ex-ante values from PDD) have been correctly justified.

⁴ The three thermal-mass flow-meters were installed for operational control, not for CERs calculation.

4 SUMMARY OF FINDINGS

The verifier can confirm that the published MR and related documents are complete and verifiable in accordance with the CDM requirements. All the findings raised by the verification team, the responses by the PPs and the conclusion from the team are presented in Annex 1, the means of verification and resulting changes in the MR or related documents are stated as follows:

CAR 1, means of verification
The final submitted monitoring report was verified by the verification team. All requested changes and additional information have been provided.
CAR 1, changes in the MR or related documents
The monitoring report has been revised.
CAR 2, means of verification
The manual data records of the operators were cross-checked, even though the same do not enter into the CER calculation.
CAR 2, changes in the MR or related documents
Manual data records of the operators in digital form were revised.
CAR 3, means of verification
The final submitted monitoring report and CER calculation tool were verified by the verification team. Gas flow data of FIR 600 and FIR 800 have been revised and are in consistency with the PLC data now.
CAR 3, changes in the MR or related documents
The monitoring report and CER calculation tool have been revised.
FAR 1, means of verification
Not applicable
FAR 1, changes in the MR or related documents
Not applicable
FAR 2, means of verification
Not applicable
FAR 2, changes in the MR or related documents
Not applicable
FAR 3, means of verification
Not applicable
FAR 3, changes in the MR or related documents
Not applicable

5 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed the 5th periodic verification of the CDM project: “São João Landfill Gas to Energy Project (SJ)”. The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC). The managements of Biogas Energía Ambiental S/A and Arcadis Tetraplan S/A. are responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project’s revised monitoring plan, approved on 18-02-2008 and the applied methodology ACM0001, Version 2.

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the approved revised monitoring plan;
- the project is operated as planned and described in the validated and registered project design document, however see the comments regarding installed capacity in chapter 3.2. of this report.
- that the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- that the monitoring system is in place and generates GHG emission reductions data;
- that the GHG emission reductions are calculated without material misstatements;
- that the monitoring plan in Monitoring Report is as per the approved revised monitoring plan.
- that the approved revised monitoring plan is as per the applied methodology.

Our opinion refers to the project’s GHG emissions and resulting GHG emission reductions reported both determined due to the valid and registered project’s baseline, its revised monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm the following statement:

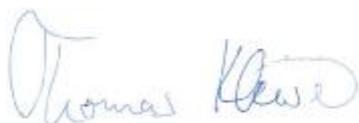
Reporting period: From 01-04-2008 to 30-06-2008

Verified emissions in the above reporting period:

Emission reductions from methane:	162,019	t CO _{2e}
Emission reductions from electricity:	9,599	t CO _{2e}
Project emissions:	15	t CO _{2e}
Total Project Emission Reductions:	171,603	t CO _{2e}

Munich, 30-04-2009

Fortaleza, 30-04-2009



Thomas Kleiser
Head of the Certification body “climate
and energy“



Johann Thaler
Assessment Team Leader



Annex 1: Verification Protocol

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1 PERIODIC VERIFICATION CHECKLIST

Table 1: Data Management System/Controls

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
1. Defined organizational structure, responsibilities and competencies		
1.1 Position and roles	Full	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 quality manual.
1.2 Responsibilities	Full	<p>Responsibilities are clearly defined for operation, monitoring and data management</p> <p>An updated functional organigram, dated 25/06/2008 (responsibles for documentation were included in the organigram) of Sao Joao Ambiental S.A including a summary description from 28/11/2007 of tasks and responsibilities were presented to the verification team. The description clearly shows the tasks and responsabilites related with the CDM activity.</p> <p>Sotreq is responsible for supervising the operation related with electricity generation at SJ landfill for one year. For that time, Sotreq is continuously represented by a supervisor and once a week for one day by a coordenator. Sotreq provides continous training to local operators from SJ landfill. The contract (signed for one year) between Sotreq and Biogas Energia Ambiental S.A..has been presented to the verification team at the 4th verification.</p> <p>The procedure PO-009 (Procedimentos e ações em situações de emergencia) and PO-001 (Partida da planta de gas apos queda de energia da concessionária) explains actions in emergency situations. They clearly show different kinds of emergencies, its</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		causes, actions to be taken and responsibilities. No revision of those procedures has taken place.
1.3 Competencies needed	Full	<p>All competencies and capabilities are covered by well trained and experienced personnel.</p> <p>Between the 4th and this 5th verification, 2 new operators have been hired. Certificates about realized training for those new operators have been presented to the verification team.</p> <p>During the on-site visit a responsibility matrix (including the hierarchy sequence) has been presented (elaborated on November 28, 2007 and approved on January 18, 2008), explaining that in absence of a determined person, the next sub-ordinated person assumes the function with its responsibilities of the absent person.</p> <p>The summary description dated 28/11/2007 describes the hiring requirements for each job position.</p>
1.4 Management and operational system	Full	Operational procedures PO-001 until PO-011 have been presented during the on-site visit. These procedures include all CDM related essential informations.
2. Conformance with monitoring plan		
2.1 Reporting procedures	Full	<p>The procedure PO-005 explains reporting procedures. See 3.3.</p> <p>The monitoring plan of the registered PDD was changed. The monitoring plan of the registered PDD mentioned that the amount of landfill gas to the powerhouse would be calculated and is determined by the difference between total landfill gas captured and the amount of landfill gas sent to flares. This was changed in the following way: The amount of landfill gas will be measured by an own flow meter. Thus, in total there are installed 3 flow-meters instead of 2 as mentioned in the initial monitoring plan: the first to</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>measure the total flow, the second to measure the gas sent to the flares and the third to measure the methane sent to the power house.</p> <p>Furthermore, the parameter "electricity fed into grid" was changed to "Net quantity of electricity displaced during the year". Besides, it was explained that "the net quantity of electricity displaced will be measured by an electricity meter. SJ will measure the total electricity fed into the grid (via an electricity-meter). Data will be kept for two years after the end of the crediting period.</p> <p>While the power house is not installed, SJ will consume electricity from a diesel generator. The electricity consumed will be measured by a flow-meter. The diesel generator CO2 emission factor is based on a conservative value (1.3 tCO2/MWh), according with the "Tool to calculate project emissions from electricity consumption (version 1)". Data will be kept for two years after the end of the crediting period."</p> <p>A request for revision of the monitoring plan was submitted on November 09, 2007 to the DOE and approved by the EB on February 18, 2008.</p>
2.2 Necessary Changes	Full	See 2.1.
3. Application of GHG determination methods		
3.1 Methods used	Partial	<p>The calculation procedures reflect the revised monitoring plan completely. Some parts of the monitoring plan have been changed (see 2.1.).</p> <p>All algorithms as given by ACM0001, version 2, which are required to calculate the emission reductions, are correctly applied in the monitoring report and in an Excel spreadsheet.</p> <p>All monitored data (including from this verification on net electricity export data) are</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>transferred from flow-meters electronically to a centralized computer software (sistema supervisorio, called ELIPSE).</p> <p><u>Corrective Action Request 1:</u></p> <p>The following changes/addings should be provided in the monitoring report:</p> <ol style="list-style-type: none"> 1. Please revise in 1.6. of the monitoring report the information that "monitoring of the parameters of methane sent to the power house occurred" only from that verification on. 2. Please take out in 1.2. of the monitoring report that "emission reduction from the electricity exported were not considered in this version of the monitoring report". Electricity export was partly considered in the CER calculation. Besides, it should be mentioned, that the monitoring system of net electricity export data was fully functioning. 3. Please include the net electricity export data for the months April and May into the monitoring report (as well as into the excel calculation sheet). The data for those two months were missing both in report as well as in the calculation sheet. Please revise the CER calculation. 4. In 2.2.1. please revise the comment regarding EGy. 5. Please mention in 1.2. that 2 electricity meters (measuring the net electricity exported) are in use. 6. Please revise information in 1.2. of the monitoring report regarding the engines in stand-by: according to information on-site, only one engine (1,6 MW) is in stand-by. 7. Please update the information regarding electricity generation through the diesel

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>generator in 1.2.</p> <p>8. Please update the functional organigram</p> <p>9. Please update in 2.3.3 the operators which were hired.</p> <p>10. Please revise in 2.3.4. the information that Arcadis downloads the data every week for elaboration of the monitoring period to "regularly".</p> <p>11. Regarding installed capacity, it should be made clear in the MR how the situation looks like nowadays.</p> <p>12. In 2.2.: Please correct the error of the electricity meter (grid) to 1%.</p>
3.2 Information/process flow	Partial	<p>The information and process flow is well established. The procedure PO-005 has been presented to the verification team explaining the information and process flow.</p> <p>In case of electricity black-outs or oscillations of electricity (troubleshooting) there are well established steps that avoid data loss. Operators register all gas flow data manually every 3 hours in proper sheets. Those manual records are verified by the supervisor of operation and maintenance weekly for completeness. This is evidenced by procedure PO-011. Furthermore, every hour, the operators perform a "print-screen" of the PLC Controlling System Panel, which presents the operational variables.</p> <p>Even though manual data registries did not enter into the CER calculation for this monitoring period, the verification team cross-checked the manual data registries. Various inconsistencies between the registry in paper form and the digital excel sheet have been identified, mainly in April 2008. CAR 2 refers to resolving these inconsistencies.</p> <p>Arcadis (Eduardo Cardoso Filho) has not followed the instruction requested in FAR 1 from the 4th verification to transfer himself the manual data records to a proper sheet in</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>digital form and to compare it with the digital sheet filled out by the operator for consistency. Thus, FAR 1 from the 4th verification will be converted to CAR 2 of this 5th verification and a new FAR will be raised in order to avoid data transfer errors for manual data in the future.</p> <p><u>Corrective Action Request 2:</u></p> <p>Arcadis (Eduardo Cardoso Filho) should provide the manual data records in a proper sheet in digital form for the monitoring period to the verification team.</p> <p><u>Forward Action Request 1:</u></p> <p>The correctness of manual data transfers done by the operator into the excel file should be regularly checked by the technical assistant or monitoring supervisor in order to avoid data transfer errors in the future.</p>
3.3 Data transfer	Full	<p>As mentioned above (see 3.1), data transfer occurs electronically by using a supervisory software (ELIPSE), which has been installed together with the project equipment. No manipulation or modification of this electronic data is possible. Data are downloaded once a week directly into an Excel sheet.</p> <p>A representative of Arcadis Tetraplan (Eduardo Cardoso Filho) downloads the primary PLC data regularly, and compares it, in the case PLC data is missing, with the manual data registries made by the operator. The gas flow data to the flares, measured by flow meter FIR 500, are examined in a proper excel sheet (in the following called: excel sheet processing PLC data) whether the hourly average temperature of the respective flares is below 900°C; if this is the case, the gas flow for this hour is not considered in the CER calculation. When calculating the hourly average of the flare temperature, only those temperature registries were considered when the instant gas-flow was above 0</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>Nm3/h. The worksheets of that excel sheet are connected with links.</p> <p>The procedure PO-005 ("Procedimento dos parametros de monitoramento da usina"), explains the double checking by Arcadis Tetraplan (Eduardo) and the regular downloading of primary data by a representative of Arcadis Tetraplan (Eduardo).</p>
3.4 Data trails	Partial	<p>Data in the CER calculation tool of "LFG measured FIR600", "LFG measured FIR 800" and "methane content in the gas in %" were verified by PLC (primary) data. Data of "net electricity exported" were verified for June 2008 and should be completed in monitoring report as well as CER calculation tool as requested in CAR 1.</p> <p>Regarding the data of "LFG measured FIR600" and "LFG measured FIR800", various inconsistencies have been identified, as the daily report not always registered the data at 23:59 o'clock, but sometimes at a different hour. CAR 3 was raised to resolve these inconsistencies. A synchronisation of the PLC was done on June 03, 2008 by the company "Next automation", in order to avoid such problems in the future.</p> <p>Regarding "methane content in the gas in %", some inconsistencies have been identified, however in each case the figure indicated in the monitoring report and CER calculation tool is more conservative than the primary data.</p> <p>All verified data of "net electricity exported" for June 2008 were consistent between monitoring report and primary data (PLC data). However, refer to CAR 1.</p> <p>Data of "LFG measured FIR500" have been verified by means of the "excel sheet processing PLC data". No inconsistencies have been found.</p> <p>Data of the total flow metered by FIR 600 have been compared with the sum of FIR 500 (gas flow to flares) and FIR 800 (gas flow to the powerhouse). For all days, the sum of FIR 500 and FIR 800 (both FIR 500 and FIR 800 enter into the CER calculation) is less than the total flow (the same does not enter into the CER calculation), thus the gas flow</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>data are reliable and conservatively applied in the CER calculation.</p> <p>The exhaust gas analysis reports (from 17/01/2008 and 14/04/2008) were submitted to the verification team. The calculation of the flare efficiency were verified by the verification team and the flare efficiency can be confirmed to be correct as indicated in the monitoring report.</p> <p><u>Corrective Action Request 3:</u></p> <p>Please revise the data of "LFG measured FIR600" and "LFG measured FIR800" for May and June 2008 in the Monitoring Report and CER calculation tool. The data should be revised as according to the registered data in the hourly report sheets.</p>
4. Identification and maintenance of key process parameters		
4.1 Identification of key parameters	Partial	<p>Key process parameters (except installed capacity for electricity generation) are well defined in the monitoring report, and exactly as described in the PDD.</p> <p>Regarding installed capacity, SJ landfill site had at the time of the 5th monitoring period an installed capacity of 22.4 MW (14 engines per 1,6 MW, whereas 1 engine of 1,6 MW was kept as standby) and an installed operative capacity of 21.56 MW (14 engines per 1.54 MW). Nowadays, SJ landfill site has an installed capacity of 25.6 MW (16 engines per 1,6 MW, whereas 1 engine of 1,6 MW is kept as standby) and an installed operative capacity of 24.64 MW.</p> <p>The registered PDD mentions an installed capacity of 20 MW for electricity generation. However, it is not clearly stated in the PDD whether the installed capacity of the project activity must be 20 MW physical installation. Thus, the project participants together with TÜV SÜD decided to submit a Request for Clarification in September 2008 to the CDM</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>EB to clarify, whether the wording presented in the PDD "20 MW installed capacity" is to be taken as fix maximum physical installed capacity or whether it can be understood as the equivalent average capacity displacing energy from the grid.</p> <p>The CDM-EB in their response on April 02, 2009 explained the following: "Regarding the content itself, the request for clarification is how to interpret the capacity defined in the PDD. Unfortunately there is no further information as to the cause of this discrepancy. During verification, the DOE should seek further clarification from the project participants on this discrepancy and to see whether a request for deviation can be used to fit this purpose, as currently it is the only means to communicate with the Board on such issues."</p> <p>For this monitoring period, the actual electricity production (36,221 MWh) has not reached the capacity stated in the PDD considering 91 days in the given monitoring period (38,309 MWh (154,080 MWh / 366 days x 91 days)). The actual electricity production is based on AES Eletropaulo monthly electricity export data and graphics (IRL 38), which has been cross-checked with the electricity transaction notes (IRL 37).</p> <p>As for this monitoring period the capacity stated in the PDD has not been reached, no Request for Deviation is submitted, however FAR 2 is raised to verify in the next verification(s) whether the actual electricity generation is higher than the capacity stated in the PDD. In the case this happens, a Request for Deviation would be submitted to the CDM-EB.</p> <p><u>Forward Action Request 2:</u></p> <p>It should be checked in the next verification(s) whether the produced actual electricity is above the capacity stated in the PDD. The latter one is defined by 154,080 MWh/year (20 MW x 90% x 8,560 hours) in E.4. of the registered PDD. In the case the produced electricity in the given monitoring period is above the capacity stated in the PDD (the 154,080 MWh/year has to be hereby converted to the days of the respective monitoring</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		period) a request for deviation to the CDM-EB has to be submitted.
4.2 Calibration/maintenance	Partial	<p>Weekly calibration records (for the period from 25/03/2008 to 08/07/2008) for the gas analyser have been presented to the verification team during the on-site visit. However, one weekly analysis is missing (between 15/04 to 29/04). The verification team did not consider it as necessary to raise any CAR or FAR as on May 06, 2008 (shortly after this period) an alarming system was implemented as mentioned in the paragraph below.</p> <p>During the 5th verification, a new elaborated alarming system was presented, reminding the operator to do the weekly calibration of the methane analyser. Besides, it is automatically generated a digital file with all relevant data for calibration and after calibration once the operator activates the calibration bottom. The new approach was included in procedure PO-002.</p> <p>The flow-meters, which were manufactured by the Dutch company Elster Instromet (model SM-RI), are obliged to have a calibration certificate at delivery. These calibration certificates (done by NMI, Dutch Calibration/Measurement Institute) have been presented to the verification team in previous verifications.</p> <p>In the Netherlands, it is not obliged by the NMI to do recalibrations. In Germany it is obliged by law to recalibrate within 10 years. There are no international general rules on how often to recalibrate. In the case of the Sao Joao project Biogas Energia Ambiental S.A. chose an interval of 5 years, which is half the required interval in Germany. A letter issued by Elster Instromet evidences this information.</p> <p>The flow meters (Elster Instromet) were not subject to any calibration between the 4th and 5th verification.</p> <p>The electricity meter measuring the net electricity exported to the grid was verified before leaving factory by an accredited laboratory certified according to ISO 9001:2000.</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>The diesel generator was in use for only some hours in the given monitoring period due to some power shortages. The equipment including electricity meter (manufactured by SIEMENS) is continuing to be kept in stand-by in emergency cases (as e.g. power shortages). The electricity meter was not subject to any calibration between the 4th and 5th verification.</p> <p>It exists a calibration plan (within the procedure PO-005) showing all the necessary calibrations of CDM related equipment and the time schedule for calibrations. However, calibration information of the electricity meters is not included in the procedure yet.</p> <p><u>Forward Action Request 3:</u></p> <p>Please include the electricity meters in the calibration plan of procedure PO-005.</p>
5. GHG Calculations		
5.1 Baseline Calculations	Full	<p>The calculation follows the approved methodology using an adjustment factor of 20 % as common industry practise in Brazil. No new legislation was created in the host country during the monitoring period obligating a certain biogas destruction in landfills, thus the Adjustment Factor remains as the validated value of 20 %.</p> <p>The parameter "Regulatory requirements relating to landfill gas projects (as Adjustment factor)" is mentioned as required in the monitoring report in 4.8.</p> <p>Baseline emissions calculation, project emissions calculation and emission reduction calculation have been verified and no errors have been identified.</p> <p>Excel data spreadsheets and calculations are configured for down-rounding to full numbers (in the case of "LFG measured FIR 600", "LFG measured FIR 500", "LFG measured FIR 800"), for down-rounding after 4 decimals (in the case of "methane measured FIR 600", "methane mesured FIR 500", "methane measured FIR 800 and</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>"methane destroyed in flares", "methane content").</p> <p>Final numbers are downrounded to full numbers without decimal rounds.</p> <p>Due to some few power shortages in some hours of the given monitoring period, some project emissions due to the electricity consumption from the diesel generator were given. However, the same were not very significant, since the diesel generator is only used in emergency cases, like e.g. power shortages and internal electricity needs are supplied by the electricity generated by the project activity. This is according to the revised monitoring plan approved by the EB in February 2008. Nevertheless, the electricity consumption from the diesel generator was considered as project emissions in the CER calculation.</p>
5.2 Use of estimates and default data	Full	<p>No estimates are used. The default data (global warming potential, density of methane and emissions factor of diesel engines) are correctly applied. Regarding the emissions factor of diesel engines, the applied value (1.3 tCO₂e/MWh) is according to the "Tool to calculate project emissions from electricity consumption", version 1.</p> <p>The ex-ante in the registered PDD determined emissions factor (0.2677 tCO₂/MWh) for net electricity exported to the grid is correctly applied in the CER calculation.</p>
5.3 Guidance on checks and reviews	Full	<p>The procedure PO-005 explains checks and reviews (a.o. by Arcadis) for the elaboration of the monitoring report.</p>
5.4 Internal validation and verification	Full	<p>As mentioned above (3.3.) PO-005 ("Procedimento dos parametros de monitoramento da usina") explains the double checking by Arcadis Tetraplan (Eduardo Cardoso Filho) and the regular downloading of primary data by a representative of Arcadis Tetraplan (Eduardo Cardoso Filho).</p>

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		PO-008 ("Procedimentos para elaboracao do relatorio operacional mensal") explains troubleshooting procedures in daily routine.
5.5 Data protection measures	Full	<ol style="list-style-type: none"> 1. The PLC is not connected to the Internet, thus the risk of virus is minimized. 2. Only defined persons have access to the data base of the system. 3. Antivirus programmes are installed at the system. 4. Back-up procedures (see 5.6.) 5. Van der Wiel (one of Biogas shareholders) and Julio Cesar Prado (production manager) are the only parties with external access to the data registered from the PLC. <p>The Monitoring Report, version 1 for the 5th verification with the monitoring period 01/04/2008 to 30/06/2008 states that the report was developed and revised by Arcadis Tetraplan and Biogas Energia Ambiental. The report is signed by both parties.</p>
5.6 IT systems	Full	<p>The procedure PO-010 ("Backup dos dados do sistema supervisorio da usina") mentions back-up procedures.</p> <ul style="list-style-type: none"> -A weekly CD backup of the supervisory system´s hard disk -A weekly backup of the supervisory system´s hard disk is made by the server of Heleno & Fonseca (one of Biogas shareholders) -Van der Wiel (another Biogas shareholder) has radio access to the supervisory system. -ARCADIS Tetraplan regularly downloads the primary data for the elaboration of the

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i> or <i>Corrective Action Requests</i>)
		<p>monitoring report</p> <p>The whole process is controlled by an electrical control system. This control system is provided with a PLC (Programmable Logical Controller).</p>

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Table 2: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
<p>Potential reporting risks based on an assessment of the emission estimation procedures can be expected to occur in the following fields of action:</p> <p>Possible errors in manual data transfer.</p>	<p>Regarding the potential reporting risks identified in the left column the following mitigation measures have been observed during the document review and the on site mission:</p> <p>FAR 1 was raised to avoid possible data transfer errors for manual data in the future. The correctness of manual data transfers done by the operator into the excel file should be regularly checked by the technical assistant or monitoring supervisor in order to avoid data transfer errors in the future.</p>	<p>There are no areas of residual risks.</p>

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Table 3: Detailed audit testing of residual risk areas and random testing

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including <i>Forward Action Requests</i> and <i>Corrective Action Requests</i>)
There are no areas of residual risks.	--	--

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Table 4: Compilation of open issues

Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
<p><u>Corrective Action Request 1:</u></p> <p>The following changes/addings should be provided in the monitoring report:</p> <ol style="list-style-type: none"> 1. Please revise in 1.6. of the monitoring report the information that "monitoring of the parameters of methane sent to the power house occurred" only from that verification on. 2. Please take out in 1.2. of the monitoring report that "emission reduction from the electricity exported were not considered in this version of the monitoring report". Electricity export was partly considered in the CER calculation. Besides, it should be mentioned, that the monitoring system of net electricity export data was fully functioning. 3. Please include the net electricity export data for the months April and May into the monitoring report (as well as into the excel calculation sheet). The data for those two months were missing both in report as well as in the calculation sheet. Please revise the CER calculation. 4. In 2.2.1. please revise the comment regarding EGy. 5. Please mention in 1.2. that 2 electricity meters (measuring the net electricity exported) are in use. 6. Please revise information in 1.2. of the monitoring report regarding the engines in stand-by: according to information on-site, only one 	<ol style="list-style-type: none"> 1. The Monitoring Report was corrected. 2. The Monitoring Report was corrected. 3. The net electricity exported was included in the Monitoring Report. 4. The Monitoring Report was corrected. 5. The Monitoring Report was corrected. 6. The Monitoring Report was corrected, to include the only engine in stand-by. 7. Information was updated. Internal needs of electricity were considered during electricity generation black-out periods. 8. The Functional Organigram was updated. 9. The hired operators were in- 	<ol style="list-style-type: none"> 1. Information in 1.6. has been revised. p 2. Chapter 1.2. was revised. p 3. Net electricity data for months April and May were included into the monitoring report as well as into the CER excel calculation tool. Electricity export data in the CER calculation tool were verified by PLC data provided by SJ landfill site, and the monthly values were compared with AES Eletropaulo electricity export transaction notes and monthly electricity export data and graphics from AES Eletropaulo website. The lower of both (SJ and AES Eletropaulo) values, which was finally the data from AES Eletropaulo was con-

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Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
<p>engine (1,6 MW) is in stand-by.</p> <p>7. Please update the information regarding electricity generation through the diesel generator in 1.2.</p> <p>8. Please update the functional organigram</p> <p>9. Please update in 2.3.3 the operators which were hired.</p> <p>10. Please revise in 2.3.4. the information that Arcadis downloads the data every week for elaboration of the monitoring period to "regularly".</p> <p>11. Regarding installed capacity, it should be made clear in the MR how the situation looks like nowadays.</p> <p>12. In 2.2.: Please correct the error of the electricity meter (grid) to 1%.</p>	<p>cluded in the Monitoring Report.</p> <p>10. The information was revised.</p> <p>11. The information was revised.</p> <p>12. Error of the electricity meter (grid) was corrected.</p>	<p>servatively used in the CER calculation. p</p> <p>4. Comment of EGy was revised in 2.2.1. p</p> <p>5. Chapter 1.2. mentions now that 2 electricity meters at SJ landfill site are in use. p</p> <p>6. Chapter 1.2. mentions now that only one engine is in stand-by. p</p> <p>7. Information was updated. p</p> <p>8. The functional organigram was updated. p</p> <p>9. The two operators hired between the last verification and this verification, have been included in 2.3.3. of the monitoring report. p</p> <p>10. Chapter 2.3.4. was updated. p</p> <p>11. Information regarding installed capacity nowadays</p>

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Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
		<p>was provided in the final monitoring report. p</p> <p>12. The error of the electricity meter (grid) was corrected. p</p> <p>CAR 1 was closed. p</p>
<p><u>Corrective Action Request 2:</u></p> <p>Arcadis (Eduardo Cardoso Filho) should provide the manual data records in a proper sheet in digital form for the monitoring period to the verification team.</p>	<p>Manual data was provided to the Verification Team.</p>	<p>The manual data records were submitted in digital form to the verification team and inconsistencies were resolved.</p> <p>CAR 2 was closed. p</p>
<p><u>Corrective Action Request 3:</u></p> <p>Please revise the data of "LFG measured FIR600" and "LFG measured FIR800" for May and June 2008 in the Monitoring Report and CER calculation tool. The data should be revised as according to the registered data in the hourly report sheets.</p>	<p>The Monitoring Report and CER calculation tool were reviewed.</p>	<p>Data of FIR 600 and FIR 800 in the CER calculation tool and monitoring report are now consistent with the PLC data. The verification team verified it accordingly.</p> <p>CAR 3 was closed. p</p>
<p><u>Forward Action Request 1:</u></p> <p>The correctness of manual data transfers done by the operator into the excel file should be regularly checked by the technical assistant or monitoring supervisor in order to avoid data transfer errors in the future.</p>	<p>Data will be regularly checked.</p>	<p>Open for the next verification</p>

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Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
<p><u>Forward Action Request 2:</u> It should be checked in the next verification(s) whether the produced actual electricity is above the capacity stated in the PDD. The latter one is defined by 154,080 MWh/year (20 MW x 90% x 8,560 hours) in E.4. of the registered PDD. In the case the produced electricity in the given monitoring period is above the capacity stated in the PDD (the 154,080 MWh/year has to be hereby converted to the days of the respective monitoring period) a request for deviation to the CDM-EB has to be submitted.</p>	Will be checked in the next verification(s).	Open for the next verification
<p><u>Forward Action Request 3:</u> Please include the electricity meters in the calibration plan of procedure PO-005.</p>	The electricity meters will be included in the procedure.	Open for the next verification



Annex 2: Information Reference List

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Reference No.	Document or Type of Information
1	<p>Date: July 11, 2008, Interview at São João landfill gas site:</p> <p>Participants at the audit on the part of São João landfill gas site: Daniel Picanco Santos, Monitoring Supervisor Julio Cesar Prado, Production manager Felise Sakamoto, Technical assistant Bruna Barbosa, Technical assistant</p> <p>Participants at the audit on the part of ARCADIS Tetraplan S/A, a CDM consultant to the project: Eduardo Cardoso Filho, Project developer</p> <p>Participants at the audit on the part of TÜV SÜD: Johann Thaler, ATL, TÜV SÜD do Brazil Wilson Tomao, GHG auditor, TÜV SÜD do Brazil</p>
2	Registered Project Design Document "Sao Joao Landfill Gas to Energy Project (SJ) ", version 2B, December, 21, 2005, pdf-file.
3	Monitoring Report, version 1, pdf-file, monitoring period 01/04/2008-30/06/2008, dated 02/07/2008, submitted on July 11, 2008.
4	Contract between Sotreq S.A. and SJ Energia Ambiental S/A regarding supervising the operation of electricity generation , dated 09/11/2007, re-submitted on July 11, 2008.
5	Procedure in emergency situations, PO-009 (Procedimentos e ações em situações de emergencia, 01/10/2007, rev. 1), paper-copy, re-presented on July 11, 2008.
6	Procedure about re-starting the plant after an electricity breakdown, PO-001 (Partida da planta de gas apos queda de energia da concessionaria), dated 15/11/2007, revision 00, paper-copy, re-presented on July 11, 2008.

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Reference No.	Document or Type of Information
7	Calibration of methane analyser, PO-002 (Calibração do Painel analisador de gases – metano e oxigênio, dated 06/05/2008), word-file, submitted on July 11, 2008.
8	Procedure for the elaboration of the monthly operational report, PO-008 (Procedimentos para elaboracao do relatorio operacional mensal, 10/11/2007, rev. 01), word-file, re-presented on July 11, 2008.
9	Procedure for data back-up of the supervisory system, PO-010 (Backup dos dados do sistema supervisorio da usina, 15/11/2007, rev. 02), word-file, re-presented on July 11, 2008.
10	Functional Organigram of Sao Joao Ambiental S.A dated 25/06/2008 including a summary description (28/11/2007) of tasks and responsibilities, paper copy, presented on July 11, 2008.
11	2 Training certificates of new hired operators: Jose de Arimateia dos Santos (training period: 14/04/2008-18/04/2008), Reginaldo Nogueira de Souza (training period: 22/04/2008-29/04/2008) , submitted on July 11, 2008.
12	Procedure for manual data collection, PO-011 (Procedimento para coleta manual dos parametros e dados da usina), dated 21/11/2007, rev 00, submitted on July 11, 2008.
13	Responsibility matrix and hierarchy sequence (Matriz de Responsabilidades / Sequencia Hierarquica), 28/11/2007, paper-copy, re-presented on July 11, 2008.
14	Calibration records (weekly) of the gas analyzer for the period 25/03/2008 to 08/07/2008, part of PO-002, paper copies, presented on July 11, 2008.
15	Bioagri exhaust gas analysis reports Collection dates: 04/01/2008, Reports dated 17/01/2008: Flare 520 N° 1088/08 Flare 540 N° 1087/08 Flare 560 N° 1086/08 Collection dates: 04/04/2008, Reports dates 14/04/2008: Flare 520 N° 32851/2008

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Reference No.	Document or Type of Information
	Flare 540 N° 33309/2008 Flare 560 N° 32848/2008 paper-copies and pdf-file, presented on July 11, 2008.
16	Flare efficiency calculation sheet (HOFSTETTER), excel-file, presented on July 11, 2008.
17	Document (issued by NUK) proving that the error margin of the methane analyser is less than 1 %, paper copy, presented at 4 th verification.
18	Revision of the monitoring plan, pdf-file, approved by the EB on February 18, 2008.
19	Clarification letter by Elster Instromet about calibration of flow-meters, pdf-file, presented at 4 th verification.
20	Approved baseline and monitoring methodology ACM0001, version 2.
21	Procedure of monitoring parameters (including calibration plan), PO-005 (Procedimento dos parametros de monitoramento da usina, 26/11/2007, rev. 3), paper-copy, re-presented on July 11, 2008.
22	Digital sheets for manual data records „Monitoramento dos parametros de funcionamento“, paper-copies, presented on July 11, 2008.
23	Manual for the power meter for electricity exported (Merlin Gerin, CM4000, PowerLogic), without date, submitted at 4 th verification.
24	IPCC: Revised Guidelines (1996) for National Greenhouse Gas Inventories
25	IPCC: 2000, Good Practice Guidance
26	Email Siemens Mercosul, dated 19/11/2007, informing that no calibration is necessary for the meter measuring the electricity consumption from the diesel generator and Email Next Automation, dated 20/11/2007 informing about internal meter tests and its results.
27	CER calculation tool, “Sao Joao – Calculation Spreadsheet v01 (5 th verification)”, excel-file, submitted on July 06, 2008.
28	CARS System Van der Wiel, pdf-file, submitted at 4 th verification.
29	Operating hours of the flare, registries at Van der Wiel , excel sheet, submitted at 4 th verification.

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Reference No.	Document or Type of Information
30	Operation Description Hofstetter Flares, pdf-file, submitted at 4 th verification.
31	Evidence that no periodic calibration for the electricity meter is necessary, Electrical Power Monitoring and Control 2004 Master Format™ CSI Spec 26 09 13 (Formerly Spec. 16290), file:"Spec_26_09_1311.pdf", pdf-file, presented on July 11, 2008.
32	Excel calculation sheet for the average flare temperature when the instant gas-flow is higher than zero for every hour of the monitoring period (excel sheet processing PLC data), excel files for April, May and June "São João – PLC 2008.04", "São João – PLC 2008.05", "São João – PLC 2008.06" , excel files, submitted on July 11, 2008.
33	Digital report sheet about weekly calibration of the methane analyzer, dated 11/07/2008, paper-copy, presented on July 11, 2008.
34	Certificate of calibration of electricity meters at factory, Schneider Electric, calibration date 29/10/2007, model CM4000T, serial numbers 32004233 and 32004234, calibration reports dated 09/07/2008, paper-copies, submitted on July 11, 2008.
35	Evidence about synchronisation of the PLC, done by company "Next Automation" on 03/06/2008, paper-copy, submitted on July 11, 2008.
36	PLC data (gas flow of FIR500, FIR600, FIR800, methane content in the residual gas, SJ registries of electricity exported data), presented during the on-site visit.
37	AES Eletropaulo monthly electricity export transaction notes (April, May, June 2008), submitted during the on-site visit.
38	Monthly electricity export data and graphics from website AES Eletropaulo, submitted per Email.
39	Turbine flow-meter (FIR 600): 10508423 - certificate G1/S/7616, dated 23/05/2007 (date of calibration certificate), issued by NMI paper copy presented during the on-site visit.
40	Temperature Transmitter (FIR 600): C2F622018 – 2007: certificate G1/S/5159, calibration dated 15/05/2007, issued by NMI paper copy presented during the on-site visit.
41	Pressure Transmitter (FIR 600): 91G216023 – 2007: certificate G1/S/5159, calibration dated 15/05/2007, issued by NMI paper copy presented during the on-site visit.
42	Turbine flow-meter (FIR 500): 10508421, SM-RI-X-K : certificate G1/S/7614, dated 23/05/2007 (date of calibration certificate), issued by NMI paper copy presented during the on-site visit.
43	Temperature Transmitter (FIR 500): C2G311000-2007: certificate G1/S/5157, calibration dated 15/05/2007, issued by NMI paper copy

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Reference No.	Document or Type of Information
	presented during the on-site visit.
44	Pressure Transmitter (FIR 500): 91G216021 - 2007: certificate G1/S/5157, calibration dated 15/05/2007, issued by NMI paper copy presented during the on-site visit.
45	Turbine flow-meter (FIR 800): 10508422, SM-RI-X-K : certificate G1/S/7615, dated 23/05/2007 (date of calibration certificate), issued by NMI paper copy presented during the on-site visit.
46	Temperature Transmitter (FIR 800): C2G311001 – 2007: certificate G1/S/5158, calibration dated 15/05/2007, issued by NMI paper copy presented during the on-site visit.
47	Pressure Transmitter (FIR 800): 91G216022 – 2007: certificate G1/S/5158, calibration dated 15/05/2007, issued by NMI paper copy presented during the on-site visit.
48	Certificate that gas used for weekly calibrations of the gas analyser is according to the Brazilian standards and norms, Linde, dated 16/06/2007, N° 1644/07.
49	CER calculation tool, “Sao Joao – Calculation Spreadsheet v02 (5 th verification)”, dated 21/04/2009, excel-file, submitted per Email.
50	Final Monitoring report, version 2, pdf-file, monitoring period 01/04/2008-30/06/2008, dated 20/04/2009, submitted per Email.