VERIFICATION AND CERTIFICATION REPORT

CAIEIRAS LANDFILL GAS EMISSION REDUCTION

(UNFCCC Registration Ref. No. 0171)

Verification Period:
13/06/2014 to 31/12/2014
(first and last day included)

Report No. : ESSPL/CDM/2015/023
Revision No.: 1.0

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ESSPL/CDM/2015/023	28/03/2015	01	28/03/2015
Project title :	Caieiras landfill gas emission reduction		
Organizational Unit :	EPIC SUSTAINABILITY SERVICES PVT LTD		
Client :	Essencis Soluções Ambientais S.A.		

Summary:

EPIC Sustainability Services Pvt. Ltd. (EPIC) has performed the 10th periodic verification assessment (2nd periodic verification within the 2nd 7-year crediting period) of the registered CDM project activity titled "Caieiras landfill gas emission reduction". The project activity was registered by the UNFCCC on 09/03/2006 as CDM project activity with registration no. 0171 and it is currently under its 2nd 7-year renewable crediting period (period from 13/12/2013 to 30/03/2020). The verification assessment covered the monitoring period from 13/06/2014 to 31/12/2014 (including both days) and was performed on the basis of document review of the Monitoring Report, Registered Project Design Document (PDD), supporting documents, on-site assessment, interviews performed with representatives of the host-country project participant and project operator Essencis Soluções Ambientais S.A., resolution of identified outstanding issues and issuance of Verification Report.During the monitoring period from 13/06/2014 to 31/12/2014, the operation of the project activity resulted in permanent and real mitigation of emissions of methane (CH_4) through collection and combustion of landfill gas (LFG) in 4 installed high temperature enclosed flares. While LFG is rich in CH_4, as established in the PDD for the project activity, in the absence of the project activity (baseline scenario) it is assumed that the largest share of LFG collected and destroyed by the project activity would be directly emitted into the atmosphere.

As part of the conducted verification assessment, the EPIC's verification team identified outstanding issues (17 Correction Action Requests (CARs) that were appropriately addressed and resolved by the host-country PP Essencis Soluções Ambientais S.A. inter alia through revision of the Monitoring Report and supporting documents. The EPIC's verification team was able to confirm that GHG emission reductions achieved by the project activity during the considered monitoring period are correctly calculated in the latest version of the Monitoring Report (version 2, dated 05/03/2015). The project activity applies the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) + applicable methodological tools. Reported emission reductions are correctly determined as monitoring requirements and GHG calculation approach as per the registered PDD. Therefore, EPIC certifies the emission reductions for the monitoring period from 13/06/2014 to 31/12/2014 (including both days) are correctly determined and reported as 360,815 tCO2e and thus requests the CDM-EB to issue equivalent amount of CERs for the project activity.

Subject : CDM Verification

Work carried out by :		
Mr. Marco Ratton	Lead Auditor	☒ No distribution without permission from the Client or responsible organisational unit
Mr. Rodrigo Pedroso	Expert Assisting Technical Review	☐ Limited distribution
Mr. R. Vijaya Raghavan	Technical Reviewer	☐ Unrestricted distribution
Work approved by :		
Mr. K Sudheendra (**Head – Operations**)		

Abbreviations

ACM	Approved Consolidated Methodology (CDM baseline and monitoring methodology)
ANP	Brazilian National Agency of Petroleum, Natural Gas and Biofuels (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis)*
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CDM-M&P	Modalities and Procedures for Clean Development Mechanism
CDM-PCP	Clean Development Mechanism Project Cycle Procedures
CDM-PS	Clean Development Mechanism Project Standard
CDM-VVS	Clean Development Mechanism Validation and Verification Standard
CER	Certified Emission Reduction
CETESB	Companhia Ambiental do Estado de São Paulo (Environmental Agency for São Paulo State in Brazil)
CH_4	Methane
CL	Clarification Request
CMP	Meeting of Parties to the Kyoto Protocol
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COP/MOP	The Conference of the Parties to the United Nations Framework Convention on Climate Change serving as the Meeting of the Parties to the Kyoto Protocol
CTR	*Central de Tratamento de Resíduos* ("Waste Treatment Facility" when translated into English language)
DNA	Designated National Authority
DOE	Designated Operational Entity
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas
HDPE	High density polyethylene
INMETRO	*Instituto Nacional de Metrologia, Normalização e Qualidade Industrial* (Brazilian "Institute for Metrology, Standardization and Industrial quality" when translated into English language). INMETRO is the Brazilian official agency for metrology and certification affairs
LFG	Landfill gas
LPG	Liquefied Petroleum Gas
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MP	Monitoring Plan

MR	Monitoring Report
MSW	Municipal Solid Waste
ONS	*Operador Nacional do Sistema* (Brazilian entity responsible for the coordination of the dispatch of power plants connected to the National Electricity Grid of Brazil)
PDD	Project Design Document
PLC	Programmable logic controller
PNRS	Política Nacional de Resíduos Sólidos (Brazilian National Policy on Waste Management as established by Federal Law No. 12,305/10 (the LPNRS).
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
RMSP	Região Metropolitana de São Paulo (São Paulo's Metropolitan Region)
SQL	Structured Query Language
UNFCCC	United Nations Framework Convention for Climate Change
UV	Ultra violet

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1 INTRODUCTION

1.1 Objective

The objective of the verification assessment is the review by a Designated Operational Entity (DOE) of *ex-post* determination of GHG emission reductions occurred as result of the operation of the CDM project activity during a defined monitoring period.

Certification is the written assurance (declaration) by the DOE that, during the considered monitoring period, the project activity in question achieved reported emission reductions as verified by the appointed verification team.

The objective of the performed verification assessment was to verify and certify emission reductions reported for the project activity "Caieiras landfill gas emission reduction" for the monitoring period from 13/06/2014 to 31/12/2014 (including both days). The performed verification assessment encompassed the following tasks:

- Verification that the project activity was implemented and has operated in accordance with construction and design details outlined in the PDD /2/. Such verification included confirmation that all physical features (technology, project equipment, and monitoring and metering equipment) of the project activity are in place and in accordance with details made available in the PDD /2/;

- Verification that the Monitoring Report /3/ and other supporting documents provided are deemed complete, transparent, verifiable and under conformance with all applicable CDM rules and requirements;

- Verification that the actual monitoring systems as well as monitoring and management procedures for the project activity comply with the description of the monitoring system and related procedures as per:
    - the monitoring plan of the PDD /2/;
    - applied CDM baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas" (version 13.0.0) /11/ + applied methodological tools /14/ /7/ /40/ /34/ /13/ /69/;
- Confirmation that all monitoring data are measured, calculated or selected; recorded and stored (archived) as per the applied CDM baseline and monitoring methodology + applied methodological tools.
- Verification that reported GHG emission data is sufficiently supported by evidences.

1.2 Scope

The verification assessment shall ensure that reported GHG emission reductions are deemed complete and sufficiently accurate in order to be certified. The verification of the registered CDM project activity is based on information made available in the PDD /2/, the Monitoring Report /3/, emission reduction calculation spreadsheet(s) /5/ and all other supporting documents made available to the verification team + information collected through performance of interviews and/or collected as part of the performed on-site visit. Furthermore, publicly available information was considered as far as available and required.

The verification assessment was carried out on the basis of the following rules and requirements, applicable for the verified CDM project activity:

- Article 12 of the Kyoto Protocol /9/,
- Guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1 /9/ and subsequent decisions made by the Executive Board and COP/MOP,
- Other relevant rules, including the host country legislation,
- CDM Validation and Verification Standard (CDM-VVS) /1/,
- Monitoring plan of the PDD /2//,
- CDM baseline and monitoring methodology ACM0001 “Flaring or use of landfill gas” (version 13.0.0) /11/.
- Monitoring Report (all versions) /3/ /4/
- The following methodological tools, which are referred in the Monitoring Report /3/:
    - “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 01) /13/
    - “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (version 02) /34/
    - "Tool to calculate the emission factor for an electricity system” (versions 3.0.0 /69/ and 04.0 /40/)
    - "Project emissions from flaring" (version 02.0.0) /7/
    - "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/

1.3 Description of the Project Activity

1.3.1 Project Characteristics

General information/details for the project activity are summarized in Table 1.

Table 1: Project general information/details

Item	Description
Title of the CDM project activity	"Caieiras landfill gas emission reduction"
Project description	The project design encompasses collection and combustion of LFG under efficient and controlled conditions at the CTR Caieiras landfill in the installed 4 high temperature enclosed flares with the unique purposes of avoiding emissions of methane (CH_4) into the atmosphere (that would occur in the absence of the project activity (absence of the project)). The CTR Caieiras landfill is located in municipality of Caieiras in the suburban area of the city of São Paulo in Brazil. LFG (which is rich in CH_4) has been historically generated at the CTR Caieiras landfill as result of the anaerobic decomposition of municipal solid waste (MSW) disposed in the site.
Project size	☒ Large Scale ☐Small Scale
CDM Reference No.	0171
Date of registration as a CDM project activity by UNFCCC	09/03/2006
Project Scope (according to UNFCCC Sectoral Scope and Technical Area numbers for CDM)	CDM Sectoral Scope 13 – Waste handling and disposal Technical Area 13.1 - Waste handling and disposal
Applied CDM baseline and monitoring methodology	ACM0001 "Flaring or use of landfill gas" (version 13.0.0)
CDM crediting period	2nd 7-year renewable crediting period (from 13/12/2013 to 30/03/2020).
Project's actual starting date	The project activity started to operate on 01/02/2007.

Project's commissioning date	The project activity was commissioned on 31/01/2007

1.3.2 Involved Parties and Project Participants

The following parties to the Kyoto Protocol and project participants are involved in this project activity (Table 2).

Table 2: Project Parties and project participants (as informed by the project participants and as per the latest version of the completed Modalities of Communication (MoC) form [25])

Party(ies)		Project Participant(s)
Host party	Brazil	Essencis Soluções Ambientais S.A.
Other involved party/ies	Norway	Nordic Environment Finance Corporation

1.3.3 Project Location

Project location details are summarized in Table 3:

Table 3: Project Location

Project Location Details	
Host Country	Brazil
Region:	Metropolitan Region of São Paulo (RMSP)
Project location address:	The project site is located in the extreme Northeast region of Caieiras municipality at the Bandeirantes highway, km 33. Caieiras is one of the municipalities which encompass the Metropolitan Region of São Paulo (RMSP).
Latitude:	23°20'40"S (-23.3444)
Longitude:	46°46'20"W (-46.7722)

1.3.4 Technical Project Description

In accordance with the conceived project design, the CDM project activity "Caieiras landfill gas emission reduction" was designed and implemented and has operated along the monitoring period from 13/06/2014 to 31/12/2014 by collecting and combusting LFG under efficient and controlled conditions in the installed 4 high temperature enclosed flares. Also in accordance

with the project design, the unique purpose of the project activity has been avoiding emissions of LFG into the atmosphere. The project activity has not promoted any commercial or economic utilization of collected LFG.

In accordance to the project design, all project's electricity demand has been met during the considered monitoring period by imports of electricity sourced by the National Electricity Grid of Brazil that is the electricity grid for which the project activity is connected to. As confirmed by the EPIC's verification team, no backup captive off-grid electricity generator has ever been used for meeting the project's electricity demand under circumstances of planned or unplanned temporary interruption of supply of grid-sourced electricity to the project activity. Whenever the supply of grid-sourced electricity to the project activity is interrupted, the project's operation is also been interrupted.

As confirmed by the EPIC's verification team, during the considered monitoring period, the project activity encompassed the operation of the following project infrastructure:

- Three LFG condensation traps to separate liquids in the collected LFG (leachate and condensate);

- One LFG centrifugal blower, manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 125 HP (93.2 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h.

- Two LFG centrifugal blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 100 HP (74.5 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h of LFG

- Two LFG centrifugal blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 200 HP (149.1 kW) and nominal LFG pumping capacity for 7,000 Nm^3/h of LFG.

- LFG monitoring equipment/instruments[1]:

    - Four LFG mass flow meter (one flow meter for each individual flare),

    - One LFG temperature sensor,

    - One LFG pressure sensor,

    - One continuous $CH_4/CO_2/O_2$ content gas analyzer unit,

    - Four thermocouples (to measure temperature in the exhaust gases of each one of the installed flares),

    - Four UV flame detectors (to monitor operational and flame status of each one of the installed flares).

- Four enclosed high temperature flares (of which main specifications are correctly outlined in the registered PDD /2/),

- Two electricity meters (to measure the consumption of grid-sourced electricity by the project activity's related equipment).

[1] Details about the specifications of the installed monitoring instruments/equipment are included in Section 4.1.3.

During the monitoring period from 13/06/2014 to 31/12/2014, the project's LFG collection system also encompassed about 320 operational vertical LFG collecting wells connected through a high-density polyethylene (HDPE) pipeline network. As the part of the typical operation of the CTR Caieiras landfill, some of the LFG extracting wells are normally temporarily disconnected from the LFG collection system in order to allow MSW disposal, compacting and movement of equipments (wheel loaders and excavators) and trucks.

As explained by the representatives of the host-country project participant and project operator Essencis Soluções Ambientais S.A. (which is also the company in charge of operation of all MSW management activities at the CTR Caieiras landfill), the size of the project's LFG extracting system (number of LFG collection wells connected to the project's LFG pipeline network) is often modified as a result of the dynamics of the landfill operation (opening of new cells, closure of working fronts (MSW disposal areas), etc.). As confirmed by the EPIC's verification team, no references to the number (quantity) and/or specific location of the project's LFG collection are included in PDD /2/.

As appropriately outlined in the latest version of the Monitoring Report /3/, the combined total MSW disposal capacity at the CTR Caieiras landfill is about 60,000,000 ton of MSW. The landfill is currently not expected to close prior of year 2030. By the end of 10th monitoring period, an accumulated amount of about 27,000,000 ton of MSW was disposed in the site.

The project activity was implemented and remains being operated without having any collected LFG being sold to a local industry or being internally used as gaseous fuel for electricity generation.

2 VERIFICATION TEAM

2.1 Assessment Team

A competent team with relevant knowledge and experience in the specific sectoral scopes and project activity was appointed by EPIC for performing the verification for the project activity. The appointment of the verification team takes into account the required knowledge of the host country and general project activity knowledge requirements for validating the project activity design and the relevant CERs will be achieved. The assessment team can be composed of an Assessment Team Leader (ATL), auditors (A) and host country or technical expert (E).Table 4 below shows the composition of the assessment team, the qualification of the team members and their functions.

Table 4: Verification team

Name	Function	Sectoral scope specific knowledge	Technical area specific knowledge	Local knowledge	Type of involvement				
					Desk review	On-site visit / interviews	Reporting	Supervision of work	Expert input
Mr. Marco A. Ratton	Lead Auditor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Details about the assessment team member(s):

Marco A. Ratton is based in Brazil and has acted a CDM auditor since 2007. He holds vast experience with independent assessment of CDM project activities within the area of solid waste management and effluent treatment in Latin America and other regions. He also has previous working experience with planning of municipal waste management as well as educational background in mechanical fabrication technologies, economics and environmental management & policy. He has undergone extensive training on CDM validation and verification and is a qualified lead auditor for Sectoral Scope 13 under Technical Area “Waste handling and disposal” in accordance with procedures of EPIC sustainability services Pvt. Ltd. He has experience conducting ISO 9001/14001 audits.

2.2 Technical Review Team and Approval

Prior of submitting the Verification Report to the CDM-EB of UNFCCC, a technical review of the whole verification assessment (including revision of the draft version of the Verification Report) was performed by an appointed technical review (TR) team. The TR team is composed of persons competent in the technical area the project activity falls under. Each person involved in

the review is independent to the previously performed tasks encompassed by the verification assessment.

As part of the technical review, the complete assessment previously performed by the verification team as outlined in the draft version of the Verification Report is checked and, whenever required, adjusted and corrected.

Details about the appointed TR team and the person(s) responsible for approval of the Verification Report are summarized in the table below:

Table 4: Technical review team and approval

Name	Function	Technical area specific knowledge	Sectoral scope specific knowledge	Supervision of work
Mr. R. Vijaya Raghavan	Technical Review	Yes	Yes	Yes
Mr. Rodrigo Pedroso	Technical Expert assisting Technical Review	Yes	Yes	-

Details about the Technical Review team member(s):

Mr. R. Vijayaraghavan holds BE in Mechanical Engineering, M.Tech in Energy Conservation and Management and MBA in Technology Management. He is certified as Energy Auditor by Bureau of Energy Efficiency (BEE), Government of India. He has 10 years of working experience in energy sector including validation and verification and successful registration of twenty CDM wind power projects. These projects include two large scale and eighteen small scale projects. He has also undergone extensive training on GHG validation and verification and has been qualified as Lead Auditor for Sectoral Scope 13 under Technical Area "Waste handling and disposal". He is also an ISO 26000 lead auditor certified by Professional Evaluation and Certification Board (PECB).

Mr. Rodrigo Pedroso has a Bachelor of Science degree in Environmental Engineering and has experience in CDM validation / verification activities within the area of solid waste management and effluent treatment in Latin America. Prior of starting collaborating with EPIC, he was involved in CDM verification and validation assessments for a number of LFG collection and destruction/utilization CDM initiatives in Brazil and Chile (CDM technical scope 13). His previous professional experience includes monitoring activities for local polluting sources (air emissions), handling and legal compliance of industrial solid waste and effluents and sales engineering of power generation equipment using landfill gas as gaseous fuel as well.He has undergone extensive training on CDM validation and verification and is a qualified expert for Sectoral Scope 13 under Technical Area "Waste handling and disposal" in accordance with procedures of EPIC sustainability services Pvt. Ltd.

3 METHODOLOGY

3.1 Verification Process

The verification process is based on applicable verification guidelines described in the latest version of the CDM Validation and Verification Standard (CDM-VVS) /1/. In addition to that, standard auditing techniques have been applied by the EPIC's verification team. As part of the verification assessment, the verification team initially performed a desk review on all verification related documents, followed by an on-site visit to the project site in order to review the project implementation and its operation. As part of the verification process, the verification findings and observations from these two initial assessment phases are collected and are described in a Verification Questionnaire/36/. For all identified inconsistencies and lack of clarity, related findings (list of outstanding issues) are raised. The next steps are to close out the findings through direct communication with the project participants and receipt of updated version of the Monitoring Report/3/ and/or supporting documents and finally preparing the Verification Report. The draft version of the Verification Report undergoes a technical review by EPIC prior to its submission to the CDM-EB.

3.2 Desk review

The EPIC's verification team conducted a desk review of all documents initially provided by Essencis Soluções Ambientais S.A. + other publicly available documents that are relevant for the verification assessment. The main assessed documents are listed below:

- The registered PDD /2/ for the 2nd 7-year renewable crediting period of the CDM project activity "Caieiras landfill gas emission reduction", including the corresponding Validation Report for the Renewal of crediting period /10/;
- The initial version of the Monitoring Report for the 10th verification of the project activity /4/;
- The applied CDM baseline and monitoring methodology ACM0001 "Flaring or use of landfill gas" (version 13.0.0) /11/.
- The findings from the yet on on-going 9th verification assessment /26/ for the project activity. The verification assessment for the previous monitoring period (period from 13/12/2013 to 12/06/2014) is also being performed by EPIC.
- Relevant decisions, clarifications and guidance from the CMP of the Kyoto Protocol and the CDM Executive Board;
- Any other information and references relevant to the project activity's resulting emission reductions (e.g., IPCC reports, data on electricity generation in the national grid or laboratory analysis and national regulations).

Besides the above-mentioned documents, the EPIC's verification team also assessed other additional documents that were required to assess the accuracy of the emission reduction calculations presented in the Monitoring Report /3/. A detailed list of assessed documents is included in Section 5 (References) of this Verification Report.

3.3 On-site assessment

On 03/03/2015 and 04/03/2015, Mr. Marco A. Ratton from the EPIC's verification team performed an on-site visit to the project site. Besides of visual inspection to all project infrastructure, the performed on-site inspection also included further review of all project related monitoring data and records as well as a set of interviews with project operational staff in order to confirm of the correctness and suitability of all data sources and assumptions considered in the Monitoring Report /3/ and calculations of achieved emission reductions.

The main tasks covered during the on-site visit include, but are not limited to the following:

- Confirmation that all project equipment was installed and operated as per the monitoring plan of the PDD /2/ during the considered monitoring period;
- Performance of interviews with the project activity's operational staff and performance of observations of the operation of the project activity (in order to check the risks of inappropriate operation and data collection procedures).
- Performance of review of information processes for generating, processing, recording and reporting data for the parameters monitored ex-post.
- Auditing of the project's monitoring processes, routines and documentations in order to check their appropriateness.
- Complete checking of the monitored data (figures quoted in the Monitoring Report /3/ were checked by reviewing operation records).
- Checking of data aggregation trail procedure

Representatives of the host-country project participant and project operator Essencis Soluções Ambientais S.A. (incl. the project's operational staff) were interviewed in order to confirm selected information and to resolve issues identified in the document review.

The main topics of the interviews are summarized in Table 6.

Table 5: Interviewed persons

Name	Organization/Function	Interview Topics
Mr. Fernando Freitas	Essencis Soluções Ambientais S.A.: operation manager	- General implementation and operational aspects of the project activity - Technical equipment and operational issues - Changes in the project activity since CDM validation and commisioning - Monitoring and measurement equipment/instruments - Remaining issues from validation and previous verifications assessments
Mr. Nuno Barbosa	Unicarbo Ltda. (CDM consultancy service company / not a project participant[2])	

[2] As appropriately outlined in the latest version of the Monitoring Report, UniCarbo Energia e Biogás Ltda. is a CDM consulting and advisory service company that supported the host-country project participant Essencis

		- Calibration procedures - Quality management system and QA/QC procedures - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data handling and management - Data uncertainty and residual risks - Emission reduction calculations - Procedural aspects of the verification - Performance of maintenance and repair events - Compilation of CDM documentation (incl. the Monitoring Report)

3.4 Resolution of Findings and Reporting

Based on the performed document desk review, performed on-site visit, conducted follow-up interviews and further investigations; the verification questionnaire was completed as part of the performed verification assessment. As per the EPIC's verification procedure, in case inconsistencies or lacks of clarity are identified during the performance of the verification assessment, the verification team raises:

Corrective Action Requests (CARs), if:

- non-conformities with the application of the monitoring plan or monitoring methodology are found in monitoring and reporting process, or if the evidence provided to prove conformity is insufficient;
- mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- issues identified in a FAR during the validation or previous verification to be verified during the current verification which have not been properly addressed by the project participants.

Clarification Request (CL), if:

- provided information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

In case the verification team identifies essential risks for further verifications or the actual status requires a special focus on this item for the next consecutive verification, a Forward Action Request (FAR) is raised.

While aiming to resolve outstanding issues which needed to be clarified or resolved, a detailed list of verification findings was submitted to the representatives of the host-country project

Soluções Ambientais S.A. with CDM related issues (inter alia completion of the Monitoring Report). This CDM consulting and advisory service company is not project participants.

participant Essencis Soluções Ambientais S.A. for resolution of all raised CARs and/or CLs. Only after the findings are answered by the client in an appropriate manner, the CARs and CLs were closed out.

The Verification Protocol applied for the 10th periodic verification of the "Caieiras landfill gas emission reduction" consists of the Verification Questionnaire /36/ and List of findings /35/ (set of tables where the raised Corrective action request (CAR), Request for clarification (CL) and Forward Action Request (FAR)). In order to guarantee the required transparency and objectiveness of the verification process, the outstanding issues raised by the EPIC's verification team are all identified in a detailed in tables which includes all raised CARs and CLs (and also includes the related summary of related responses and actions provided by the host-country project participant Essencis Soluções Ambientais S.A.). These tables are presented in Annex 1 of this report and the Verification Checklist.

3.5 Technical Review

Prior to the submission of the final Verification Report to UNFCCC, a technical review was carried out by EPIC for the whole verification assessment as per information included in the draft version of this Verification Report.

For performing the technical review team includes at least one competent GHG auditor appointed for the scope and technical area the project activity falls under. More than one GHG auditor can eventually be appointed for performing the technical review. A Technical Expert may also be appointed as part of the technical review team

As a result of the internal technical review process, the EPIC verification opinion and specific topics and elements of the assessments (as earlier prepared by the Assessment Team Leader (ATL) of the EPIC's verification team) may be confirmed or revised. Furthermore reporting improvements might be achieved as result of the performed technical review.

4 VERIFICATION REPORTING

4.1 Verification of Compliance

4.1.1 Compliance of the Project Implementation in Accordance with the Registered Project Design

As a result of the performed on-site visit and the performed review of project documentation as well as historical monitoring records, the EPIC's verification team was able to confirm that adopted technology, the project equipment, as well as the monitoring and metering equipment were implemented and operated during the monitoring period from 13/06/2014 to 31/12/2014 in accordance with the project design and monitoring details as described in the PDD /2/.

Moreover, as part of conducted interviews with operational staff of Essencis Soluções Ambientais S.A., the verification team was informed in further details about the whole progress of the project activity during the latest 8 years.

During the whole monitoring period from 13/06/2014 to 31/12/2014, the project activity operated as a LFG collection and destruction initiative by following the project technical description as per the PDD /2/. As indicated in the Monitoring Report /3/, during the considered monitoring period, the project activity was temporarily out of operation due to different reasons (e.g. power outage, equipment maintenance, calibration events, pipe drainage, problems in the PLC panel, etc.). This was verified by the EPIC's verification team through assessment of a service and maintenance log book /41/ (with historical of service and maintenance interventions in the project activity infrastructure)).

As also established by the PDD /2/, the project activity's electricity demand was entirely met by imports of grid electricity (without any captive electricity generator fuelled by fossil fuel being used) during the whole monitoring period.

4.1.2 Compliance of the Monitoring Plan with the Monitoring Methodology including Applicable Tools

During the document review and the on-site visit, the EPIC's verification team has reviewed the application of the implemented monitoring plan vis-à-vis the monitoring requirements of the PDD /2/ along the monitoring period from 13/06/2014 to 31/12/2014.

Moreover the application of the monitoring plan during the monitoring period was also compared against the applicable requirements of the monitoring methodology ACM0001 (version 13.0.0) /11/ in order to verify its compliance.

Based on this review, the verification team confirms that the monitoring plan was applied during the period from 13/06/2014 to 31/12/2014 in conformance with the provisions of the PDD /2/. Moreover, the applied monitoring plan also sufficiently meets the requirements of the baseline and monitoring methodology ACM0001 (version 13.0.0) /11/ and applicable tools /13/ /34/ /7/ /14/.

4.1.3 Compliance of Monitoring Activities with the Registered Monitoring Plan

The application of the monitoring plan during the monitoring period from 13/06/2014 to 31/12/2014 is summarized in this section.

Parameters monitored ex-post:

The EPIC's verification team was able to confirm that all monitoring parameters of which monitoring is required by the monitoring plan of the PDD /2/ were monitored during the monitoring period from 13/06/2014 to 31/12/2014. Table 8 presents the parameters monitored during the considered monitoring period.

Table 6: Parameters monitored ex-post

Monitored parameters
Management of the SWDS (Management of SWDS)
Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$)
Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$)
Temperature of the LFG stream in time interval *t* (T_t)
Pressure of the LFG stream in time interval *t* (P_t)
Amount of grid electricity consumed by the project activity during the year *y* ($EC_{PJ,y}$)
Operation margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year *y* ($EF_{grid,OM,y} = EF_{grid,OM-DD,y}$)
Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)
Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)
Flame detection of flare in the minute *m* ($Flame_m$)
Maintenance events completed in year *y* as monitored by the project participants ($Maintenance_y$)
Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$)
Net calorific value of the fuel LPG ($NCV_{LPG,y}$)
CO_2 emission factor of fuel LPG in year *y* ($EF_{CO2,LPG,y}$)
Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,sat}$)

Not monitored parameters: The monitoring plan of the PDD /2/ also includes the following monitoring parameters of which monitoring was not required during the considered monitoring period since the methodological options for which they are applicable were not selected[3].

[3] While Option C of the methodological tool «Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) was selected for the determination of $F_{CH4,flared,y}$ during the considered monitoring period, the following applies:

Table 7: Parameters not monitored during the considered monitoring period

Not monitored parameters
Volumetric flow of LFG stream in time interval *t* on a dry basis ($V_{t,db}$)
Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db}$)
Mass flow of the LFG stream in time interval *t* on dry basis ($M_{t,db}$)

Assessment of parameters monitored ex-post:

Tables 9 to 23 include assessment details for parameters monitored *ex-post* during the monitoring period from 13/06/2014 to 31/12/2014.

Table 8: Monitoring details for the monitoring parameter "Management of the SWDS"

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Management of the SWDS (Management of SWDS)
Measuring, recording and reporting frequencies:	The ex-post determination of the monitoring parameter Management of the SWDS is not based on measurements. As correctly outlined in the Monitoring Report /3/, management of the CTR Caieiras landfill is annually compared against the previously conceived original construction and operational design of the landfill in order to confirm that management and operation of the CTR Caieiras landfill (including relevant aspects related to landfilling practice) were not modified with the unique aim of increasing generation of methane on site.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. As per the monitoring plan of the registered PDD /2/, monitoring for the parameter Management of the SWDS is to be performed on the basis of a technical evaluation assessment of the overall management and operation of the CTR landfill with an every year frequency. The assessment should identify whether the management of the landfill was not modified when compared with the original design for the landfill. While the monitoring parameter Management of the SWDS is included in the monitoring plan for the project

- $V_{t,db}$ was not monitored as Option A of the methodological tool Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) was not selected.

- $v_{CH4,t,db}$ was not monitored as Options A and D of the methodological tool Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) was not selected.

- $M_{t,db}$ was not monitored as Option D of the methodological tool Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) was not selected.

	activity since 13/12/2013 (starting date of the 2nd 7-year renewable crediting period for which the registered PDD /2/ applying ACM0001 (version 13 /11/) + applicable methodological tools is valid), the performance on 02/12/2014 of the 1st evaluation assessment of the management practice at the CTR Caierias landfill (as the applicable monitoring procedure for the parameter Management of the SWDS) is deemed reasonable and acceptable. The performed assessment developed by a qualified 3rd party sufficiently confirms that the applied monitoring frequency is in accordance with both the monitoring plan from the registered PDD /2/ and ACM0001 (version 13.0.0) /11/.
Type of monitoring equipment/instrument:	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
Company which has performed the applicable calibration events:	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.

Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. While monitoring of the parameter Management of the SWDS is not performed based on measurements, there are no monitoring equipment/instruments utilized.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	The outcome of the technical evaluation performed by the independent 3rd party engineering company "Cepollina Engenheiros Consultores Ltda." is reported in a declaration document /52/ issued by such company that is dated 02/12/2014. This document was made available and was assessed by the EPIC's verification team. As appropriately outlined in the latest version of the Monitoring Report /3/, *«(...) as part of the performed technical evaluation, the current configuration and operational conditions of the CTR Caieiras landfill were compared against the previously conceived design and operational conditions of the landfill prior to the implementation of the project activity on the basis of different sources, including inter alia:* *- Original design documents of the landfill (as described in the documentation required for all phases of the environmental licensing for the CTR Caieiras landfill);* *- Applicable local or national regulations* *- Expertise and experience of "Cepollina Engenheiros Consultores Ltda." with the CTR Caieiras landfill. Since January 2007 "Cepollina Engenheiros Consultores Ltda." has performed regular technical inspections at the CTR Caieiras landfill as part of the continuously performed assessment of geotechnical stability monitoring for the landfill cells. Such regular assessments are required by the competent environmental authority from São Paulo State (Companhia de Tecnologia de Saneamento Ambiental - CETESB) for the validity of the environmental and safety permit/licensing for the CTR Caieiras landfill. (…)"* The EPIC's verification team has verified that the issued technical evaluation/declaration /52/ sufficiently confirms that the original conceived design of the landfill has not been

	modified so far. No changes in the aspects, conditions and circumstances related to management of the landfill (e.g. waste disposal, waste covering, waste compacting, management of leachate, draining of rainwater, etc.) have occurred with an aim to deliberate increase methane generation on the CTR Caieiras landfill. It is thus demonstrated that baseline emissions of CH_4 at the CTR Caieiras landfill were not under any circumstance artificially inflated in by deliberate change in the operation of the landfill.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The EPIC's verification team was able to verify that information included in the Monitoring Report /3/ is in accordance with the content of the declaration document issued by Cepollina Engenheiros Consultores Ltda. dated 02/12/2014. This document was made available and was assessed by the EPIC's verification team.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Yes. Details for data transfer and reporting of emission reductions (incl. relevant QA/QC process) are assessed in Section 4.1.4. In the particular case of the monitoring parameter Management of the SWDS, related monitoring records are not considered in the context of emission reduction calculations for the considered monitoring period. Further details for monitoring management and quality assurance related aspects for the project activity are included in Section 4.1.4.7.

Table 9:" Monitoring details for the monitoring parameter Volumetric flow of LFG stream in time interval *t* on a wet basis" ($V_{t,wb}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (monitored as per Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/).
Measuring, recording and reporting frequencies:	During the considered monitoring period, continuously measurements of the monitoring parameter $V_{t,wb}$ were recorded/reported with an every minute frequency. As correctly outlined in the latest version of the Monitoring Report /3/, while measurements for $V_{t,wb}$ are performed by the installed 4 LFG flow meters (one flow meter for each individual installed flare), the monitoring parameter is thus measured, recorded and reported on the basis of the

<table>
<tr><td></td><td>following sub-parameters:

- $V_{t,wb,flare-1}$: Volumetric flow of LFG to Flare 1

- $V_{t,wb,flare-2}$: Volumetric flow of LFG to Flare 2

- $V_{t,wb,flare-3}$: Volumetric flow of LFG to Flare 3

- $V_{t,wb,flare-4}$: Volumetric flow of LFG to Flare 4

This is deemed correct, acceptable and under conformance with requirements of ACM0001 (version 13.0.0) /11/ and applicable methodological tools.

It is important to note that, as further assessed in Section 4.1.4.3, while measurements for $V_{t,wb}$ are performed by the installed 4 LFG flow meters in Nm^3/h on the basis of the sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$ $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$, such sub-parameters are thus equivalent to the calculation sub-parameters $V_{t,wb,n,flare-1,}$ $V_{t,wb,n,flare-2,}$ $V_{t,wb,n,flare-3}$ and $V_{t,wb,n,flare-4.}$</td></tr>
<tr><td>Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>As per the registered PDD /2/, continuous measurements of $V_{t,wb}$ are to be recorded and report every minute. Moreover, as per the applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0) /14/ (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, monitoring of Volumetric flow of LFG stream in time interval t on a wet basis should be performed continuously if not specified in the underlying methodology. While ACM0001 (version 13.0.0) /11/ does not specify any monitoring frequency for Volumetric flow of LFG stream in time interval t on a wet basis, the applied measuring, recording and recording frequencies for Volumetric flow of LFG stream in time interval t on a wet basis are thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>Measurements of Volumetric flow of LFG stream in time interval t on a wet basis are performed by the 4 installed LFG flow meters (one for each installed high temperature enclosed flare) on the basis of the sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$.

Flow meter used for measuring the sub-parameter $V_{t,wb,flare-1}$:

<table>
<tr><td colspan="2">Specifications of the flow meter used for measuring the sub-parameter $V_{t,wb,flare-1}$</td></tr>
<tr><td>Manufacturer</td><td>Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.</td></tr>
<tr><td>Model</td><td>FT-2</td></tr>
</table>
</td></tr>
</table>

Serial Number	1412000235
Accuracy:	±1.0%

Source: [31]

Flow meter used for measuring the sub-parameter $V_{t,wb,flare-2}$:

Specifications of the flow meter used for measuring the sub-parameter $V_{t,wb,flare-2}$	
Manufacturer	Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.
Model	FT-2
Serial Number	1412000236
Accuracy:	±1.0%

Source: [31]

Flow meter used for measuring the sub-parameter $V_{t,wb,flare-3}$:

Specifications of the flow meter used for measuring the sub-parameter $V_{t,wb,flare-3}$	
Manufacturer	Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.
Model	FT-2
Serial Number	1412000237
Accuracy:	±1.0%

Source: [31]

<table>
<tr><td></td><td>

Flow meter used for measuring the sub-parameter $V_{t,wb,flare-4}$:

<table>
<tr><th colspan="2">Specifications of the flow meter used for measuring the sub-parameter $V_{t,wb,flare-4}$</th></tr>
<tr><td>Manufacturer</td><td>Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.</td></tr>
<tr><td>Model</td><td>FT-2</td></tr>
<tr><td>Serial Number</td><td>1412000238</td></tr>
<tr><td>Accuracy:</td><td>±1.0%</td></tr>
</table>

Source: /31/

</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?</td><td>The registered PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any accuracy requirement for the LFG flow meters installed at the project site. The accuracy range for the installed instruments is ±1.0%. It is EPIC's contention that the use of the installed instruments represents good practice for monitoring of LFG flow.</td></tr>
<tr><td>Calibration frequency /interval for the monitoring equipment/instrument:</td><td>As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A. and recommendations from the equipment's manufacturer, the installed 4 LFG flow meters are calibrated every 2 years by a third party independent accredited calibration laboratory [4].

Calibration details for the flow meter used for measuring the sub-parameter $V_{t,wb,flare-1}$:

For the LFG flow meter with S/N 1412000235, a valid calibration event was performed on 04/06/2014 as indicated in the Certificate of Calibration No. 1412000235 1214 C7 /15/ issued by Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda. This Certificate of Calibration was made</td></tr>
</table>

[4] It is important to note that, in order to perform the calibration events, the flow meters are temporarily disconnected from the LFG collection pipeline. During this period, the project's PLC unit reports the values of LFG flow for the related flow meter ($V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) as null (zero).

	available and was assessed by the EPIC's verification team. *Calibration details for the flow meter used for measuring the sub-parameter $V_{t,wb,flare-2}$:* For the 1412000236 flow meter, a valid calibration event was performed on 04/06/2014 as indicated in the Certificate of Calibration No. 1412000236 1214 C7 /15/ issued by Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda. This Certificate of Calibration was made available and was assessed by the EPIC's verification team. *Calibration details for the flow meter used for measuring the sub-parameter $V_{t,wb,flare-3}$:* For the 1412000237 flow meter, a valid calibration event was performed on 04/06/2014 as indicated in the Certificate of Calibration No. 1412000237 1214 C7 /15/ issued by Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda. This Certificate of Calibration was made available and was assessed by the EPIC's verification team. *Calibration details for the flow meter used for measuring the sub-parameter $V_{t,wb,flare-4}$:* For the 1412000238 flow meter, a valid calibration event was performed on 04/06/2014 as indicated in the Certificate of Calibration No. 1412000238 1214 C7 /15/ issued by Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda. This Certificate of Calibration was made available and was assessed by the EPIC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	As per both the PDD /2/ and ACM0001 (version 13.0.0) /11/, the installed LFG flow meters are to be calibrated in a frequency as per the instrument's specifications and/or instrument manufacturer's recommendations. Thus, the applied calibration frequency (every 2 years, as per recommendations from the equipment's manufacturer) under full conformance with both the monitoring plan of the PDD /2/ and ACM0001 (version 13.0.0) /11/
Company which has performed the applicable calibration events:	The calibration events performed for the installed 4 LFG flow meters that are valid for the considered monitoring period were all performed by Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda. (manufacturer of the LFG flow meters).
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events for the installed 4 LFG flow meters confirms proper functioning of these monitoring instruments.

Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration events for the installed 4 LFG flow meters are valid for the whole considered monitoring period from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG flow sent to each flare (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) as visualized by the EPIC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by each one of the installed 4 LFG flow meters (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring equipment respectively (at the time of the performed on-site visit to the project site). Further assessment details about recording of values measured at the project site are included in Section 4.1.4.2. Furthermore, a *data authenticity checking* was performed for all every minute basis measurement records of the following LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction

	calculation spreadsheets /5/ include only authentic monitoring records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Yes. Details for data transfer and reporting of emission reductions (incl. relevant QA/QC process) are assessed in Section 4.1.4. Further details for monitoring management and quality assurance related aspects for the project activity are included in Section 4.1.4.7.

Table 10: Monitoring details for the monitoring parameter "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis" ($v_{CH4,t,wb}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) (monitored as per Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/).
Measuring, recording and reporting frequencies:	During the monitoring period from 13/06/2014 to 31/12/2014, continuously measurements for the monitoring parameter $v_{CH4,t,wb}$ were recorded/reported with an every minute frequency. As part of performed measurements, samples of collected LFG continuously pass through the infrared cell of the installed continuous CH_4 content gas analyzer unit as a stream. Each every-minute reported value of $v_{CH4,t,wb}$ corresponds to a measurement actually performed at the last time instant the minute in question. While it takes about 5 seconds for the collected gas to go through the filtering/cooling process prior of reaching the infra-red cell (according to information provided by the equipment manufacturer), each individual every-minute measurement that is recorded/reported for a specific time instant (for example, 12:03:00) actually represents the concentration of the gas that entered the gas analyzer pump five seconds before (e.g. 12:02:55).
Are measuring, recording and reporting frequencies in accordance with the	As per the registered PDD /2/, continuous measurements of $v_{CH4,t,wb}$ are to be recorded and report every minute. Moreover, as per the applicable guidance of the

<table>
<tr><td>monitoring plan and monitoring methodology? (Yes / No)</td><td>methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0) /14/ (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, monitoring of Volumetric fraction of CH_4 in the collected LFG in time interval t on a wet basis should be performed continuously if not specified in the underlying methodology.

While ACM0001 (version 13.0.0) /11/ does not specify any monitoring frequency for Volumetric fraction of CH_4 in the collected LFG in time interval t on a wet basis , the applied measuring, recording and recording frequencies for Volumetric fraction of CH_4 in the collected LFG in time interval t on a wet basis are thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>During the monitoring period from 13/06/2014 to 31/12/2014, continuously measurements of the monitoring parameter $v_{CH4,t,wb}$ were performed by an installed continuous CH_4 content gas analyzer unit for which main specifications are summarized below:

<table>
<tr><th colspan="2">Specifications of installed continuous CH_4 content gas analyzer unit</th></tr>
<tr><td>Manufacturer</td><td>BGM Instrumentação Controle e Automação Ltda.</td></tr>
<tr><td>Model</td><td>CENTRUM AG 4000</td></tr>
<tr><td>Serial Number</td><td>NS 53159</td></tr>
<tr><td>Accuracy</td><td>±2.0%</td></tr>
</table>
Source: /45/

It is important to note that EPIC was able to confirm during the performed on-site visit that the implemented LFG collection process ensures that LFG passing through the installed flow meters and through the installed continuous CH_4 content gas analyzer unit are measured on the same basis/conditions (wet basis).The installed CH_4 content gas analyzer unit is installed in the main LFG collection pipeline right before it splits to the 4 high temperature flares, where the LFG flow meters are installed.</td></tr>
</table>

Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	The registered PDD /2/, ACM0001 (version 13.0.0) /11/ do not specify any accuracy requirement for the CH_4 content gas analyzer unit installed at the project site. The accuracy range for the installed instrument is ±2.0%. It is EPIC's contention that the use of the installed instrument represents good practice for monitoring of CH_4 content of LFG.
Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the installed CH_4 content gas analyzer unit is to be calibrated every 3 months by trained project activity's operational staff of project activity. This is confirmed by the EPIC's verification team to be in accordance with recommendations from the equipment's manufacturer. Related Certificates of staff training /53/ were made available to the EPIC's verification team [5]. The performed 27 calibration events which are valid for the monitoring period from 13/06/2014 to 31/12/2014 were correctly performed by comparison with canisters of calibrated span gases purchased from a certified gas supplier. Two of the valid calibrations were performed on 11/06/2014 and 05/01/2015, which are dates prior and after the monitoring period. The certified span gases utilized for the calibration events of the CH_4 gas analyzer unit are summarized below: Set of certificates for the cylinder of span gases used for the calibration of the CH_4 content gas analyzer unit: - Gas cylinders with 99.999% N_2 span gas: cylinder n° 395939 /24/ (supplied by IBG – Indústria Brasileira de Gases Ltda.) - Gas cylinders with 99.999% N_2 span gas: cylinder n° 395749 /24/ (supplied by IBG – Indústria Brasileira de

[5] As explained by the project's operational staff to the EPIC's verification team, while the equipment is not disconnected from the project activity for the performance of calibration events, whenever a calibration event is performed at the installed CH_4 content gas analyzer unit, the equipment reading cell measures the CH4 concentration of the utilized span gases and the last reported value of CH_4 content in collected LFG ($V_{CH4,t,wb}$) (value measured and reported prior of activating the calibration mode in the equipment) is continuously retrieved by the project's PLC unit and recorded by the project's database for monitoring data every single miniute until the calibration mode of the instrument is deactivated. This is deemed reasonable and acceptable. Since, as also assessed by the EPIC's verification team, a typical calibration events normally takes about 20 minutes; it is reasonable to assume that CH_4 concentration at collected LFG will not dramatically change during such short time span.

Gases Ltda.)

- Gas cylinders with 5.01% O_2 span gas: cylinder n° 3933516 /24/ (supplied by IBG – Indústria Brasileira de Gases Ltda.)
- Gas cylinders with 59.95% CO_2 span gas: cylinder n° 4849733 /24/ (supplied by IBG – Indústria Brasileira de Gases Ltda.)
- Gas cylinders with 59.96% CH_4 span gas: cylinder n° 1118 /24/ (supplied by IBG – Indústria Brasileira de Gases Ltda.)
- Gas cylinders with 60% CO_2 span gas: cylinder n° 877597 /24/ (supplied by IBG – Indústria Brasileira de Gases Ltda.)

As part of the performed calibration events, the relationship (measurement deviation/error) between the measurements of CH_4 content performed in the utilized span standard with known/certified CH_4 content is established. Through this procedure, the potential measurement error/deviation for CH_4 content of collected LFG is identified and expressed as a percentage. Such measurement deviations/errors are indicated in the calibration notes. Information available in the calibration notes /22/ were assessed by EPIC. As outlined in the calibration notes /22/, the calibration events were performed in the dates indicated in the table below. Moreover, for each individual calibration event, measurement deviation/error for CH_4 content was identified as also indicated below:

CH_4 content gas analyzer unit	
Calibration Results/findings:	
Date of performed calibration events	Identified measurement deviation/error for CH_4 content measurements- Span - %)
11/06/2014	+0.7%
18/06/2014	+0.7%
25/06/2014	-0.3%
02/07/2014	+1.0%
10/07/2014	+1.5%
17/07/2014	+0.5%
23/07/2014	-1.8%

31/07/2014	+0.9%
07/08/2014	-1.4%
14/08/2014	-0.1%
21/08/2014	-0.7%
28/08/2014	+0.4%
04/09/2014	-0.5%
11/09/2014	-0.6%
18/09/2014	-0.2%
25/09/2014	+0.1%
02/10/2014	+0.2%
10/10/2014	+0.1%
17/10/2014	-0.1%
10/11/2014	-0.5%
19/11/2014	+0.3%
26/11/2014	+0.6%
04/12/2014	+1.6%
12/12/2014	+0.4%
19/12/2014	+1.4%
26/12/2014	+0.5%
05/01/2015	+1.0%

Source: /22/

The EPIC's verification team has assessed the certificates /24/ of the utilized span gas cylinders and calibration notes in order to confirm the correctness of information provided above. Moreover, by assessing the reported details for the 27 valid calibration events, the EPIC's verification team was able to confirm that the composition of the utilized span gases were properly considered in the context of the determination of the measurement deviations/errors for CH_4 content measurements (Span).

Is the calibration interval in line with the monitoring plan of the PDD? If the	As per the PDD /2/ , ACM0001 (version 13.0.0) /11/ and the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/, the installed continuous

PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	CH_4 content gas analyzer unit is to be calibrated in a frequency to be established under conformance with instrument's specifications and/or instrument manufacturer's recommendations. Thus, the adopted calibration frequency (every 3 months, as per recommendations from the equipment's manufacturer) is in line with the monitoring plan of the PDD /2/, ACM0001 (version 13.0.0) /11/ and the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/, A communication issued by the service representative of the equipment manufacturer in Brazil confirms their approval for the internal working procedure CA.BG.01.05 of Essencis Soluções Ambientais S.A. As assessed by the EPIC's verification team, the latest version of the internal working procedure ""*CA.BG.01.05-Rev 09 – Calibração Analisador de Gases"* (Gas analyzer calibration) /56/ details the procedure for performing calibration events the installed $CH_4/CO_2/O_2$ content gas analyzer unit and specifies a calibration frequency of every 3 months. It is the opinion of the EPIC's verification team that the adopted calibration frequency represents good practice.
Company which has performed the applicable calibration events:	All the 27 calibration events valid for the monitoring period from 13/06/2014 to 31/12/2014 were performed by the own staff of Essencis Soluções Ambientais S.A.. The staff responsible for the calibrations received previous training following the applicable procedure "*CA.BG.01.05-Rev 08 - Calibração Analisador de Gases"* (Gas analyzer calibration) /56/. Moreover, related Certificates of training /53/ were made available to the EPIC's verification team. Moreover, the EPIC's verification team was also able to verify that the work procedure CA.BG.01.05 was approved by equipment manufacturer and that it is available in the project site. As informed by the project participants, the main reason for performing the calibrations internally is the relatively remote location of the project site and difficulties on scheduling a 3rd party for performing such relatively easy calibration events.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events for the CH_4 content gas analyzer unit confirmed proper functioning of this instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed 27 calibration events for the installed CH_4 content gas analyzer unit that are referred in the Monitoring Report /3/ are valid for the whole monitoring period

	from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of CH_4 content in the collected LFG as visualized by the EPIC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed in the display of the installed CH_4 content gas analyzer unit (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring equipment respectively (at the time of the performed on-site visit to the project site). Further assessment details about recording of values measured at the project site are included in Section 4.1.4.2. Furthermore, a *data authenticity checking* was performed for all every minute basis measurement records of the following LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction calculation spreadsheets /5/ include only authentic monitoring

	records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Yes. Details for data transfer and reporting of emission reductions (incl. relevant QA/QC process) are assessed in Section 4.1.4. Further details for monitoring management and quality assurance related aspects for the project activity are included in Section 4.1.4.7.

Table 11: Monitoring details for the monitoring parameter "Temperature of the LFG stream in time interval *t"* (T_t)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Temperature of the LFG stream in time interval *t* (T_t)
Measuring, recording and reporting frequencies:	During the considered monitoring period, continuously measurements of the monitoring parameter T_t were recorded/reported with an every-minute frequency. It is noteworthy that, while the installed LFG flow meters automatically convert and report values of LFG flow in normalized cubic meters (Nm^3) by considering standard temperature and pressure (STP) conditions, monitoring of T_t is not required as per the monitoring plan of the PDD /2/. Nonetheless, continuously measurements of T_t were recorded/reported for sake of completeness.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD /2/, continuous measurements of T_t are to be recorded and report every minute. Moreover, as per the applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/ (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, monitoring of T_t should be performed continuously if not specified in the underlying methodology. While ACM0001 (version 13.0.0) /11/ does not specify any monitoring frequency for T_t, the applied measuring, recording and recording frequencies for T_t are thus in accordance with both ACM0001 (version 13.0.0) /11/

<table>
<tr><td></td><td>and the registered PDD [2].</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>During the considered monitoring period, continuously measurements of T_t were performed by an installed LFG temperature sensor of which main specifications details are summarized below:

<table>
<tr><th colspan="2">Specifications of installed LFG temperature sensor</th></tr>
<tr><td>Manufacturer</td><td>Pressgage instrumentos de Medição e Controle Ltda.</td></tr>
<tr><td>Model</td><td>STP-100</td></tr>
<tr><td>Serial Number</td><td>45519</td></tr>
<tr><td>Accuracy</td><td>±1.0%</td></tr>
</table>
Source: [44]</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?</td><td>The PDD [2] and ACM0001 (version 13.0.0) [11] do not specify any accuracy requirement for the LFG temperature sensor installed at the project site. The accuracy range for the installed instrument is ±1.0%. It is EPIC's contention that the use of the installed instrument represents good practice for monitoring of LFG temperature.</td></tr>
<tr><td>Calibration frequency /interval for the monitoring equipment/instrument:</td><td>As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A. and recommendations from the equipment's manufacturer, the installed LFG temperature sensor is to be calibrated every year[6]. As confirmed by the EPIC's verification team through assessment of the specification sheet for the installed LFG temperature sensor,</td></tr>
</table>

[6] As explained by the project's operational staff to the EPIC's verification team, whenever a calibration event is performed at the installed LFG temperature sensor, the instrument is temporarily disconnected from the main LFG pipeline. During the calibration period, the PLC unit reports the values of LFG temperature as null (zero). While values for LFG volumetric flow are already measured and reported in Nm^3/h, the lack of reported, values for LFG temperature during the performance of the valid calibration event (prior to the starting of the considered monitoring period) does not affect the determination of emission reductions during such limited time periods.

	the selected calibration frequency is as per the recommendations of the instrument manufacturer. A valid calibration event was performed on 11/03/2014 as indicated in the Certificate No. T-202/14 /17/, issued by Naka Comércio e Indústria de Instrumentação Ltda. The Calibration Certificate was made available and assessed by the EPIC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	As per both the PDD /2/ and ACM0001 (version 13.0.0) /11/, the installed LFG temperature sensor is to be calibrated in a frequency as per the instrument's specifications and/or instrument manufacturer's recommendations. Thus, the adopted calibration frequency (every year, as per recommendations from the equipment's manufacturer) is in line with the both the monitoring plan of the PDD /2/ and ACM0001 (version 13.0.0) /11/.
Company which has performed the applicable calibration events:	The valid calibration event for the LFG temperature sensor was performed by Naka Comércio e Indústria de Instrumentação Ltda.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration event for the LFG temperature sensor confirms proper functioning of the measurement instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration event referred in the Monitoring Report /3/ is valid for the whole monitoring period from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG temperature as visualized by the EPIC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by LFG temperature indicators (which are located next to the LFG temperature sensor) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring equipment respectively (at the time of the performed on-site visit to the project site). Further assessment details about recording of values measured at the project site are included in Section 4.1.4.2. Furthermore, a *data authenticity checking* was performed for all every minute basis measurement records of the following

	LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2,}$ $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction calculation spreadsheet /5/ includes only authentic monitoring records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Yes. Details for data transfer and reporting of emission reductions (incl. relevant QA/QC process) are assessed in Section 4.1.4. Further details for monitoring management and quality assurance related aspects for the project activity are included in Section 4.1.4.7.

Table 12: Monitoring details for the monitoring parameter "Pressure of the LFG stream in time interval *t"* (P_t)

<table>
<tr><th colspan="2">Assessment</th></tr>
<tr><td>Data / Parameter:
(as per the monitoring plan of the PDD):</td><td>Pressure of the LFG stream in time interval t (P_t)</td></tr>
<tr><td>Measuring, recording and reporting frequencies:</td><td>During the considered monitoring period, continuously measurements of the monitoring parameter P_t were recorded/reported with an every-minute frequency.

It is noteworthy that, while the installed LFG flow meters automatically convert and report values of LFG flow into normalized cubic meters (Nm^3) by considering standard temperature and pressure (STP) conditions, monitoring of P_t is not required as per the monitoring plan of the PDD /2/. Nonetheless, continuously measurements of P_t were recorded/reported for sake of completeness.</td></tr>
<tr><td>Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>As per the registered PDD /2/, continuous measurements of P_t are to be recorded and report every minute. Moreover, as per the applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0) /14/ (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, monitoring of Pressure of the LFG stream in time interval t should be performed continuously if not specified in the underlying methodology. While ACM0001 (version 13.0.0) /11/ does not specify any monitoring frequency for the parameter P_t the applied measuring, recording and recording frequencies for the monitoring parameter P_t are thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>During the considered monitoring period, continuous measurements of the monitoring parameter P_t were performed by an installed LFG pressure sensor of which main specifications are presented below:

<table>
<tr><th colspan="2">Specifications of installed LFG pressure sensor</th></tr>
<tr><td>Manufacturer</td><td>Pressgage instrumentos de Medição e Controle Ltda.</td></tr>
<tr><td>Model</td><td>TPI-PRESS</td></tr>
<tr><td>Serial Number</td><td>43608</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td></tr>
</table>
Source: /42/</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as</td><td>The PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any accuracy requirement for the LFG pressure sensor installed at the project site. The accuracy range for the</td></tr>
</table>

stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	installed instrument is ±1.5%. It is EPIC's contention that the use of the installed instrument represents good practice for monitoring of LFG pressure.
Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A. and recommendations from the equipment's manufacturer, the installed LFG pressure sensor is to be calibrated every year [7]. As confirmed by the EPIC's verification team through assessment of the specification sheet for the installed LFG pressure sensor, the selected calibration frequency is as per the recommendations of the instrument manufacturer. A valid calibration event was performed on 10/03/2014 (Certificate No. R-0154/14 /16/, issued by Naka Comércio e Indústria de Instrumentação Ltda.). The Calibration Certificate was made available and assessed by the EPIC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	As per both the PDD /2/ and ACM0001 (version 13.0.0) /11/, the installed LFG pressure sensor is to be calibrated in a frequency as per the instrument's specifications and/or instrument manufacturer's recommendations. Thus, the adopted calibration frequency (every year, as per recommendations from the equipment's manufacturer) is in line with the both the monitoring plan of the PDD /2/ and ACM0001 (version 13.0.0) /11/.
Company which has performed the applicable calibration events:	The valid calibration event for the LFG pressure sensor was performed by Naka Comércio e Indústria de Instrumentação Ltda.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration event for the LFG pressure sensor confirms proper functioning of the measurement instrument.
Is(are) the performed	Yes. The performed calibration event referred in the

[7] As explained by the project's operational staff to the EPIC's verification team, whenever a calibration event is performed at the installed LFG pressure sensor, the instrument is temporarily disconnected from the main LFG pipeline. During the calibration period, the PLC unit reports the values of LFG pressure as null (zero). While values for LFG volumetric flow are already measured and reported in Nm^3/h, the lack of reported, values for LFG pressure during the performance of the valid calibration event (prior to the starting of the considered monitoring period) does not affect the determination of emission reductions during such limited time periods.

calibration(s) valid for the whole reporting period?	Monitoring Report /3/ is valid for the whole monitoring period from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG pressure as visualized by the EPIC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by LFG pressure indicators (which are located next to the LFG pressure sensor) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring equipment respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2. Further assessment details about recording of values measured at the project site are included in Section 4.1.4.2. Furthermore, a *data authenticity checking* was performed for all every minute basis measurement records of the following LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2,}$ $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by

	anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction calculation spreadsheets /5/ include only authentic monitoring records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 13: Monitoring details for the monitoring parameter "Amount of grid electricity consumed by the project activity during the year *y"* ($EC_{PJ,y}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Amount of grid electricity consumed by the project activity during the year *y* ($EC_{PJ,y}$)
Measuring, recording and reporting frequencies:	During the considered monitoring period, accumulated values of continuously measurements of the monitoring parameter $EC_{PJ,y}$ were aggregated and recorded/reported monthly by the staff of Essencis Soluções Ambientais S.A..
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD /2/, continuous measurements of $EC_{PJ,y}$ are to be recorded and report at least with an every month frequency. The "Tool to calculate baseline, project and/or leakage emissions from electricity consumption», and ACM0001 (version 13.0.0) /11/ do not clearly indicate recording and reporting frequencies for continuous measurements for the parameter $EC_{PJ,y}$. Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the PDD /2/ , "Tool to calculate baseline, project and/or leakage emissions from electricity consumption» and ACM0001 (version 13.0.0) /11/ .
Type of monitoring equipment/instrument:	During the considered monitoring period, continuously measurements of the monitoring parameter $EC_{PJ,y}$ were performed by two installed electricity meters of the same

<table>
<tr><td></td><td>model/specifications (with one being used exclusively for measuring the consumption of grid-sourced electricity by the Blower 04) of which main specifications are presented below:

<table>
<tr><th colspan="2">Specifications of installed electricity meters</th></tr>
<tr><td>Manufacturer</td><td>KRON Instrumentos Elétricos Ltda.</td></tr>
<tr><td>Model</td><td>MULT-K</td></tr>
<tr><td>Serial Number (S/N)</td><td>Electricity meter 01 (Blower 1,2,3,5 and landfill installation (including project's monitoring and control system): 234215

Electricity meter 02 (Blower 4): 465025</td></tr>
<tr><td>Accuracy</td><td>±0.2%</td></tr>
</table>
Source: /28/</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?</td><td>The PDD /2/, "Tool to calculate baseline, project and/or leakage emissions from electricity consumption», and ACM0001 (version 13.0.0) /11/ do not specify any accuracy requirement for the electricity meters installed at the project site. The accuracy range for the installed instruments is ±0.2%. It is EPIC's contention that the use of the installed instruments represents good practice for monitoring of consumption of grid-sourced electricity by the project activity.</td></tr>
<tr><td>Calibration frequency /interval for the monitoring equipment/instrument:</td><td>As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A. and recommendations from the equipment's manufacturer, the installed electricity meters are to be calibrated every 5 years. As confirmed by the EPIC's verification team through assessment of the specification sheet for the installed electricity meters /28/, the selected calibration frequency is as per the recommendations of the instrument manufacturer. For the electricity meter with S/N 234215, a calibration event was performed on 19/03/2012 (Calibration Certificate R-0701/12 /23/, issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.).

For the electricity meter with S/N 465025, a calibration event was performed on 19/03/2012 (Calibration Certificate R-0702/12 /29/, also issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.).</td></tr>
<tr><td>Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the</td><td>Both the monitoring plan of the PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any calibration frequency requirements for the electricity meters. The registered PDD /2/</td></tr>
</table>

frequency of calibration, does the selected frequency represent good monitoring practice?	states the following: *"Instrument will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice."* As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/, the following requirement is established regarding maintenance and calibration for electricity meters: *"(...) meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO)".* It is important to note that the installed electricity meters are approved/certified by the Brazilian national authority for metrology and standardization affairs (INMETRO). The meters are thus in conformance with INMETRO's requirements for maintenance and testing of electricity meters. Furthermore, the adopted calibration frequency is confirmed to be in accordance with related requirements/recommendations as established by the meters manufacturer. While, as confirmed by the EPIC's verification team, as per the instrument manufacturer, the meters are to be calibrated every 5 years, a calibration frequency of 5 years is applied for the installed electricity meters.
Company which has performed the applicable calibration events:	Both installed electricity meters were calibrated by Naka Instrumentação Industrial Ltda.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events confirm proper functioning of the electricity meters (at the time the calibration events were performed).
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration events dated 19/03/2012 (for both meters /23/ /29/) as correctly outlined in the Monitoring Report /3/, are valid for the whole considered monitoring period.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Records of grid-sourced electricity consumed by the project activity during the considered monitoring period, as reported in the summarized emission reduction calculation spreadsheet /5/ and Monitoring Report /3/ were cross-checked with monthly invoices of grid-sourced electricity purchase issued by Elektro Eletricidade e Serviços S.A. /32/ (the local

	power distribution company) which were made available and assessed by the EPIC's verification team during the performed on-site visit. Such cross-checking confirmed correctness of reported data for $EC_{PJ,y}$ during the considered monitoring period.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The EPIC's verification team has confirmed that values for the monitoring parameter $EC_{PJ,y}$ as reported in the summarized emission reduction calculation spreadsheet /5/ and Monitoring Report /3/ are as per the primary monitoring records.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 14: Monitoring details for the monitoring parameter "Operation margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year *y*" ($EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Operation margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year *y* ($EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$)
Measuring, recording and reporting frequencies:	Not applicable. The selected value for $EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$ (0.5822 tCO_2/MWh) is the recently calculated value valid for year 2014 as published by the DNA of Brazil. The DNA of Brazil has publishing annual values for $EF_{grid,OM,y}$ /43/.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$. As established in the registered PDD /2/, annual ex-post determined value for $EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$ are considered.
Type of monitoring equipment/instrument:	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$

	= $EF_{grid,OM-DD,y}$.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$.
Company which has performed the applicable calibration events:	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$.
How were the values in the Monitoring Report (and/or supporting documents, i.e	As confirmed by the EPIC's verification team, the DNA of Brazil has regularly calculated values of $EF_{grid,OM,y}$ for the National Electricity Grid of Brazil by applying classified

emission reduction calculation spreadsheet) verified and/or compared?	information and data on dispatch of electricity by grid-connected power plants within the National Electricity Grid of Brazil and by following calculation guidance applicable for "Dispatch data analysis operating margin CO_2 emission factor" ($EF_{grid,OM-DD,y}$) (based on dispatch merit order data for grid-connected power plants) as established by the methodological tool "Tool to calculate the emission factor for an electricity system" (version 3.0.0 as per the PDD /69/ and version 04.0 /40/ (latest version)). Related clarifications and details for the determination of $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ by the DNA of Brazil are made available at a specific section of the website of the DNA of Brazil /43/ Information made available in the website of the DNA of Brazil /43/ confirms the correctness of the selected value for $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$. The EPIC's verification team also confirmed as part of its performed assessments that *ex-post* determined values for both $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ and Build margin CO_2 emission factor ($EF_{grid,BM,y}$) on the basis of information published by the DNA of Brazil /43/ have been selected and applied for the determination of both baseline and project emissions related to electricity generation and consumption respectively in CDM projects hosted in Brazil with full acceptance both from the DOEs involved in the assessments and from the CDM-EB. The selected 2014 vintage value for the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ (0.5822 tCO_2/MWh) was confirmed by the EPIC's verification to correctly represent the official value for $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ for year 2014 as published by the DNA of Brazil /43/. In summary, it is EPIC's opinion that the selection and reporting of the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ is deemed correct and acceptable.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Not applicable. There are no measurements or measurement instruments/equipment involved for the definition of $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$.

Table 15: Monitoring details for the monitoring parameter " Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t"* ($F_{CH4,EG,t}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)
Measuring, recording and reporting frequencies:	For the considered monitoring period and for each individual flare, measurements for the monitoring parameter $F_{CH4,EG,t}$ were performed twice during the year encompassed by the considered monitoring period (year 2014) by a third party accredited entity and with a time interval between each set of measurements of at least every six months. The independent 3rd party inspection service company Ecosampling Ambiental Ltda. was selected by Essencis Soluções Ambientais S.A. for performing all measurements related to the determination of set of biannual values for $F_{CH4,EG,t}$ for each individual flare. As outlined in the test/evaluation technical reports /46/ issued by Ecosampling Ambiental Ltda., performance of measurements for the determination of set of values for $F_{CH4,EG,t}$ for each flare (calculation sub-parameters $F_{CH4,EG,t,flare-1}$, $F_{CH4,EG,t,flare-2}$, $F_{CH4,EG,t,flare-3}$ and $F_{CH4,EG,t,flare-4}$) valid for the considered monitoring period occurred in the following dates: - 13/06/2014 (Flare 3 and Flare 4) - 16/06/2014 (Flare 1 and Flare 2) - 19/12/2014 (Flare 1, Flare 2 Flare 3 and Flare 4)
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD /2/, measurements and calculations for the determination of values for the monitoring parameter $F_{CH4,EG,t}$ for each individual flare are to be performed biannually. As per the applicable guidance of the methodological tool "Project emissions from flaring" (version 02.0.0) /7/, "*(…) The two time periods in year y during which the flare efficiency is measured, each a minimum of one hour and separated by at least six months* ". While there are 185 days from 16/06/2014 to 19/12/2014 (not including such dates), the time interval between the performed measurements are deemed acceptable and in accordance with both the registered PDD /2/ and the methodological tool "Project emissions from flaring" (version 02.0.0) /7/.
Type of monitoring equipment/instrument:	As outlined in the Monitoring Report /3/ and in the test/evaluation reports /46/ issued for the valid performed measurements and calculations for the regular determination of the values of $F_{CH4,EG,t}$, for performing the measurements of

	amount of residual methane in the exhaust gas of the flares an analyzer FID / California Analytical Instruments (CAI) model 600 MHFID was utilized by the independent 3rd party inspection service company Ecosampling Ambiental Ltda. Moreover, for determining the speed of exhaust gas in the flare (in order to calculate the flow of exhaust gas of the flares), an appropriated Pitot tube was used by Ecosampling Ambiental Ltda. as part of the measurements. As per information made available in the technical evaluation/testing reports /46/, applicable measurement and test methodologies of U.S.A. Environmental Protection Agency (US-EPA) and CETESB (Companhia Ambiental do Estado de São Paulo (Environmental Agency for São Paulo State in Brazil)) were applied as follows: • US-EPA Method 25A – "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer" • CETESB L9.221 - *Dutos e chaminés de fontes estacionárias - determinação dos pontos de amostragem: procedimento* (translated into English language as "Stacks and chimneys in stationary emission sources- Sampling points determination procedure) • CETESB L9.222 - *Dutos e chaminés de fontes estacionárias - determinação da velocidade e vazão dos gases: método de ensaio* (translated into English language as "Stacks and chimneys in stationary emission sources – Determination of speed and outflow of gases)
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	The registered PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any equipment or procedural requirement for performing the related measurements and calculations for the determination of values for $F_{CH4,EG,t}$. The methodological tool "Project emissions from flaring" (version 02.0.0) /7/ establishes that *"(…) under Option B.1 the measurement is conducted by an accredited entity on a biannual basis».* The following disclaimer about the entity that performed the set of measurements for $F_{CH4,EG,t}$ that are valid for the considered monitoring period is appropriately included in Section D.2. of the Monitoring Report /3/: *"Ecosampling Ambiental Ltda. is a licensed independent third party inspections services company with specialized in inspections and testing of air emissions from stationary sources. In Brazil, operation of inspection entities and labs are regulated*

	by the Instituto Nacional de Metrologia, Qualidade e Tecnologia (INMETRO) (the Brazilian national authority for metrology and certification affairs)". In summary, it is the opinion of EPIC that Ecosampling Ambiental Ltda. performing related measurements with the analyzer FID / California Analytical Instruments (CAI) model 600 MHFID + an appropriate Pitot tube and following the applicable measurement and test methodologies of the US-EPA and CETESB represent a good practice for the determination of $F_{CH4,EG,t}$. The EPIC's verification team has assessed the operation and maintenance manual /49/ for gas analyzer 600 MHFID California Analytical Instruments (CAI) and was able to confirm this type of gas analyzer is appropriate for performing gas related analysis and measurements in enclosed high temperature flares. This equipement has accuracy of about 2% of reading at or above 2.0 ppm. Licensing information/status for the inspection service company "Ecosampling Ambiental Ltda." /68/ vis-a-vis accreditation requirements from INMETRO were made available and were assessed by the EPIC's verification team.
Calibration frequency /interval for the monitoring equipment/instrument:	The technical test/evaluation reports /46/ issued by the third party independent inspection service company Ecosampling Ambiental Ltda. highlight that both the utilized gas analyzer FID / California Analytical Instruments (CAI) model 600 MHFID and Pitot tube were in full conformance with calibration requirements applicable for these instruments/equipment.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	The registered PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any equipment or procedural requirement for performing the related measurements and calculations for the determination of values for $F_{CH4,EG,t}$. The methodological tool "Project emissions from flaring" (version 02.0.0) /7/ establishes that *"(…) under Option B.1 the measurement is conducted by an accredited entity on a biannual basis».* Thus no calibration frequency requirement for related instruments/equipment is specified either. It was not made available to the EPIC's verification team any evidence/proof (e.g. Certificates of Calibration, description of applied calibration procedures, etc.) outlining the adopted calibration intervals for the equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. The technical valid test/evaluation reports /46/ issued by the third party independent inspection service company Ecosampling Ambiental Ltda. highlight that both the utilized gas analyzer FID / California Analytical Instruments (CAI)

	model 600 MHFID and the Pitot tube were in conformance with calibration requirements applicable for these instruments.
Company which has performed the applicable calibration events:	No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the EPIC's verification team.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the EPIC's verification team.
Is(are) the performed calibration(s) valid for the whole reporting period?	No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the EPIC's verification team.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	The related technical test/evaluation reports /46/ for the performed measurements of $F_{CH4,EG,t}$ issued by the inspection service company Ecosampling Ambiental Ltda. were made available and assessed by the EPIC's verification team. Information made available in the Monitoring Report /3/ are in line with measurement details outlined in these technical reports /46/.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The EPIC's verification team compared the results of all measurements and calculations as outlined in the test/evaluation technical reports /46/ issued by Ecosampling Ambiental Ltda. against description of measurements and calculations as presented in the latest version of the Monitoring Report /3/ and spreadsheet including the calculation of flare efficiency values valid for the considered monitoring period /5/. Moreover, as per the registered PDD /2/ *"(…) The average flow rate to the flare during the time period t must be greater than the average flow rate observed for the previous six months. (...)*". The EPIC's verification team was able to confirm, through assessment of the related emission reduction calculation spreadsheets (files *"062014.xls"*, *"122014.xls"* and *"MR 10 - Caieiras - V.2 - 05.03.2015 – FE.xls"* /6/), that the average flow rate to the installed 4 high temperature enclosed flares during the second measurement event (performed in December 2014) was indeed higher than it was during the first measurement events (performed in June 2014).

Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 16: Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)
Measuring, recording and reporting frequencies:	During the considered monitoring period, continuous measurements of the monitoring parameter $T_{EG,m}$ were recorded/reported with an every minute frequency. As correctly outlined in the latest version of the Monitoring Report /3/, while measurements for the monitoring parameter $T_{EG,m}$ are performed by the installed 4 thermocouples (one thermocouple for each individual installed flare), this monitoring parameter is thus measured, recorded and reported on the basis of the following sub-parameters: - $T_{EG,m,flare-1}$: Temperature of exhaust gas in Flare 1 - $T_{EG,m,flare-2}$: Temperature of exhaust gas in Flare 2 - $T_{EG,m,flare-3}$: Temperature of exhaust gas in Flare 3 - $T_{EG,m,flare-4}$: Temperature of exhaust gas in Flare 4 This is deemed correct, acceptable and under conformance with requirements of ACM0001 (version 13.0.0) /11/ and applicable methodological tools.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD /2/, continuous measurements of the monitoring parameter $T_{EG,m}$ are to be recorded and report every minute. Moreover, as per the applicable guidance of the methodological tool "Project emissions from flaring" (version 02.0.0) /7/, (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, values of $T_{EG,m}$ shall be recorded once per minute. Thus, the applied measuring,

<table>
<tr><td></td><td>recording and recording frequencies for $T_{EG,m}$ are thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>Measurements of $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$ are continuously performed by 4 installed thermocouples (one for each installed high temperature enclosed flare).

Thermocouple used for measuring the sub-parameter $T_{EG,m,flare-1}$:

<table>
<tr><td colspan="2">Specifications of the thermocouple installed on Flare 1

(measurements for the sub-parameter $T_{EG,m,flare-1}$)</td></tr>
<tr><td>Manufacturer</td><td>Naka Comércio e Indústria de Instrumentação Industrial Ltda.</td></tr>
<tr><td>Model</td><td>NKTC-3000, type N</td></tr>
<tr><td>Serial Number</td><td>099156</td></tr>
<tr><td>Accuracy</td><td>±0.75%</td></tr>
</table>
Source: /48/

Thermocouple used for measuring the sub-parameter $T_{EG,m,flare-2}$:

<table>
<tr><td colspan="2">Specifications of the thermocouple installed on Flare 2

(measurements for the sub-parameter $T_{EG,m,flare-2}$)</td></tr>
<tr><td>Manufacturer</td><td>Naka Comércio e Indústria de Instrumentação Industrial Ltda.</td></tr>
<tr><td>Model</td><td>NKTC-3000, type N</td></tr>
<tr><td>Serial Number</td><td>099157</td></tr>
<tr><td>Accuracy</td><td>±0.75%</td></tr>
</table>
Source: /48/</td></tr>
</table>

Thermocouple used for measuring the sub-parameter $T_{EG,m,flare-3}$:

Specifications of the thermocouple installed on Flare 3 (measurements for the sub-parameter $T_{EG,m,flare-3}$)	
Manufacturer	Naka Comércio e Indústria de Instrumentação Industrial Ltda.
Model	NKTC-3000, type N
Serial Number	099158
Accuracy	±0.75%

Source: /48/

Thermocouple used for measuring the sub-parameter $T_{EG,m,flare-4}$:

Specifications of the thermocouple installed on Flare 4 (measurements for the sub-parameter $T_{EG,m,flare-4}$)	
Manufacturer	Naka Comércio e Indústria de Instrumentação Industrial Ltda.
Model	NKTC-3000, type N
Serial Number	099159
Accuracy	±0.75%

Source: /48/

Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does	The PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any accuracy requirement for the thermocouples installed at the project site. The accuracy range for the installed instruments is ±0.75%. It is EPIC's contention that the use of the installed instrument represents good practice for monitoring of temperature in the exhaust gas of the flares.

the utilization of the monitoring equipment/instrument represents good monitoring practice?	
Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A. and recommendations from the equipment's manufacturer, the installed thermocouples are to be calibrated every year [8]. As confirmed by the EPIC's verification team through assessment of the specification sheet for the installed thermocouples /48/, the selected calibration frequency is as per the recommendations of the instrument manufacturer. *Calibration details for the thermocouple used for measuring the sub-parameter $T_{EG,m,flare-1}$:* For the 099156 thermocouple, a valid calibration event was performed on 11/03/2014 (Certificate of Calibration No. T0198-14 /18/ issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.). *Calibration details for the thermocouple used for measuring the sub-parameter $T_{EG,m,flare-2}$:* For the 099157 thermocouple, a valid calibration event was performed on 11/03/2014 (Certificate of Calibration No. T0196-14 /18/ issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.). *Calibration details for the thermocouple used for measuring the sub-parameter $T_{EG,m,flare-3}$:* For the 099158 thermocouple, a valid calibration event was performed on 11/03/2014 (Certificate of Calibration No. T0201-14 /18/ issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.). *Calibration details for the thermocouple used for measuring the sub-parameter $T_{EG,m,flare-4}$:* For the 099159 thermocouple, a valid calibration event was performed on 11/03/2014 (Certificate of Calibration No.

[8] It is important to note that, in order to perform the calibration events, the thermocouples are temporarily disconnected from the flares. During this period, the PLC unit reports the values of temperature in the exhaust gas of the flare for the related thermocouple ($T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) as null (zero).

	T0200-14 issued by Naka Comércio e Indústria de Instrumentação Industrial Ltda.). The Calibration Certificates /18/ were made available and assessed by the EPIC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	As per both the PDD /2/ and the methodological tool "Project emissions from flaring" (version 02.0.0) /7/, the installed thermocouples are to be replaced or calibrated in a frequency as per the instrument's specifications and/or instrument manufacturer's recommendations. Thus, the adopted calibration frequency (every year, as per recommendations from the equipment's manufacturer) is in line with the both the monitoring plan of the PDD /2/ and ACM0001 (version 13.0.0) /11/.
Company which has performed the applicable calibration events:	The valid calibration events for the installed thermocouples were all performed by Naka Comércio e Indústria de Instrumentação Ltda.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events for the installed thermocouples confirm proper functioning of these measurement instruments.
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration events referred in the Monitoring Report /3/ are valid for the whole monitoring period from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of temperature in the exhaust gas of each flare (calculation sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$.) as visualized by the EPIC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by a display existent in the flare control panel (which are located next to the flares) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring equipment respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2.

	Furthermore, a *data authenticity checking* was performed for all every minute basis measurement records of the following LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2,}$ $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction calculation spreadsheets /5/ include only authentic monitoring records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 17: Monitoring details for the monitoring parameter Flame detection of flare in the minute *m* ($Flame_m$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Flame detection of flare in the minute *m* ($Flame_m$)
Measuring, recording and reporting frequencies:	During the considered monitoring period, the operational status of the flares were recorded and reported every-minute on the basis of continuous measurements of the status of flame in the flares. As correctly outlined in the latest version of the Monitoring Report /3/, while measurements for $Flame_m$ are performed by the installed 4 UV flame detectors (one flame detector for each individual installed flare), this monitoring parameter is thus measured, recorded and reported on the basis of the following sub-parameters: - $Flame_{m,flare-1}$: Flame detection status for Flare 1 - $Flame_{m,flare-2}$: Flame detection status for Flare 2 - $Flame_{m,flare-3}$: Flame detection status for Flare 3 - $Flame_{m,flare-4}$: Flame detection status for Flare 4 This is deemed correct, acceptable and under conformance with requirements of ACM0001 (version 13.0.0) /11/ and applicable methodological tools. As confirmed by the EPIC's verification team through assessment of the 7 monthly emission reduction calculation spreadsheets /5/, for every minute *m* during which flame was detected in the flare *n* (where n = 1, 2, 3 and 4), the flame status of the measured flare for each minute is set as 1 (1 = Flame "*on*"), otherwise the flame status of this flare for the given minute is set to 0 (0 = Flame "*off*").
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per both the registered PDD /2/ and the methodological tool "Project emissions from flaring" (version 02.0.0) /7/, (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, the operational status of each flare (calculation sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) shall be recorded once per minute. Thus, the applied measuring, recording and recording frequencies for Flame detection of flare in the minute *m* ($Flame_m$) are thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.
Type of monitoring	Monitoring of the operational status of each flare (calculation

equipment/instrument:

sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) is performed by 4 installed UV flame detectors (one for each installed high temperature enclosed flare).

UV Flame detector used for monitoring $Flame_{m,flare-1}$:

Specifications of the UV Flame detector installed on Flare 1	
Manufacturer	SELCON Sistemas Eletrônicos de Controle Ltda.
Model	SEL-SV-UL-K4
Serial Number	323730808
Working hours (lifetime)	50,000 h

Source: /19/

UV Flame detector used for monitoring $Flame_{m,flare-2}$:

Specifications of the UV Flame detector installed on Flare 2	
Manufacturer	SELCON Sistemas Eletrônicos de Controle Ltda.
Model	SEL-SV-UL-K4
Serial Number	55600905
Working hours (lifetime)	50,000 h

Source: /19/

UV Flame detector used for monitoring $Flame_{m,flare-3}$:

Specifications of the UV Flame detector installed on Flare 3	
Manufacturer	Honeywell Analytics Ltd

	Model: C7061 Serial Number: R7861 Working hours (lifetime): 40,000 h Source: /21/ *UV Flame detector used for monitoring Flame$_{m,flare\text{-}4}$:* Specifications of the UV Flame detector installed on Flare 4 Manufacturer: SELCON Sistemas Eletrônicos de Controle Ltda. Model: SEL-SV-210230-K6 Serial Number: 565400312 Working hours (lifetime): 50,000 h Source: /20/
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. There are no measured values for Flame detection of flare in the minute *m*.

Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. As confirmed by the EPIC's verification team through assessment of the UV Flame detector installed at the project site /19/ /20/ /21/, and correctly outlined in the latest version of the Monitoring Report, the installed UV Flame detectors have a self-checking function and thus do not require any calibration or maintenance service.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable.
Company which has performed the applicable calibration events:	Not applicable.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	A *data authenticity checking* was performed for all every minute basis measurement records of the following LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period: - Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$) - Volumetric fraction of CH_4 in the collected LFG in time

	interval *t* on a wet basis ($v_{CH4,t,wb}$) - Temperature of the LFG stream in time interval *t* (T_t) - Pressure of the LFG stream in time interval *t* (P_t) - Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) - Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2,}$ $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior of being used as primary data input for the processing of emission reduction calculations. The performed checking also aimed to ensure that the emission reduction calculation spreadsheets /5/ include only authentic monitoring records. Details about the performed *data authenticity checking* (which is valid for above-listed LFG and flow related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 18: Maintenance events completed in year *y* as monitored by the project participants ($Maintenance_y$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Maintenance events completed in year *y* as monitored by the project participants ($Maintenance_y$)
Measuring, recording and reporting frequencies:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., all the maintenance events performed at the project site are registered by the staff of the project participant and project operator Essencis Soluções Ambientais S.A. in a customized maintenance log book (with

	details about historical of performed interventions (repair, maintenance and calibration services). As established in the registered PDD /2/, the latest version of the Monitoring Report /3/ summarizes the maintenance events (inspection and maintenance services) that were performed in the 4 installed flares during the considered monitoring period. The listed events (dated 14/06/2014, 01/07/2014, 22/09/2014, 26/09/2014, 01/10/2014 and 01/11/2014) encompasses general inspection/maintenance service (incl. inspection of the condition of the flare isolation ceramics revetment material, checking of conditions of the LPG supply valve for pilot flame, checking of condition/function of the air inlet dumpers, checking of the conditions of the thermocouples, checking of the condition of the UV flame detector, checking of the condition of the flame arrester valve, checking of the conditions of the LFG injectors, checking of painting conditions). As also appropriately outlined in the Monitoring Report, general inspection/maintenance services on the flares are opportunely performed during planned or unplanned interruptions of operation of the flares. Morever, as also highlighted in the Monitoring Report, the isolation ceramics revetment material of the Flare 1 and Flare 2 were replaced once in February 2009 and February 2012 respectively. For Flares 3 and Flare 4 (which were installed in July 2011 and February 2012 respectively), the isolation ceramics revetment material was not yet replaced. As indicated in the registered PDD /2/, the expected lifetime for the isolation ceramics revetment material for the flares is of at least 10 years (as established in details for the ex-ante determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$)).
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per both the registered PDD /2/ and the methodological tool "Project emissions from flaring" (version 02.0.0) /7/, (which is applied in accordance to ACM0001 (version 13.0.0)) /11/, monitoring of the parameter $Maintenance_y$ is to be performed annually. Thus, the applied monitoring frequency for the parameter (with maintenance events being registered at the date when the event is performed) is thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.
Type of monitoring equipment/instrument:	Not applicable. There are no measurements involved in the monitoring of $Maintenance_y$.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_y$.

equipment/instrument represents good monitoring practice?	
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_{y.}$
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_{y.}$
Company which has performed the applicable calibration events:	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_{y.}$
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_{y.}$
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. There are no measurements involved in the monitoring of the parameter $Maintenance_{y.}$
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Yes. The EPIC's verification team compared details included in the Monitoring Report /3/ for the monitoring parameter $Maintenance_y$ against all available documented evidences for performed maintenance services at the flares installed as part of the project activity (incl. log book with details about historical of performed interventions (repair, maintenance and calibration services) at the flares).
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Not applicable. While all performed maintenance events in the installed flares (including inspection and/or replacement of flare revetment material) were performed in accordance with requirements established in details for the ex-ante determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$)), the determination of emission reductions achieved by the project activity during the considered

	monitoring period are thus not negatively impacted by the records for the monitoring parameter $Maintenance_{y.}$
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Not applicable.

Table 19: Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$)
Measuring, recording and reporting frequencies:	During the monitoring period from 13/06/2014 to 31/12/2014, measurements of Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$) were performed by the local LPG distribution company Cia Ultragas S.A. as part of each LPG delivery event.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD [2], continuous measurements of $FC_{LPG,y}$ are to be monitored with a frequency not lower than once a month.
Type of monitoring equipment/instrument:	Monitoring records for $FC_{LPG,y}$ were measured by a weight scale with the specifications provided below.

Specifications of the weight scale used for measuring LPG mass	
Manufacturer	Mettler-Toledo Inc.
Model	2180
Serial	10423008

	<table><tr><td>Number</td><td></td></tr><tr><td>Capacity</td><td>Max. 250 kg</td></tr><tr><td>Accuracy</td><td>± 50 grams</td></tr></table> Source: /30/
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	The PDD /2/ and ACM0001 (version 13.0.0) /11/ do not specify any measurement requirement for monitoring consumption of LPG. The accuracy for the installed scale is ± 50 grams. It is EPIC's opinion that the use of this kind of weight scale represents good practice for measuring consumption of LPG by the project activity.
Calibration frequency /interval for the monitoring equipment/instrument:	The EPIC's verification team was able to confirm that the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - ANP*), as the federal government agency responsible for the regulation of the oil sector (including production and distribution of petroleum fuels) defines in its Resolution 15 (dated 2005-05-18) /55/ that any LPG distributor operating in Brazil should have a functioning weight scale for checking the weight of LPG commercialized in 45 kg cylinders. As also established by the Resolution 15, related weight scales should be regularly calibrated by a certification/calibration company with accreditation from the Brazilian national authority for metrology and standardization issues (INMETRO). Moreover, it was made available to the EPIC's verification team a declaration/communication issued by the local LPG distribution company Cia Ultragaz S.A. (dated 10/02/2015) /27/ confirming that: - Cia Ultragaz S.A. has historically calibrated weight scales as per the Internal working procedure "Monitoramento dos equipamentos de envazamento e controle" (*Monitoring of measurement/control and bottling equipment*). Doc. Code: IT-CO-61.0008; Rev. 4 /60/.

	- The weight scale Mettler-Toledo - model 2180 – S/N 10423008 has been regularly calibrated as per internal working procedure IT-CO-61.0008 /60/. A copy of the working procedure IT-CO-61.0008 /60/ was also made available and was assessed by the EPIC's verification team. Moreover, Certifications of Calibration /59/ for the pattern standard weights internally used by Cia Ultragaz S.A. (used for the performance of regular calibration events of weight scales) and a Calibration Ceritifcate for the weight scale 10423008 (calibration event performed on 14/06/2012, Certificate No. MA038/2014 /58/, dated 27/08/2014 and issued by Instituto de Pesos e Medidas do Estado de São Paulo IPEM-SP) were also made available and assessed by the verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	As per the PDD /2/ "*(…) Periodic calibration events will be performed in the mass meters by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations*." As per Resolution 15 /55/ of ANP, any LPG distributor operating in Brazil should have a functioning weight scale for checking the weight of LPG commercialized in 45 kg cylinders. As also established by the Resolution 15, related weight scales should be regularly calibrated by a certification/calibration company with accreditation from the Brazilian national authority for metrology and standardization issues (INMETRO). The adopted calibration frequency is in accordance with national requirements and also with related requirements/recommendations as established by the weight scale manufacturer.
Company which has performed the applicable calibration events:	The weight scale used by the local LPG distribution company Cia Ultragaz S.A. was calibrated by Instituto de Pesos e Medidas do Estado de São Paulo IPEM-SP.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration event for the weight scale confirm proper functioning of the measurement instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration event referred in the Monitoring Report /3/ is valid for the whole monitoring period from 13/06/2014 to 31/12/2014.
If applicable, has the reported monitoring data been cross-checked with other available data or	EPIC's verification team has compared the records of LPG delivered to the CTR Caieiras landfill as reported in the summarized emission reduction calculation spreadsheet /5/ and Monitoring Report /3/ with declaration/communication /27/ issued by the local LPG distribution company Cia. Ultragaz

source?	S.A. confirming the quantities of LPG supplied to Essencis Soluções Ambientais S.A. during the period from March 2013 to December 2014. Declared values valid for the monitoring period from 13/06/2014 to 31/12/2014 were compared against values for LPG cost expenditures and notes of delivery events of LPG in the project site as per available records in the financial/accounting management system of /50/.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	EPIC's verification team has confirmed that values for Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$) as reported in the summarized emission reduction calculation spreadsheet /5/ and Monitoring Report /3/ are in accordance with provided evidences of primary records /27/ /50/.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 20: Net calorific value of the fuel LPG ($NCV_{LPG,y}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Net calorific value of the fuel LPG ($NCV_{LPG,y}$)
Measuring, recording and reporting frequencies:	Not applicable. The selected value for Net calorific value of the fuel LPG ($NCV_{LPG,y}$) (46.5 GJ/ton_{LPG}) corresponds to the National default value as per the Brazilian National Energetic Balance Report for year 2014 (Balanço Energético Nacional (BEN) – 2014) / Table VIII.9 – Specific Mass and Heating Values (Higher Heating Value) /51/. The determination of $NCV_{LPG,y}$ is also in accordance with applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" /13/. No measurement or calculation was performed in the context of the determination of the parameter and no monitoring

	equipment/instrument was used either.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the PDD /2/, "*(…) In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied."*. The adopted monitoring frequency (annual national default value) is thus in accordance with the PDD /2/.
Type of monitoring equipment/instrument:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Company which has performed the applicable calibration events:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.

Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
If applicable, has the reported monitoring data been cross-checked with other available data or surce?	In order to confirm that the selected value for $NCV_{LPG,y}$ indeed corresponds to the value as per the default values published in the Brazilian Energetic Balance Report 2014 /51/, EPIC's verification team assessed this report. Moreover, as part of its verification assessment, the EPIC's verification team also confirms that the determination of $NCV_{LPG,y}$ is indeed in accordance with applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" /34/. Moreover, EPIC has also confirmed that the reported value is within the uncertainty range of the IPCC default value (as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines /12/).
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	See above.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 21: CO_2 emission factor of fuel LPG in year *y* ($EF_{CO2,LPG,y}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	CO_2 emission factor of fuel LPG in year *y* ($EF_{CO2,LPG,y}$)
Measuring, recording and reporting frequencies:	Not applicable. The value for the monitoring parameter $EF_{CO2,LPG,y}$ is selected as 0.0656 tCO_2/GJ which corresponds to the default value as per the IPCC Guidelines for National Greenhouse Gas Inventories, 2006 (IPCC, 2006), Chapter 1, Volume 2, Table 1.4 (value at the upper limit of the uncertainty at 95% confidence interval) /12/. The determination of $EF_{CO2,LPG,y}$ is in accordance with applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" /34/. No measurement or calculation was performed in the context of the determination of the parameter $EF_{CO2,LPG,y}$ and no monitoring equipment/instrument was used either.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the PDD /2/, "*(…) In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied."*. The adopted monitoring frequency (annual IPCC default value) is thus in accordance with the PDD /2/.
Type of monitoring equipment/instrument:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Is the calibration interval in	Not applicable. No measuring instrument was used for

line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	determining the value of the parameter during the considered monitoring period.
Company which has performed the applicable calibration events:	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. No measuring instrument was used for determining the value of the parameter during the considered monitoring period.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	In order to confirm that the selected value for $EF_{CO2,LPG,y}$ indeed corresponds to the default value as per the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 1, Table 1.4 /12/ (value at the upper limit of the uncertainty at 95% confidence interval), the EPIC's Assessment Team assessed these IPCC guidelines. Moreover, as part of its verification assessment, the EPIC's verification team also confirms that the determination of $EF_{CO2,LPG,y}$ is indeed in accordance with applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from fossil fuel combustion" /34/.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	See above.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used	See Section 4.1.4.7.

for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	

Table 22: Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,sat}$)

Assessment	
Data / Parameter: (as per the monitoring plan of the PDD):	Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,sat}$)
Measuring, recording and reporting frequencies:	The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements. As correctly indicated in the Monitoring Report /3/, $p_{H2O,t,Sat}$ is determined as a function of the LFG temperature (T_t) and it is only used in the context of the determination of the methane mass flow in the residual gas (in a dry basis) for each minute *m* of the two time periods in year *y* during which the flare efficiency is measured (parameter $F_{CH4,RG,t}$).
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Type of monitoring equipment/instrument:	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.

frequency of calibration, does the selected frequency represent good monitoring practice?	
Company which has performed the applicable calibration events:	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. The determination of applicable value for the monitoring parameter $p_{H2O,t,sat}$ is not based on measurements.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	EPIC's verification team has confirmed that the values of $p_{H2O,t,sat}$ as reported in the FE calculation spreadsheet /5/ and Monitoring Report /3/ were indeed calculated as per the applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/, which refers to the literature "Fundamentals of Classical Thermodynamics" /67/.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Not applicable.

4.1.4 Assessment of Data and Calculation of GHG Emission Reductions

4.1.4.1 Handling of records for both parameters monitored *ex-post* and *ex-ante* determined parameters in the context of determination of achieved emission reductions

As part of the adopted monitoring procedure, measurements for the following LFG and flaring related monitoring parameters were automatically processed by the project's PLC unit and recorded in a customized SQL based database with a data recording/reporting frequency of every one minute:

- Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$) (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$);
- Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis ($v_{CH4,t,wb}$),
- Temperature of the LFG stream in time interval *t* (T_t),
- Pressure of the LFG stream in time interval *t* (P_t),
- Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$) (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$)
- Flame detection of flare in the minute *m* ($Flame_m$) (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2,}$ $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$)

As confirmed by the EPIC's verification team, the project's customized SQL based data-server is directly connected to a data supervisor system model E3. The system was designed by the IT solution company Elipse Software Ltda. As per the operational of the E3 data supervisor platform, two data files are generated every week (with summarized files being registered in the end of each month) as follows:

- a MS-Excel format spreadsheet file /6/ with every one-minute values for $V_{t,wb}$ (sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$, $w_{CH4,y}$), $v_{CH4,t,wb}$, T_t, P_t, $T_{EG,m}$ (sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$) and $Flame_m$ (sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$) are generated
- a PDF format file with the same monitoring recording details made available at the MS-Excel spreadsheet[9].

It is EPIC's opinion that the use of the E3 data supervisor system and the customized SQL[10] based data base for recording monitoring details for the project activity represents good practice in terms of data acquisition and data archiving.

[9] While each monthly MS-Excel format and PDF format data files contain identical every-minute LFG and flaring related monitoring records for the whole month period encompassed by the considered monitoring period, the PDF format files are used for storage of monitoring data as the project's SQL database have limited data storage capacity. This was confirmed by the EPIC's verification team.

4.1.4.2 Data transmission, data export/conversion and creation of "raw data" input files for the emission reduction calculations

SQL-format data with values of the measured records at the LFG extracting and flaring station has been regularly retrieved from the data base through the available interface in the data supervisor system model E3.

As per the implemented monitoring procedure, at regular time intervals, the monitoring manager for the project activity exports/converts data from SQL-format into an MS-Excel-format (.xls files) by using the data supervisor system model E3. Data is also exported/converted into a PDF-format to ensure a backup file in the data base. These data exports/conversions into PDF and MS-Excel formats are performed by selecting the related functions (buttons) in the user graphical interface of the data supervisor system model E3.

Also as part of the implemented project's monitoring procedure, 7 monthly generated MS-Excel format "raw-data" files /6/ resulted from regular data exports were thus used as primary monitoring input data for the emission reduction calculations (as established in the applicable work procedure of Essencis Soluções Ambientais S.A.).

For the monitoring period from 13/06/2014 to 31/12/2014, as per the adopted work procedures, a set of 7 monthly "raw-data" MS-Excel-format files were generated. Moreover, a set of seven "PDF-format" files were also generated. As outlined in the Monitoring Report /3/, the "raw-data" files /6/ in PDF format were generated for checking purposes. The set of 7 MS-Excel "raw-data" files /6/ were used as primary monitoring data input for the compilation of the 7 monthly emission reduction calculations as follows:

Table 23: Generated files with monitoring input data for the emission reduction calculations

Period	File Names
June 2014	*"jun 14_2.xls"*
July 2014	*"jul 14.xls"*
August 2014	*"aug 14.xls"*
September 2014	*"sep 14.xls"*
October 2014	*"oct 14.xls"*
November 2014	*"nov 14.xls"*
December 2014	*"dec 14.xls"*

[10] SQL (sometimes also referred to as Structured Query Language) is a programming language designed for managing data in relational database management systems. SQL is currently the most widely used database language.

The set of 7 generated MS-Excel-format "raw-data" files /6/ and the set of generated 7 PDF-format "raw data" files were made available and assessed by EPIC's verification team. All raw data files contains, for every minute, historical monitoring records for LFG flow sent to each flare, LFG pressure, LFG temperature, CH_4 content of LFG, temperature of the exhaust gas of the flares as well as flame status of each flare, which are used for the calculation of GHG emission reductions. As verified by EPIC, while for each individual MS-Excel format "raw-data" spreadsheet file /6/, the number of records exceeds 42,000 rows. It is crucial to note that when generating such files in MS-Excel and PDF formats, data could be eventually intentionally or unintentionally edited/modified. Thus, in order to ensure that only authentic (not edited /not modified) "raw data" were used as a basis for the emission reduction calculations, a systematic *data authenticity checking* was performed by the EPIC's verification team for all the monitored data as described and assessed in Section 4.1.4.4.

As part of the adopted project's monitoring procedure, in order to compile the set of 7 monthly emission reduction spreadsheets /6/ valid for the considered monitoring period, every minute measurement records of the set of LFG and flaring related parameter, as presented in the raw-data files, were used as input data for the compilation of the 7 monthly MS-Excel format emission reduction calculation spreadsheets /5/.

As per the adopted monitoring procedure and in accordance with the requirements of ACM0001 (version 13.0.0) /11/ and related provisions of the PDD, GHG emission reductions are calculated based on measurement records and selected default values of the *ex-post* monitored parameters (of which monitoring details are presented in Tables 9 to 23) and also using the values for the ex-ante determined parameter as presented below:

Table 24: Parameters determined ex-ante which are used in the context of emission reduction calculations

Parameter	Value
Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline (OX_{top_layer})	0.1
Global Warming Potential of CH_4 (GWP_{CH4})	25 tCO_2e/tCH_4
Universal ideal gases constant (R_u)	8,314 $Pa.m^3/kmol.K$
Molecular mass of gas *k* (MM_k) (For the particular case of the project activity, *k* = N_2)	28.01 kg/kmol
Molecular mass of greenhouse gas *I* (MM_i) (For the particular case of the project activity, *i* = CH_4)	16.04 kg/kmol
Ajustment Factor (AF)	20%
Total pressure at normal conditions (P_n)	101,325 Pa
Temperature at normal conditions (T_n)	273.15 K

Molecular mass of water (MM_{H2O})	18.0152 kg/kmol
Average technical transmission and distribution losses for grid sourced electricity consumed by the project activity ($TDL_{grid,y}$)	20%
Weighting of build margin emissions factor (w_{BM})	75%
Weighting of operating margin emissions factor (w_{OM})	25%
Build margin CO2 emission factor in year *y* ($EF_{grid,BM,y}$)	0.2010 tCO_2/MWh

Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval ($SPEC_{flare}$)

$SPEC_{flare, Flare 1}$ $SPEC_{flare, Flare 2}$ $SPEC_{flare, Flare 3}$ $SPEC_{flare, Flare 4}$	Min.	Max.
Operational LFG flow for each flare (for continuous operation):	650 Nm^3/h	6,500 Nm^3/h
Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):	500 ^oC	1,200 ^oC
Required minimum frequency for inspection and maintenance service in each flare (incl. inspection in the conditions of the flare isolation ceramics revetment material):	Min. every 6 months	
Required/recommended minimum frequency for replacement of the flare isolation ceramics revetment material in each flare:	after 10 years of regular and appropriate operation	

It is noteworthy that values of the fixed parameters indicated in Table 25 were selected *ex-ante* in the PDD /2/.

Baseline emissions for each month of the monitoring period were partially calculated through application of the the *blank* version of the spreadsheet template developed by the project participant Essencis Soluções Ambientais S.A. and termed "monthly emission reduction calculation spreadsheet template" /63/. This spreadsheet template uses the following data/information as input data for the determination of every-minute and accumulated monthly values for the calculation parameters "Amount of methane in the LFG which is flared and/or used in the project activity" ($F_{CH4,PJ,y}$) and "Amount of methane in the LFG that would be flared in the baseline scenario (absence of project activity)" ($F_{CH4,BL,y}$):

- Monitoring records included in the 7 MS-Excel format "raw-data" spreadsheet files /6/ valid for the monitoring period
- the *ex-ante* determined parameters presented in the Table 25
- the calculated values of Flare efficiency (parameter $\eta_{flare,calc,m}$)

It is noteworthy that the calculations for the determination of the applicable values for the monitoring parameter Flare efficiency ($\eta_{flare,calc,m}$) are performed in a separate calculation spreadsheet termed "*FE calculation spreadsheet*" (file name "*MR 10 - Caieiras - V.2 - 05.03.2015 - FE.xls*" /5/). Further assessment for the determination of $\eta_{flare,calc,m}$ is presented on Section 4.1.4.3.

For the monitoring period from 13/06/2014 to 31/12/2014 encompassing 7 months of years 2014, 7 monthly calculated spreadsheet (termed "*monthly emission reduction calculation spreadsheets*") /5/ were thus generated as a result of the use of the spreadsheet template for each individual month encompassed by the considered monitoring period. Each one of the elaborated 7 monthly emission reduction calculation spreadsheet files /5/ aggregates (reports) the following recorded monitoring data on an every minute recording/reporting frequency (folder "Output"):

- Volumetric flow of LFG sent to each high temperature enclosed flare (monitoring parameter "Volumetric flow of LFG stream in time interval *t* on a wet basis" ($V_{t,wb}$) on the basis of the sub-parameters $V_{t,wb,flare-1}$: $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,flare-4}$);
- Methane fraction in the LFG (monitoring parameter "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis" ($v_{CH4,t,wb}$))
- Temperature of landfill gas (monitoring parameter "Temperature of the LFG stream in time interval *t*" (T_t));
- Pressure of the landfill gas (monitoring parameter "Pressure of the LFG stream in time interval *t*" (P_t));
- Temperature of the flares (monitoring parameter "Temperature in the exhaust gas of the enclosed flare in minute *m*" ($T_{EG,m}$) on the basis of the sub-parameters $T_{EG,m,flare-1}$, $T_{EG,m,flare-2}$, $T_{EG,m,flare-3}$ and $T_{EG,m,flare-4}$);
- Flame status of the flares (monitoring parameter "Flame detection of flare in the minute *m*" ($Flame_m$) on the basis of the sub-parameters $Flame_{m,flare-1}$, $Flame_{m,flare-2}$, $Flame_{m,flare-3}$ and $Flame_{m,flare-4}$).

An additional calculation spreadsheet (termed "Summarized emission reduction calculation spreadsheet") (file name "*MR 10 - Caieiras - V.2 - 05.03.2015.xls*") /5/ correctly summarizes the achieved baseline emissions due to destruction of methane by the project activity during the considered monitoring period (by summing the accumulated monthly values for the calculation parameters $F_{CH4,PJ,y}$ and also summing the accumulated monthly values for the calculation parameters $F_{CH4,BL,y}$ from each one of the 7 monthly emission reduction spreadsheets /5/). Further assessment details about the calculation of baseline emissions are included in Section 4.1.4.3.

Project emissions due to consumption of both LPG and grid-sourced electricity by the project activity are also calculated in the summarized emission reduction calculation spreadsheet /5/ on the basis of monitoring records (input data) for (i) monitoring parameters that are not automatically recorded/reported by the project's PLC unit (Amount of grid electricity consumed by the project activity during the year *y* ($EC_{PJ,y}$), Operation margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year *y* ($EF_{grid,OM,y} = EF_{grid,OM-DD,y}$), Quantity of LPG consumed by the project activity in year *y* ($FC_{LPG,y}$), Net calorific value of the fuel LPG ($NCV_{LPG,y}$) and CO_2 emission factor of fuel LPG in year *y* ($EF_{CO2,LPG,y}$)) and (ii) related *ex-ante* determined parameters (Average technical transmission and distribution losses for grid sourced electricity consumed by the project activity ($TDL_{grid,y}$), Weighting of build margin emissions factor (w_{BM}), Weighting of operating margin emissions factor (w_{OM}) and Build margin CO_2 emission factor in year *y* ($EF_{grid,BM,y}$)). Further assessment details about the calculation of project emissions are included in Section 4.1.4.3.

The 7 MS-Excel-format monthly emission reduction calculation spreadsheets files /5/, the calculation spreadsheet for flare efficiency /5/ and the summarized emission reduction calculation spreadsheet /5/ were all made available and assessed by the EPIC's verification team.

While the EPIC's verification team was able to confirm that such 7 monthly emission reduction spreadsheets /5/ correctly calculate and report the accumulated values of the calculation parameters "Amount of methane in the LFG which is flared and/or used in the project activity" ($F_{CH4,PJ,y}$) and "Amount of methane in the LFG that would be flared in the baseline scenario (absence of project activity)" ($F_{CH4,BL,y}$) for each individual month encompassed by the considered monitoring period, the summarized emission reduction calculation spreadsheet /5/ correctly summarizes the emission reductions for the whole monitoring period (by correctly considering selected accumulated values of $F_{CH4,PJ,y}$ and $F_{CH4,BL,y}$ from the 7 monthly emission reduction spreadsheets /5/ + *ex-ante* determined parameters as input data + monitoring records for the monitoring parameters which are not automatically recorded/reported by the project's PLC unit).

In summary, the EPIC's verification team was able to confirm that calculations of baseline emissions and project emissions were correctly performed as per the formulae and methods stated in the PDD /2/, monitoring methodology and applicable tools /13/ /34/ as described and assessed in Section 4.1.4.3.

All calculations are confirmed by the EPIC's verification team to be under conformance with applicable requirements from:

- CDM baseline and monitoring methodology ACM0001 –"Flaring or use of landfill gas" (version 13.0.0) /11/,

- "Tool to calculate baseline, project and/or leakage CO_2 emissions from fossil fuel combustion" (version 02) /34/

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/.
- "Tool to calculate the emission factor for an electricity system" (versions 3.0.0 /69/ and 04.0 /40/)
- "Project emissions from flaring" (version 02.0.0) /7/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/
- Monitoring plan of the registered PDD /2/.

The table below summarizes the reported calculated values for $F_{CH4,PJ,y}$ in the generated 7 monthly emission reduction spreadsheets and the summarized emission reduction calculation spreadsheet. Assessment details about the determination of $F_{CH4,PJ,y}$ are included in Section 4.1.4.3.

Table 25: Reported results of the generated 7 monthly emission reduction spreadsheets and the summarized emission reduction calculation spreadsheet

File name for the monthly emission reduction calculation spreadsheets	Period	Reported amount of methane flared ($F_{CH4,PJ,y}$)
"062014.xls"	13/06/2014 - 30/06/2014	3,328 tCH_4
"072014.xls"	01/07/2014 - 31/07/2014	3,301 tCH_4)
"082014.xls"	01/08/2014 - 31/08/2014	2,735 tCH_4
"092014.xls"	01/09/2014 - 30/09/2014	2,499 tCH_4
"102014.xls"	01/10/2014 - 31/10/2014	2,256 tCH_4
"112014.xls"	01/11/2014 - 30/11/2014	2,220 tCH_4
"122014.xls"	01/12/2014 - 31/12/2014	4,160 tCH_4
"MR 10 - Caieiras - V.2 - 05.03.2015xls" (Summarized emission reduction calculation spreadsheet for the whole monitoring period)	From 13/06/2014 to 31/12/2014	20,499 tCH_4

As verified by the EPIC's verification team, while the number of records exceeds 42,000 rows in for each individual MS-Excel format monthly emission reduction spreadsheet /5/, it is crucial to note that, as earlier highlighted in this section, when generating the "raw-data" spreadsheet files (which are used as primary input data for each one of the monthly emission reduction spreadsheets /5/), data could be eventually intentionally or unintentionally edited/modified (by using MS-Excel application). Thus, in order to ensure that only authentic (not edited /not modified) data were used as a basis for the emission reduction calculations, a systematic *data*

authenticity checking was performed by the EPIC's verification team for all the monitored data as detailed in Section 4.1.4.4.

4.1.4.3 GHG calculation approach

In accordance with ACM0001 (version 13.0.0) /11/, applied methodological tools and the registered PDD /2/, total GHG emission reductions (ER_y) achieved by the project activity during the considered monitoring period are calculated as follows:

$ER_y = BE_y - PE_y$

Where:

BE_y Baseline emissions in year *y* (in tCO_2e/yr)

PE_y Project emissions in year *y* (in tCO_2e/yr)

Assessment of determination of baseline emissions:

As correctly indicated in the Monitoring Report /3/ and also as established by ACM0001 (version 13.0.0) /11/ , applied methodological tools and the registered PDD /2/, baseline emissions (BE_y) for the considered monitoring period are calculated as follows:

$BE_y = BE_{CH4,y}$

Where:

$BE_{CH4,y}$ Baseline emissions of methane from the SWDS. $BE_{CH4,y}$ is determined as follows:

$BE_{CH4,y} = (1 – OX_{top\_layer}) * (F_{CH4,PJ,y} – F_{CH4,BL,y}) * GWP_{CH4}$

Where:

OX_{top_layer} Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario. As indicated in the registered PDD /2/, OX_{top_layer} is *ex-ante* determined as 10%.

$GWP_{CH4,y}$ Global warming potential of CH_4. As indicated in the registered PDD /2/, $GWP_{CH4,y}$ is *ex-ante* determined as 25.

$F_{CH4,BL,y}$ Amount of methane in the LFG that would be flared in the baseline scenario (absence of project activity). $F_{CH4,BL,y}$ is calculated as follows:

$F_{CH4,BL,y} = 0.2 * F_{CH4,PJ,capt,y}$

Where:

$F_{CH4,PJ,capt,y}$ Amount of methane collected by the project activity. In the particular case of the project activity, $F_{CH4,PJ,capt,y}$ is determined as follows:

$F_{CH4,PJ,capt,y} = F_{CH4,sent,flare,y}$

Where:

$F_{CH4,sent,flare,y}$ Amount of methane in the LFG which is sent to the flares. Details for the determination of every-minute values for $F_{CH4,sent\_flare,y}$ are presented below (under *"Assessment details for the determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$"*).

$PE_{flare,y}$ Project emissions from flaring of the residual gas stream. Details for the determination of every-minute values for $PE_{flare,y}$ for each individual flare are presented below (under *"Assessement details for the determination of $PE_{flare,y}$"*).

As confirmed by the EPIC's verification team, the calculated accumulated value for $F_{CH4,BL,y}$ for the considered monitoring period is correctly determined as 4,454 tCH_4.

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity. As outined in the latest version of the Monitoring Report /3/ and in accordance with the registered PDD /2/, $F_{CH4,PJ,y}$ is correctly determined as follows:

$F_{CH4,PJ,y} = F_{CH4,flared,y}$

$F_{CH4,flared,y}$ Amount of methane in the LFG flared by the project activity (in tCH_4). In accordance requirements from the registered PDD /2/ and by correctly applying applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/, every-minute values of $F_{CH4,flared,y}$ are determined for each individual flare within the considered monitoring period as the difference between the amount of methane supplied to the particular flare and residual methane project emissions from combustion of LFG for each corresponding flare , as follows:

$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - (PE_{flare,y} / GWP_{CH4})$

Where:

$F_{CH4,sent\_flare,y}$ Amount of methane in the LFG which is sent to the flares. Details for

	the determination of every-minute values for $F_{CH4,sent\_flare,y}$ for each individual flare are presented below (under "*Assessment details fo the determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*").
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream. Details for the determination of every-minute values for $PE_{flare,y}$ for each individual flare are presented below (under " *Assessment details for determination of every-minute values for $PE_{flare,y}$* ").

Assessment details for the determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$:

In accordance with ACM0001 (version 13.0.0) /11/, the amount of methane in the LFG which is sent to the flares ($F_{CH4,sent,flare,y}$) is determined for each individual flare (calculation sub-parameters $F_{CH4,sent\_flare,y,flare-1}$, $F_{CH4,sent\_flare,y,flare-2}$, $F_{CH4,sent\_flare,y,flare-3}$ and $F_{CH4,sent\_flare,y,flare-4}$) by applying applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/.

For the considered monitoring period, Option 2 / C (Simplified calculation without measurement of the moisture content / volume flow of LFG and volumetric fraction of CH_4 in collected LFG being measured in wet basis) of this methodological tool is selected[11]. As per Option C of this methodological tool, the amount of methane in the LFG which is sent to each installed flare is determined as follows:

$$F_{CH4,sent\_flare,y,flare\text{-}n} = F_{CH4,t,flare\text{-}n} = V_{t,wb,n,flare\text{-}n} * v_{CH4,t,wb} * \rho_{CH4,n}$$

Where:

Sulfix "*Flare-n*": Flare number: Flare 1, Flare 2, Flare 3 and Flare 4

$V_{t,wb,n,flare\text{-}n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions. As confirmed by the EPIC's verification team, while the sub-parameters for the monitoring parameter $V_{t,wb,flare\text{-}n}$ are already measured in normal conditions, there are no need to calculate every-minute values of the calculation parameter $V_{t,wb,n,flare\text{-}n}$ valid for each flare (calculation sub-parameters $V_{t,wb,n,flare\text{-}1}$, $V_{t,wb,n,flare\text{-}2}$, $V_{t,wb,n,flare\text{-}3}$ and $V_{t,wb,n,flare\text{-}4}$) by using LFG pressure and LFG temperature data. As correctly outlined in the Monitoring Report /3/, while the installed LFG flow meters already measure volumetric flow of LFG in Nm³ wet gas/h (normal conditions), the following assumption is valid:

$V_{t,wb,n,flare\text{-}n}$ is equivalent to $V_{t,wb,flare\text{-}n}$

Where:

$V_{t,wb,flare\text{-}n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis for flare *n* (n = 1, 2, 3 and 4)[12].

As previously described in Section 4.1.3 and correctly indicated in the Monitoring Report /3/, as the installed LFG flow meters already measure volumetric flow of LFG in Nm³ wet gas/h (normal conditions), no measurements of "Temperature of the LFG stream in time interval *t*" (T_t), Pressure of the LFG stream in time interval *t* (P_t) are required for the determination of every-minute values of $V_{t,wb,n,flare\text{-}n}$.

[11] The registered PDD /2/ states the following regarding the determination of values for $F_{CH4,sent\_flare,y}$:

> "*(…) Applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" will be applied to determine $F_{CH4,sent\_flare,y}$ by using Option 2: Simplified calculation without measurement of the moisture content, and one of the options A, C or D. The selection of the determination option will depend on project conditions and equipment to be installed."*,

The adopted calculation approach for *determination of every-minute values for the calculation parameter* $F_{CH4,sent\_flare,y}$ for each individual installed flare during the considered monitoring period is thus in accordance with both ACM0001 (version 13.0.0) /11/ and the registered PDD /2/.

[12] As correctly outlined in the latest version of the Monitoring Report /3/, while measurements for $V_{t,wb}$ are performed by the installed 4 LFG flow meters in Nm^3/h (one flow meter for each individual installed flare), the monitoring parameter $V_{t,wb}$ is thus measured, recorded and reported on the basis of the sub-parameters $V_{t,wb,flare\text{-}1}$, $V_{t,wb,flare\text{-}2}$ $V_{t,wb,flare\text{-}3}$ and $V_{t,wb,flare\text{-}4}$ with such sub-parameters being equivalent to the calculation sub-parameters $V_{t,wb,n,flare\text{-}1}$, $V_{t,wb,n,flare\text{-}2}$, $V_{t,wb,n,flare\text{-}3}$ and $V_{t,wb,n,flare\text{-}4}$.

$v_{CH4,t,wb}$ Volumetric fraction of CH_4 in the gaseous stream in time interval *t* on a wet basis.

$\rho_{CH4,n}$ Density of CH_4 in the gaseous stream (LFG) at normal conditions. As per the selected determination procedure of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/, $\rho_{CH4,n}$ is calculated as follows:

$$\rho_{CH4,n} = (P_n * MM_i) / (R_u * T_n)$$

Where:

P_n Absolute pressure at normal conditions. *Ex-ante* determined as 101,325 Pa.

T_n Temperature at normal conditions. *Ex-ante* determined as 273.15 Kelvin.

MM_i Molecular mass of greenhouse gas *i* (*i* = CH_4). *Ex-ante* determined as 16.04 kg/mol.

R_u Universal ideal gases constant. *Ex-ante* determined as 8,314 Pa.m^3/kmol.K.

The EPIC's verification team was able to verify that the value of the parameter $\rho_{CH4,n}$ was correctly calculated and reported as 0.7156650 $kgCH_4/m^3CH_4$.

Assessment details for determination of every-minute values for $PE_{flare,y}$:

In accordance applicable guidance from both the methodological tool "Project emissions from flaring" /7/ and from the PDD /2/, for each individual flare, every minute values of $PE_{flare,y}$ for each of the installed flares (calculation sub-parameters $PE_{flare,y,flare-1}$, $PE_{flare,y,flare-2}$, $PE_{flare,y,flare-3}$ and $PE_{flare,y,flare-4}$) are determined as a function of every-minute records of mass flow of methane sent to the flare in question (for each flare n, $F_{CH4,RG,m,flare-n} = F_{CH4,sent\_flare,y,flare-n}$, where *n* = 1, 2, 3 and 4) as well as based on *ex-post* calculated values for flare efficiency for the flare *n* ($\eta_{flare,m} = \eta_{flare,calc,m}$). In accordance with applicable requirements of both the registered PDD /2/ and the methodological tool "Project emissions from flaring" /7/, every-minute values of $PE_{flare,y}$ are correctly calculated for the considered monitoring period as follows:

$$PE_{flare,y} = GWP_{CH4} * \sum_{m=1}^{525,600} F_{CH4,RG,m} * (1 - \eta_{flare,m}) * 10^{-3}$$

Where:

$F_{CH4,RG,m}$ Methane mass flow in the residual gas for the considered flare. For each minute *m* of the considered monitoring period, values for $F_{CH4,RG,m}$ are equal to the measured and reported every-minute values of the monitoring parameter "Amount of methane in the LFG which is sent to the flares" ($F_{CH4,sent\_flare,y}$) for the flare in question (calculation sub-parameters $F_{CH4,sent\_flare,y,flare-1}$, $F_{CH4,sent\_flare,y,flare-2}$, $F_{CH4,sent\_flare,y,flare-3}$ and $F_{CH4,sent\_flare,y,flare-4}$)).

$\eta_{flare,m}$ Flare efficiency in minute *m*. For the considered monitoring period, as confirmed by the EPIC's verification team, $\eta_{flare,m}$ is determined based on performed measurements by following applicable guidance of Option B B.1 of the methodological tool Project emissions from flaring" /7/. As required by this determination option, related measurements to determine the efficiency of each one of the flares (measurement for monitoring parameter $F_{CH4,EG,t}$) were performed by an accredited independent third party entity (e.g. an independent inspection/analysis service company) on a biannual basis. The calculated flare efficiency ($\eta_{flare,calc,m}$) for each flare is determined as the average of two performed measurements within the year encompassed by the considered monitoring period as follows:

$$\eta_{flare,calc,y} = 1 - \frac{1}{2}\sum_{t=1}^{2}\left(\frac{F_{CH4,EG,t}}{F_{CH4,RG,t}}\right)$$

Where:

$F_{CH4,EG,t}$ Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t*. For determining $F_{CH4,EG,t}$ biannual measurements of residual methane in the exhaust gas of the flares during a considered time and measurements of speed of exhaust gas of the flares were performed by the third party inspection service company Ecosampling Avaliações Ambientais Ltda. This inspection service company is specialized in measurement of air emissions and inspections for air pollutants. Further assessment details for the ex-post determination of values for $F_{CH4,EG,t}$ are included in Section 4.1.3.

t The two time periods in year *y* during which the flare efficiency is measured. Each measurement event takes a minimum duration of one hour. The time interval between the measurement events is at least six months. Further assessment details are included in Section 4.1.3.

$F_{CH4,RG,t}$ Mass flow of methane in the residual gas on a dry basis at reference conditions in the time period *t.*

Assessment details for the determination of $F_{CH4,RG,t}$:

As per the applicable guidance of the methodological tool "Project emissions from flaring" and also as per the PDD /2/, values of $F_{CH4,RG,t}$ shall be calculated by following the applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/. Values for the parameter $F_{CH4,RG,t}$ valid for each flare (calculation sub-parameters $F_{CH4,RG,t,flare-1}$, $F_{CH4,RG,t,flare-2}$, $F_{CH4,RG,t,flare-3}$ and $F_{CH4,RG,t,flare-4}$) are thus calculated as follows:

$F_{CH4,RG,t,flare-n} = V_{t,db,n,flare-n} * v_{CH4,t,db} * \rho_{CH4,n}$

Where:

$\rho_{CH4,n}$ Density of greenhouse gas *i* (*i* = CH_4) in the gaseous stream (LFG) at normal conditions. Further details for the determination of $\rho_{CH4,n}$ are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*".

$v_{CH4,t,db}$ Volumetric fraction of greenhouse gas *i* (*i* = CH_4) in the gaseous stream in a time interval *t* on a dry basis. As confirmed by the EPIC's verification team, Footnote 3 of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/: states the following:

> "*(…) Flow measurement on a dry basis is not feasible at reasonable costs for a wet gaseous stream, so there will be no difference in the readings for volumetric fraction in wet basis analyzers and dry basis analyzers and both types can be used indistinctly for calculation Options A and D*."

Thus, every-minute values of $v_{CH4,t,db}$ are regarded as equal to every-minute values of the monitoring parameter $v_{CH4,t,wb}$ (for which further details are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*").

$V_{t,db,n,flare-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a dry basis for flare *n* (n = 1, 2, 3 and 4). As per Option B of the applicable methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", the volumetric flow of the gaseous stream on a dry basis for each flare (calculation sub-parameters $V_{t,db,n,flare-1}$, $V_{t,db,n,flare-2}$, $V_{t,db,n,flare-3}$ and $V_{t,db,n,flare-4}$) is determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,db,n,flare-n} = V_{t,wb,n,flare-n} / (1+v_{H2O,t,db})$$

Where:

$V_{t,wb,n,flare-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions. Further details of $V_{t,wb,n,flare-n}$ are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*"

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis. As per applicable guidance of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/, $v_{H2O,t,db}$ is calculated as follows:

$$v_{H2O,t,db} = \frac{m_{H2O,t,db} * MM_{t,db}}{MM_{H2O}}$$

Where:

MM_{H2O} Molecular mass of H_2O. *Ex--ante* determined as 18.0152 kg/kmol.

$MM_{t,db}$ Molecular mass of the gaseous stream in time interval *t* on a dry basis. As per applicable guidance of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/, $MM_{t,db}$ is calculated as follows:

$$MM_{t,db} = \sum_{k} (v_{k,t,db} * MM_{k})$$

Where:

k All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs). See simplification below.

$V_{k,t,db}$ Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis. As confirmed by the EPIC's verification team, applicable guidance of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/ established the following:

"*(…) The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction*

calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen."

As also confirmed by the EPIC's verification team, ACM0001 (version 13.0.0) /11/ does not include any restriction to such simplification. Thus, only the volumetric fraction of gases that are greenhouse gases and are correctly considered in related calculations (CH_4 in the particular case of the project activity) should be measured and the difference to 100% is just considered as pure nitrogen. Further details for the determination of the volumetric fraction of CH_4 in the gaseous stream ($V_{k,t,db} = v_{CH4,t,db}$) are presented above under the calculation parameter $v_{CH4,t,db.}$

MM_k Molecular mass of gas *k* (*k* = CH_4 and N_2). As indicated in the registered PDD /2/, the molecular mass of CH_4 and N_2 are ex-ante determined as 16.04 and 28.01 respectively.

$m_{H2O,t,db}$	Absolute humidity in the gaseous stream in time interval *t* n a dry basis. As per Option 2 of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", by conservatively assuming that the gaseous stream is saturated ($m_{H2O,t,db} = m_{H2O,t,db,Sat}$), $m_{H2O,t,db}$ is calculated as follows [13]:

$$m_{H2O,t,db,Sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_t - p_{H2O,t,Sat}) * MM_{t,db}}$$

Where:

MM_{H2O}	Molecular mass of H_2O. As indicated in the registered PDD /2/, MM_{H2O} is *ex-ante* determined as 18.0152.
P_t	Absolute pressure of the gaseous stream in time interval *t*. Further assessment details for the monitoring parameter P_t are included in Section 4.1.3.
$MM_{t,db}$	Molecular mass of the gaseous stream in a time interval *t* on a dry basis. Further assessment details for the determination of $MM_{t,db}$ are presented above.

[13] It is important to note that the simplified calculation for the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) presented in Option 2 of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/ shall be applied by assuming the gaseous stream is dry or saturated depending on which is the conservative situation.

As confirmed by the EPIC's verification team, Footnote 4 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /14/ states the following:

> "*An assumption that the gaseous stream is saturated is conservative for the situation that the mass flow of greenhouse gas I is underestimated (applicable for calculating baseline emissions). Conversely, an assumption that the gas stream is dry is conservative for the situation that the greenhouse gas t is overestimated (applicable for calculating project emissions).*"

In this particular case, $m_{H2O,t,db}$ is calculated for the determination of the mass flow of methane in the residual gas on a dry basis during the time period t ($F_{CH4,RG,t}$). While $F_{CH4,RG,t}$ is used for the determination of the parameter $PE_{flare,y}$ (project emissions from flaring the residual gas), the assumption that the gaseous stream is dry (conservatively applicable for calculating project emissions) would not be conservative in this case as an overestimation of the amount of methane in the residual gas would actually increase the calculated efficiency of the flares, thus resulting in a reduction of $PE_{flare,y}$ and consequent increment of emission reductions.

	$p_{H2O,t,Sat}$	Saturation pressure of H_2O at temperature T in time *t*, Further assessment details for the monitoring parameter $p_{H2O,t,Sat}$ are included in Section 4.1.3.

As correctly outlined in the latest version of the Monitoring Report /3/, calculated values for $\eta_{flare,calc,y}$ for each one of the installed high temperature enclosed flares and valid for the considered monitoring period are summarized in the table below:

Table 26: Calculated values of $\eta_{flare,calc,y}$

Calculated values of $\eta_{flare,calc,y}$ for each flare valid for the monitoring period from 13/06/2014 to 31/12/2014	Flare 1 ($\eta_{flare,calc,y,flare-1}$)	Flare 2 ($\eta_{flare,calc,y,flare-1}$)	Flare 3 ($\eta_{flare,calc,y,flare-1}$)	Flare 4 ($\eta_{flare,calc,y,flare-1}$)
	0.9999593	0.9999521	0.9999532	0.9999578

Assessment detais for (i) compliance with operational and maintenance requirements for the flares (as established by the ex-ante determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$)) and (ii) consideration of data records for the monitoring parameter "Flame detection of flare in the minute m" ($Flame_m$) for the calculation of every-minute values:

As also confirmed by the EPIC's verification team by assessing the 7 monthly emission reduction spreadsheets /5/, in accordance with the applied monitoring procedure for the project activity, compliance with operational and maintenance requirements for the flares, as established by the *ex-ante* determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$), was correctly considered for the determination and application of values of $\eta_{flare,m}$ for calculating every-minute values of $F_{CH4,PJ,y} = F_{CH4,flared,y}$ along the considered monitoring period[14]. As also confirmed by the EPIC's verification team through assessment of the 7 monthly emission reduction calculation spreadsheets /5/, data records for the monitoring parameter "Flame detection of flare in the minute *m*" ($Flame_m$) are also considered for the determination and application of the values of $\eta_{flare,m}$ along the considered monitoring period. For each installed flare, the time the flare has operated is monitored through every-minute monitoring the flame combustion status/condition by using an UV flame detector (of which status signal (flame status "*on*" or "*off*") is recorded and reported in the monthly emission reduction calculation spreadsheets /5/. As also assessed by the EPIC's verification team, monitoring requirements related to operational requirements/conditions for the flare (as provided by the manufacturer's specifications for operating conditions as per the *ex-ante* determined parameter $SPEC_{flare}$ (min. and max. flow of LFG to the set of flares + temperature of exhaust gas of the flares + meeting of maintenance requirements)) are also correctly considered in the context of the determination and application of values for $\eta_{flare,m}$ for calculating every-minute values of $F_{CH4,PJ,y} = F_{CH4,flared,y}$ along the considered monitoring period. As also confirmed through assessment of the 7 monthly emission reduction calculation spreadsheets /5/, for each minute *m* within the considered monitoring period when the flare have combusted LFG by not operating in accordance with the operational criteria as established by the *ex-ante* estimated parameter $SPEC_{flare}$ (in terms of LFG flow, temperature of exhaust gas or maintenance practice), no destruction of methane is accounted for the flare as part of the calculation of every-minute values for $F_{CH4,PJ,y} = F_{CH4,flared,y.}$ This is under full compliance with related requirements from the registered PDD /2/.

The calculated accumulated value for $F_{CH4,PJ,y} = F_{CH4,flared,y}$ for the considered monitoring period is correctly determined as 20,499 tCH_4.

Summary of baseline emissions:

The calculated value for BE_y for the monitoring period from 13/06/2014 to 31/12/2014 is correctly determined as 361,013 tCO_2e.

[14] While all performed maintenance events in the installed flares (including inspection and/or replacement of flare revetment material) were performed in accordance with requirements established in details for the ex-ante determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$)), the determination of emission reductions achieved by the project activity during the considered monitoring period are thus not negatively impacted by the records for the monitoring parameter $Maintenance_{y.}$

All related calculations are provided in the 7 monthly emission reduction calculation spreadsheets files /5/ as well as the FE calculation spreadsheet /5/ and the summarized emission reduction calculation spreadsheet /5/. All performed calculations, as reported in the latest version of the Monitoring Report /3/ and emission reduction calculations spreadsheets /5/, were verified to be performed under conformance with applicable requirements of the registered PDD /2/, ACM0001 (version 13.0.0) /11/ and applicable methodological tools /14/ /7/.

Assessment of determination of project emissions:

As correctly indicated in the Monitoring Report /3/, project emissions due to the operation of the project activity are determined as follows:

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

Where:

$PE_{EC,grid,y}$ Project emissions due to the consumption of grid-sourced electricity by the project activity

$PE_{LPG,y}$ Project emissions due to the consumption of LPG by the project activity

Project emissions due to the consumption of grid-sourced electricity by the project activity:

As correctly outlined in the latest version of the Monitoring Report /3/, for the considered monitoring period, emissions due to the consumption of grid-sourced electricity by the project activity ($PE_{EC,y}$) are correctly determined by following applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/ as follows:

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

Where:

$EC_{PJ,y}$ Quantity of grid-sourced electricity consumed by the project activity in year *y*. For the considered monitoring period, $EC_{PJ,grid,y}$ is monitored as 550.631 MWh (rounded value). The following monthly values for consumption of grid-sourced electricity ($EC_{PJ,y}$) within the considered monitoring period are correctly reported in the Monitoring Report /3/ and summarized emission reduction calculations spreadsheet /5/ :

- June 2014: 64,980.80 kWh
- July 2014: 98,604.90 kWh
- August 2014: 92,671.50 kWh
- September 2014: 76,605.90 kWh
- October 2014: 60,510.70 kWh
- November 2014: 79,258.40 kWh
- December 2014: 77,997.90 kWh

Assessment details for the monitoring parameter $EC_{PJ,y}$ valid for the considered monitoring period are included in Section 4.1.3.

$TDL_{grid,y}$ Average technical transmission and distribution losses for grid-sourced electricity consumed by the project activity in year *y*. As indicated in the registered PDD [/2/], $TDL_{grid,y}$ is *ex-ante* determined as 20%.

$EF_{EL,grid,y}$ Emission factor for grid-sourced electricity in year *y*. For the considered monitoring period $EF_{EL,grid}$ is determined ex-post as the Combined margin CO_2 emission factor ($EF_{grid,CM,y}$) that is calculated as the weighted average of the ex-post determined value valid for year 2014 for the monitoring parameter "Operating margin CO_2 emission factor in year *y*" ($EF_{grid,CM,y}$) and the previously determined and validated value for the *ex-ante* determined parameter "Build margin CO_2 emission factors" ($EF_{grid,BM,y}$). In order to appropriately weight these two factors, the also previously determined and validated default values for the *ex-ante* determined parameters "Weighting of operating margin emission factor" (w_{OM}) and "Weighting of build margin emission factor" (w_{BM}) are applied. For the considered monitoring period, $EF_{grid,CM,y}$ is thus determined as follows:

$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$$

Where:

w_{OM} Weighting of operating margin emissions factor. As established in the registered PDD [/2/], w_{OM} is ex-an*te* determined as 0.25%.

w_{BM} Weighting of operating margin emissions factor. As established in the registered PDD [/2/], w_{BM} is *ex-ante* determined as as 0.75%.

$EF_{grid,OM,y}$ Operating margin CO_2 emission factor in year *y*. As per the applied monitoring procedure, the selected value for $EF_{grid,OM}$ (0.5822 tCO_2/MWh) represents to the official average value for year (vintage) 2014 as recently calculated and made public available by the DNA of Brazil [/43/]. Further assessment details for the monitoring parameter are included in Section 4.1.3.

$EF_{grid,BM,y}$ Build margin CO_2 emission factor in year *y*. As indicated in the registered PDD [/2/], for the 2nd 7-year crediting period of the project activity, $EF_{grid,BM}$ is *ex-ante* determined as 0.2010 tCO_2/MWh.

The calculated value for $PE_{EC,y}$ for the considered monitoring period from 13/06/2014 to 31/12/2014 is correctly determined as 196 tCO_2 (rounded value). All performed related calculations and monitoring, as reported in the latest version of the Monitoring Report [/3/] and in the summarized emission reduction calculations spreadsheet [/5/], were confirmed by the EPIC's verification team as being correctly performed and under full conformance with applicable guidance of the related provisions of both the PDD [/2/] and the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" [/13/].

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

Project emissions due to the consumption of LPG by the project activity ($PE_{LPG,y}$) are correctly determined by following the applicable guidance of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /34/ as follows:

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

Where:

$FC_{LPG,y}$ Quantity of LPG consumed by the project activity in year *y*. $FC_{LPG,y}$ is correctly reported as 405 kg (0.405 ton). Detailed assessment for monitoring of $FC_{LPG,y}$ is presented in Section 4.1.3.

$COEF_{LPG,y}$ CO_2 emission coefficient for LPG. $COEF_{LPG,y}$ is calculated as follows:

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

Where:

$EF_{CO2,LPG,y}$ CO_2 emission factor of fuel LPG (in energy basis). A default value of 0.0656 tCO_2/GJ is selected for the considered monitoring period (value sourced by IPCC Guidelines for National Greenhouse Gas Inventories, 2006 /12/, Chapter 1, Volume 2, Table 1.4). Further details about the monitoring parameter $EF_{CO2,LPG,y}$ are included in Section 4.1.3.

$NCV_{LPG,y}$ Net calorific value of the fuel LPG. A default value of 49.2 GJ/ton is selected for the considered monitoring period (value sourced by the Brazilian Energetic Balance Report, year 2014 /51/).. Further details about the monitoring parameter $NCV_{LPG,y}$ are included in Section 4.1.3.

The calculated value for $PE_{LPG,y}$ for the monitoring period from 13/06/2014 to 31/12/2014 is correctly determined as 2 tCO_2 (rounded value). All adopted calculations, as reported in the latest version of the Monitoring Report /3/ and the summarized emission reduction calculation spreadsheet /5/, are correctly performed and are in accordance with applicable guidance of the related provisions of the PDD /2/ and the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /34/.

Total project emissions (PE_y) are correctly calculated and reported as 198 tCO_2 (rounded value) and are correctly considered in the context of the emission reduction calculations.

Assessment of determination of leakage emissions:

In accordance with the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) /11/, the registered PDD /2/ indicates that no leakage emissions are to be considered in the context of emission reduction calculations.

4.1.4.4 Checking of data authenticity

As part of the performed verification assessment, the EPIC's verification team was able to confirm that the 7 monthly emission reduction calculation spreadsheets /5/ completed by the Essencis Soluções Ambientais S.A. are basically MS-Excel spreadsheets that, in theory, could

have recorded data being easily edited/modified (intentionally or unintentionally). Thus, these spreadsheets, if inappropriately edited, could potentially tamper reported monitoring records, thus resulting in unreal and incorrect calculation and reporting of emission reductions achieved by the project activity during the considered monitoring period. In order to ensure that all emission reductions calculations are completely and correctly based on authentic and real occurred monitoring records valid for the considered monitoring period, a *data authentic check* was performed as part of the verification assessment.

Such checking aimed to ensure that only authentic and unmodified monitoring data records were used by the host-country project participant Essencis Soluções Ambientais S.A. for performing the emission reduction calculation for the considered monitoring period (thus ensuring that measurement records made available in the MS-Excel format "raw data" input files /6/ and measurement records reported in the 7 monthly emission reduction spreadsheets were not intentionally or unintentionally edited/modified during the generation of these files).

The performed *data authenticity check* involved the following steps:

STEP 1: Assessment and handling of the measurement data in PDF-format:

As appropriately outlined in the latest verison of the Monitoring Report /3/, as part of the implemented data reporting and emission reduction calculation procedures applicable for the 2nd 7-year crediting period of the project activity, two sets of data files (with LFG related monitoring records) are regularly generated for each month of considered monitoring period as follows:

One MS-Excel format spreadsheet file

One PDF format data file

While each monthly MS-Excel format and PDF format data files contain identical every-minute LFG and flaring related monitoring records for the whole month period encompassed by the considered monitoring period, the PDF format files are used for storage of monitoring data as the project's SQL database have limited data storage capacity. The EPIC's verification team has assessed the 7 monthly PDF format files valid for the considered monitoring period (which were previously retrieved from the data supervisor system model E3 unit of the LFG extracting and flaring station as part of the implemented monitoring procedure at Essencis Soluções Ambientais S.A.) and converted them into a format appropriate for handling data in MS-Excel application: files were converted into .txt format. The content of the .txt files was converted into MS-Excel format. As an outcome of STEP 1, a new set of comparative files in MS-Excel format (with primary data inputs from the project's data supervisor system model E3 valid for the whole monitoring period) were generated. These comparative files were termed by the EPIC's verification team as "raw-data for checking" files /62/

STEP 2: Re-calculation of emission reductions:

By using the set of 7 MS-Excel format "raw-data for checking" comparative files /62/ (that were generated under STEP 1) as input data, the procedure for emission reductions calculation for the whole monitoring period was reproduced by the EPIC's verification team for all 7 months encompassed by the considered monitoring period. The content of the "raw-data for checking" comparative files /62/ was used as input data for the compilation of the set of 7 comparative monthly emission reduction calculation spreadsheets /61/ by applying a blank version of the emission reduction calculation spreadsheet /63/. Moreover, correct values for the applicable ex-ante determined parameters as well as the calculated values of flare efficiency (parameter $\eta_{flare,calc,m}$) were also inserted in the blank version of the emission reduction calculation

spreadsheet /63/ as input data. As a result of this step, a set of 7 comparative monthly emission reduction spreadsheets /61/ was thus created.

STEP 3 – Comparison of emission reduction calculation spreadsheets developed by the project participant Essencis Soluções Ambientais S.A. against the created comparative monthly emission reduction spreadsheets and analysis of the results:

The calculated accumulated monthly values of the parameter FCH4,PJ,y in each one of the comparative monthly emission reduction spreadsheets /61/ (files generated under STEP 2) were compared against the corresponding accumulated values for the parameter FCH4,PJ,y in each one of the emission reduction spreadsheets /5/ previously created by the project participants as part of the monitoring/reporting process.

As a result of STEP 3, by comparing files previously generated by the project participants against the files generated under STEP 2, the EPIC's verification team was able to confirm that the generated set of 7 comparative monthly checking spreadsheets /61/ are identical to the 7 monthly emission reduction calculation spreadsheets /5/ previously created by the project participants. While no quantitative deviations or differences were identified when comparing the accumulated values for the calculation parameters presented in these files, and by assuming that all encrypted data stored in the project's data supervisor system model E3 and stored in PDF format represent credible and authentic monitoring data, the performed data authenticity check thus successfully and sufficiently confirmed that only authentic and not-modified monitored measurement data (from the installed data supervisor system model E3) were previously used by the project participants for the calculation of emission reductions as reported in the Monitoring Report /3/.

4.1.4.5 Correctness, consistency and summary of reported emission reductions

As a result of the performed verification assessment, the EPIC's verification team was able to confirm that the determination of achieved GHG emission reductions for the considered monitoring period are performed and reported in a correct, objective and transparent manner. As confirmed by the EPIC's verification team, determination of baseline and project emissions are in accordance with the applicable requirements from the following reference and methodological documents:

- Monitoring plan and other related provisions of the registered PDD /2/.
- CDM baseline and monitoring methodology ACM0001 – 'Flaring or use of landfill gas" (version 13.0.0) /11/,
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 01) /13/.
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /34/
- "Tool to calculate the emission factor for an electricity system" (versions 3.0.0 /69/ and 04.0 /40/)
- "Project emissions from flaring" (version 02.0.0) /7/

- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /14/

All figures and input data as well as all performed calculations were checked by the EPIC's verification team and were found to be reported in a deemed correct, appropriate and transparent manner in the latest versions of the Monitoring Report /3/ and emission reduction calculation spreadsheets /5/. EPIC was thus able to confirm that the emission reductions reported for the monitoring period from 13/06/2014 to 31/12/2014 are entirely based on authentic measurements of LFG and flaring related monitoring data and are also based on the application of a semi-automatic and systematic data monitoring procedure for LFG and flaring related monitoring data. Moreover, as also assessed by the EPIC's verification team, LFG and flaring related monitoring data records were correctly retrieved and utilized in the emission reduction calculation spreadsheets /5/ for performing related calculation and reporting of achieved emission reductions for the considered monitoring period. EPIC was thus able to verify that, in general, all calculation and reporting procedures were adopted in a deemed transparent, correct and reliable manner.

As a conclusion, EPIC thus confirms that the reported achieved emission reductions for monitoring period from 13/06/2014 to 31/12/2014 are in accordance with all measurement, reporting and calculation requirements of the monitoring plan of the PDD /2/, monitoring and baseline methodology ACM0001 (version 13.0.0) /11/ and applicable methodological tools /13/ /34/ /40/ /7/ /14/ /69/.

EPIC thus confirms that, as presented in the latest version of emission reduction spreadsheets /5/ and Monitoring Report /3/, the project activity has achieved GHG emission reductions as follows:

Emission reductions for the monitoring period from 13/06/2014 to 31/12/2014:	360,815 tCO_2e

4.1.4.6 Comparison of verified emission reductions against ex-ante emission reduction estimation indicated in the PDD

As part of the performed verification assessment, total emission reductions achieved, reported and verified for the monitoring period encompassing 7 months within year 2014 were compared against the related *ex-ante* estimation of emission reductions for year 2014 as per the PDD /2/. The results of such comparisons are summarized and assessed below:

Table 27: Comparison of achieved emission reductions against comparable *ex-ante* estimation of emission reductions in the PDD

Period	Ex-ante estimation of emission reductions as per the PDD (in tCO_2e)	Achieved emission reductions (in tCO_2e)
Period from 13/06/2014 to 31/12/2014 (considered monitoring period)	566,817 (share of ex-ante estimation of emission reductions for year 2014 valid for the 202-day period length considered monitoring period from 13/06/2014 to 31/12/2014)[15] -	360,815
Period from 01/12/2014 to 31/12/2014 (period encompassing year 2014)	1,024,199	-

For the 202-day length monitoring period from 13/06/2014 to 31/12/2014, achieved emission reductions are about ~64% lower than the comparable value of *ex-ante* estimation of emission reductions as per the PDD /2/ valid for such period (566,817 tCO_2e)

As appropriately indicated in Section E.6 of the latest version of the Monitoring Report /3/ a set of factors and aspects that sufficiently explains the occurred differences between achieved/verified emission reductions during the considered monitoring period and the comparable value for *ex-ante* estimation of emission reductions as per the PDD /2/ for the same time period. Assessment for such factors and aspects are summarized below:

Aspects/conditions that represent a decrease factor of reported emission reductions for the considered monitoring period when compared against the ex-ante estimation of emission reduction for the same period in the PDD:

1. Uncertainties associated with the application of First Order Decay (FOD) multi-phased model for estimating the emission reductions in the PDD:

Like any other CDM project activity encompassing LFG collection and destruction/utilization, all potential uncertainties associated with the application of the First Order Decay (FOD) multi-phased model in the context of the *ex-ante* estimation of

[15]The 566,817 tCO2e value is appropriately calculated as 1,024,199 tCO_2e * 202/365, where 1,024,199 tCO_2e is ex-ante estimated GHG emissions to be achieved in year 2014 as per the registered PDD /2/.

emission reductions in the PDD /2/ are applicable for the *ex-ante* estimation of emission reductions for the "Caieiras landfill gas emission reduction.

The EPIC's verification team acknowledges that the LFG collection efficiency in a LFG collection and destruction initiative such as project activity plays an important role in differences between the achieved emission reductions and related ex-ante estimations of emission reductions as per the registered PDD /2/. Recently published literature on the topic /37/ /38/ /39/ has shown that LFG collection efficiency for well-engineered landfills with forced LFG extracting systems ranges from 50% up to 90% (depending on the design and operation of the LFG collection system). While the EPIC's verification team also acknowledges that there are indeed several operational and performance aspects for a typical LFG collection and destruction project activity that negatively influence the potentially achieved average LFG collection and destruction efficiency, in the particular context of the operation of the CDM project activity "Caieiras landfill gas emission reduction", it is reasonable to assume that achieved average LFG collection efficiency for the project activity during the considered monitoring period was significantly lower than the one earlier assumed in the context of the ex-ante estimation of emission reductions (92.80%).

2. Lack of LFG collection infrastructure covering all area of the very large CTR Caieiras landfill:

The EPIC's verification team was able to verify that, as correctly indicated in the Monitoring Report /3/, a significant share of LFG rich in methane generated at the CTR Caieiras landfill has not been collected by the project activity due to the lack of LFG collection infrastructure covering the whole are of the landfill. As confirmed by the EPIC's verification team, at the time of the performed on-site visit, many of the existent LFG collection wells were not connected to the project activity's LFG collecting pipeline network. As assessed by the EPIC's verification team, the registered PDD /2/ indicates that there are areas of the CTR landfill not yet covered by the project's LFG collection infrastructure.

3. Time periods with flares not operating as per manufacturer's specifications (operational requirements) for temperature and/or flow rate:

The EPIC's verification team was also able to verify, through assessment of the 7 monthly emission reduction calculation spreadsheets /5/ valid for the monitoring period from 13/06/2014 to 31/12/2014, that, as correctly indicated in the Monitoring Report /3/, one or more flare(s) have not operated as per the manufacturer's specifications for temperature and/or flow (*ex-ante* parameter $SPEC_{flare}$) during limited time periods within the considered monitoring period. As per the emission reductions calculation approach adopted by Essencis Soluções Ambientais S.A., during such limited time periods, although collected LFG was actually collected and combusted, the combustion efficiency of the flare(s) in question was considered as null (zero), thus resulting in null emission reductions for such time instants. That also resulted in relative decrease of emission reductions achieved by the project activity when compared to related ex-ante estimates of emission reductions.

As a conclusion, by taking into account all the factors/aspects listed above, it is the opinion of the EPIC's verification team that the occurred relative difference between achieved emission reductions during the considered monitoring period and calculated comparable PDD's ex-ante

estimation of emission reductions for the same period is deemed acceptable, plausible and reasonable.

4.1.4.7 Monitoring Management and Quality Assurance

As verified by the EPIC's verification team, competent and sufficiently trained staff are recruited for operating the project activity and handling related monitoring data. Such employees are found with knowledge not only about the operation of the project activity but also with sufficient knowledge and competence to ensure the application of all related QA/QC procedures for data recording and storage. Furthermore, for the 10th periodic verification, the host-country project participant and project operator Essencis Soluções Ambientais S.A. was also supported with consultancy and advisory services in CDM and LFG management related issues by the consultancy service company named UniCarbo Energia e Biogás Ltda. As confirmed by the EPIC's verification team, the technical team from UniCarbo Energia e Biogás Ltda. has contributed for the development of related documentation (e.g. Monitoring Report /3/ and emission reduction calculation spreadsheets /5/) and also supported Essencis Soluções Ambientais for addressing all raised outstanding issues (raised CARs). As also assessed by the EPIC's verification team, the project activity has been operated by sufficiently trained staff by correctly following guidance and instructions of internal documented working procedures and with high quality technical support from external CDM and LFG management consultants.

Sections 4.1.3, 4.1.4.1 and 4.1.4.2 include detailed descriptions and assessments of procedures for data collection, data reporting, QA/QC, performance of calibration events and other aspects related to the applied procedures for determining the emission reductions. As confirmed by the EPIC's verification team, such procedures are systematically implemented and has been appropriately followed by the host-country project participant and project operator Essencis Soluções Ambientais S.A.. During the conducted on-site visit to the project site, the EPIC's verification team was also able to verify that the operational structure of the project activity is also in line with the information made available in the PDD /2/ and in the Monitoring Report /3/. EPIC was also able to verify that detailed management and operational work procedures are in place. In summary, it was confirmed that an operational structure for the project activity is established with responsibilities clearly identified. Moreover trained staff is employed to ensure data quality. As a conclusion, EPIC was thus able to verify that a reliable and robust monitoring mechanism was established, implemented and has been followed by Essencis Soluções Ambientais S.A..

As an outcome of the performed verification assessment, EPIC was thus able to confirm that evidences, data and calculations are sufficiently and correctly provided for the achieved emission reductions reported for the monitoring period from 13/06/2014 to 31/12/2014. By verifying the application of the monitoring plan, EPIC was also able to confirm that during the considered monitoring period, the project activity was implemented and has operated under full conformance with monitoring requirements described in the registered PDD /2/.

4.2 Remaining issues, FARs from previous validation or verification

By assessing the previously issued Validation Reports for the project activity (including the report "Validation of the Renewal of Crediting Period of an Existing CDM-Project: Caieiras landfill gas emission reduction" /10/ that was issued by the DOE responsible for the validation assessment for renewal of crediting period of the project activity), the EPIC's verification team identified no missing steps or open issues from the validation phases (including validation assessment for renewal of the crediting period for the project activity) that would need to be

addressed in the context of the verification assessments within the 2nd 7-year renewable crediting period for the project activity.

Furthermore, by also assessing the Verification Reports for the previous 1st to the 7th periodic verifications for the project activity /47/ (and also the draft version of the Verification Reports for the 8th and 9th periodic verifications /26/ (where the 9th periodic verification is the first verification within the 2nd 7-year renewable crediting period (monitoring period from 13/12/2013 to 12/06/2014))), the EPIC's verification team identified no FARs to be considered/addressed in the context of the 10th and future verification assessments.

4.3 Identified correction and improvement needs during the performed verification assessment and summary of differences between the initial and final version of the Monitoring Report

The performed document review and the conducted on-site visit revealed that a set of corrections were required to be implemented in the latest version of the Monitoring Report /3/ and supporting documents (e.g. emission reduction calculation spreadsheets /5/) in order to have such documents fully in accordance with applicable CDM requirements and criteria and also in order have a deemed transparent and correct reporting of relevant monitoring aspects for the project activity during the considered monitoring period. In order to have all identified inconsistencies addressed by the host-country project participant and project operator Essencis Soluções Ambientais S.A., the EPIC's verification team raised 17 (seventeen) Corrective Action Requests (CARs). No Clarification Request (CL) or Forward Action Request (FAR) was raised by the EPIC's verification team.

The raised 17 CARs were sufficiently addressed by Essencis Soluções Ambientais S.A.. In order to address the raised CARs, corrections and improvements in the reported emission reduction calculations were performed. Moreover, information made available in the Monitoring Report /3/ was also corrected and improved. EPIC considers all corrective actions taken by Essencis Soluções Ambientais S.A. deemed appropriate and has thus successfully closed such raised CARs.

Upon successful closure of the raised CARs and based on the findings and the reviewed project documentation; the verification team confirms that there are no remaining non-conformities related to the application of the monitoring plan for the project activity or related to the completion of the Monitoring Report that requires further action.

As a conclusion, EPIC thus confirms that the application of the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) /11/ and applicable methodological tools for determining achieved emission reductions during the considered monitoring period as per the monitoring plan of the PDD /2/ is correct and transparent.

As a result of the verification assessment performed by EPIC, corrections and improvements in the Monitoring Report were implemented by Essencis Soluções Ambientais S.A.. The differences between the initial of the Monitoring Report (version 1, dated 19/01/2015) /4/ and the latest version of the Monitoring Report (version 2, dated 05/03/2015) /3/ are summarized in Table 29:

Table 28: Summary of differences/changes between the first version of the Monitoring Report made available for the EPIC's verification assessment (Monitoring Report version 1 dated 19/01/2015 [4]) and the latest version of the Monitoring Report (Monitoring Report(version 2 dated 05/03/2015 [3])

Summarized description of the changes in the Monitoring Report (and supporting documents (i.e emission reduction calculation spreadsheet(s) triggered by raised CARs and CLs.	CAR/CL triggering the change in the document
Relevant details about construction, testing and commissioning of the project activity were all moved to Section A.1 in the Monitoring Report.	CAR 1
Details about the centrifugal blowers installed as part of the project activity were corrected in Section A.1 of the Monitoring Report.	CAR 2
The power output values for the electric motors of the centrifugal blowers are also indicated in kilowatt (kW) (SI unit) in Section B.1 of the Monitoring Report.	CAR 3
Disclaimers under the detail tables for the ex-ante determined parameters "Temperature at normal conditions" (T_n) and "Total pressure at normal conditions" (P_n) in Section D.1 of the Monitoring Report were added in order to clarify that values for the *ex-ante* determined parameters "Temperature at normal conditions" (T_n) and "Total pressure at normal conditions" (P_n) are not considered in the context of the determination of baseline emissions (since measurements of LFG flow are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions)).	CAR 4
Relevant additional monitoring details for the monitoring parameter "Management of SWDS" were added in Section D.2 of the Monitoring Report.	CAR 5
Information about the required calibration frequency for the installed continuous CH_4 content gas analyzer unit (as per the application of the monitoring plan and recommendations from the equipment manufacturer) were added in Section D.2. of the Monitoring Report	CAR 6
Disclaimers were added (under the detail tables for the monitoring parameters "Pressure of the gaseous stream in time interval t" (P_t) and "Temperature of the gaseous stream in time interval *t*" (T_t)) in Section D.2 of the Monitoring Report in order to clarify that values for these parameters are not considered in the context of the determination of baseline emissions (since measurements of LFG flow are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions)).	CAR 7

Reported monthly values for consumption of grid-sourced electricity by the project activity were corrected. The determination of project emissions due to the consumption of grid-sourced electricity by the project activity was also revised (by taking into account corrected values for consumption of grid-sourced electricity by the project activity and more recent and applicable data for the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$).	CAR 8
Reported monthly values for consumption of LPG by the project activity were corrected. The determination of project emissions due to the consumption of LPG by the project activity was also revised (by taking into account corrected values for consumption of LPG by the project activity).	CAR 9
Incorrect and incomplete details about the monitoring parameter "$F_{CH4,EG,t}$" were revised in Section D.2 of the Monitoring Report.	CAR 10
Relevant details about the specifications and maintenance/calibration requirements for the UV flame detectors utilized for monitoring the parameter "Flame detection of flare in the minute *m*" ($Flame_m$) during the considered monitoring period were added in Section D.2 of the revised version of the Monitoring Report.	CAR 11
Details about relevant maintenance events performed in the project's LFG flaring infrastructure were added in Section D.2 of the Monitoring Report.	CAR 12
Details for the monitoring parameter $p_{H20,t,Sat}$ were added in Section D.2 of the Monitoring Report.	CAR 13
The determination of values for $F_{CH4,RG,t}$ applicable for the considered monitoring period was revised. Related determination details were also revised in Section E.1 of the Monitoring Report. Baseline emissions were also revised accordingly.	CAR 14
The list with aspects/conditions which is a decrease factor of reported emission reductions for the considered monitoring period (when compared against the *ex-ante* estimation of emission reduction for the same period in the PDD) was revised in Section E.6 of the Monitoring Report. It was clarified that flares not operating as per manufacturer's specifications (operational requirements) for temperature and/or flow rate also represent an aspect/condition which is a decrease factor of reported emission reductions for the considered monitoring period.	CAR 15
A disclaimer referring to the consideration of the parameters $V_{t,db}$, $v_{CH4,t,db}$ and $M_{t,db}$ for the determination of the methane mass flow in the residual gas (in a dry basis) (for the two time periods during which the flare efficiency is measured) was added in a footnote Section D.2 of the Monitoring Report.	CAR 16
Details about the installed LFG temperature sensor (to measure the temperature of collected LFG), LFG pressure sensor (to measure the pressure of collected LFG) and CH_4 content gas analyzer unit were revised in accordance with documented evidences.	CAR 17

4.4 Post Registration Changes

The verification assessment for the considered monitoring period does not include any post registration changes.

4.5 Verification/certification statement

EPIC Sustainability Services Pvt. Ltd. (EPIC) has performed the 10th periodic verification assessment (2nd periodic verification within the 2nd 7-year crediting period) of the registered CDM project activity titled “Caieiras landfill gas emission reduction”. The project activity was registered by the UNFCCC on 09/03/2006 as CDM project activity with registration no. 0171 and it is currently under its 2nd 7-year renewable crediting period (period from 13/12/2013 to 30/03/2020).

The performed CDM verification assessment covered the monitoring period from 13/06/2014 to 31/12/2014 (including both days).

It is EPIC’s responsibility to express an independent verification statement and opinion on the reported GHG emission reductions from the project activity during the covered monitoring period.

The project activity is implemented and has operated at the CTR Caieiras landfill. In accordance with related project design information made available in the registered Project Design Document (PDD) for the 2nd 7-year crediting period, the operation of the project activity resulted in permanent and real mitigation of methane (CH_4) emissions during the considered monitoring period through collection and destruction of landfill gas (LFG) by combustion under controlled conditions in four high temperature enclosed flares. While LFG is rich in CH_4, as established in the PDD for the project activity, in the absence of the project activity (baseline scenario) it is assumed that the largest share of LFG collected and destroyed by the project activity would be directly emitted into the atmosphere.

The host-country project participant and project operator Essencis Soluções Ambientais S.A. has been responsible for gathering of monitoring data in accordance with the monitoring plan of the registered PDD. While supported by hired external CDM consultants, Essencis Soluções Ambientais S.A. has been responsible for all calculations and reporting of GHG emissions reductions achieved by the project activity during the considered monitoring period.

The EPIC’s verification team performed the verification assessment and provided its verification opinion on the basis of the provisions and requirements of the CDM baseline and monitoring methodology ACM0001 - “Flaring or use of landfill gas” (version 13.0.0), the monitoring plan included in the registered version of the PDD for the 2nd 7-year crediting period of the project activity (version 5.9, dated 05/09/2013) and also as per the latest version of Monitoring Report for the considered monitoring period (version 2, dated 05/03/2015). The verification assessment performed by EPIC included:

i) checking whether the project activity was implemented and has operated in accordance with related project design details as described in the registered version of the Project Design Document (PDD) for the project activity;
ii) checking whether the provisions of both the applied CDM baseline and monitoring methodology and the monitoring plan (as per the registered PDD) were consistently and appropriately applied;
iii) assessment of all documented evidences which supports the reported data and claimed emission reductions during the considered monitoring period;

iv) checking whether the installed monitoring equipment/instrument required for measuring *ex-post* determined parameters required for calculating emission reductions were calibrated and have operated appropriately.

The EPIC's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. EPIC planned and performed the verification assessment by obtaining evidence, information and explanations that were considered necessary for providing reasonable assurance that reported GHG emission reductions are fairly stated.

It is the opinion of EPIC that reported GHG emission reductions for the CDM project activity "Caieiras landfill gas emission reduction" for the monitoring period from 13/06/2014 to 31/12/2014, as reported in the latest version of the Monitoring Report issued on 05/03/2015 (version 2), are calculated without material misstatements and under a deemed reasonable and correct manner.

EPIC Sustainability Services Pvt. Ltd. (EPIC) herewith confirms that GHG emission reductions were achieved by the CDM project activity "Caieiras landfill gas emission reduction" during the monitoring period from 13/06/2014 to 31/12/2014 as follows:

Emission reductions for the monitoring period from 13/06/2014 to 31/12/2014:	360,815 tCO_2e

Prepared by	Approved by :
	
Mr. Marco A. Ratton	Mr. K. Sudheendra
(Lead Auditor)	(Head Operations)

5 REFERENCES

/1/	UNFCCC/CDM-EB: Clean Development Mechanism Validation and Verification Standard (VVS), version 07.0 as per EB79.
/2/	Essencis Soluções Ambientais S.A.: Project Design Document (PDD) for the 2nd 7-year renewable crediting period for the CDM project activity: "Caieiras landfill gas emission reduction" Version 5.9, dated 05/09/2013.
/3/	Essencis Soluções Ambientais S.A.: Monitoring Report for the CDM project activity "Caieiras landfill gas emission reduction" - monitoring period from 13/06/2014 to 31/12/2014, version 2, dated 05/03/2015
/4/	Essencis Soluções Ambientais S.A.: Monitoring Report for the CDM project activity "Caieiras landfill gas emission reduction" - monitoring period from 13/06/2014 to 31/12/2014, version 1, dated 19/01/2015.
/5/	Essencis Soluções Ambientais S.A.: Emission reduction calculation spreadsheet for the CDM project activity "Caieiras landfill gas emission reduction" for the monitoring period from 13/06/2014 to 31/12/2014. Set of 7 monthly emission reduction spreadsheets (one for each month of the monitoring period) + flare efficiency calculation spreadsheet + summarized emission reduction spreadsheet. File names: *"062014.xls"* *"072014.xls"* *"082014.xls"* *"092014.xls"* *"102014.xls"* *"112014.xls"* *"122014.xls"* *"MR 10 - Caieiras - V.2 - 05.03.2015 – FE.xls"* *"MR 10 - Caieiras - V.2 - 05.03.2015.xls"*
/6/	Essencis Soluções Ambientais S.A.: Input data for the emission reduction calculation spreadsheets for the project activity "Caieiras landfill gas emission reduction" valid for the monitoring period from 13/06/2014 to 31/12/2014. File names: *"jun-14.xls"* *"jul-14.xls"*

	"aug-14.xls" *"sep-14.xls"* *"oct-14.xls"* *"nov-14.xls"* *"dec-14.xls"*
/7/	CDM-EB: "Project emissions from flaring", version 02.0.0.
/8/	UNFCCC: Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998)
/9/	UNFCCC: Decision 3/CMP. 1 (Marrakesh – Accords)
/10/	TÜV SÜD South Asia Pvt. Ltd.: ''Validation of the Renewal of Crediting Period of an Existing CDM-Project: Caieiras landfill gas emission reduction", Report No. 600501161, Revision No. 03, dated 24/09/2013.
/11/	UNFCCC/ CDM-EB: Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas¨, version 13.0.0.
/12/	IPCC: 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/13/	CDM-EB: "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 01
/14/	CDM-EB: ¨Tool to determine the mass flow of a greenhouse gas in a gaseous stream¨, version 02.0.0.
/15/	Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.: Certificates of Calibration for the installed LFG flow meters. Flow meter with S/N 1412000235 - calibration event performed on 04/06/2014. Certificate No. 1412000235 1214 C7. Issuance date 09/06/2014. Flow meter with S/N 1412000236 - calibration event performed on 04/06/2014. Certificate No. 1412000236 1214 C7. Issuance date 09/06/2014. Flow meter with S/N 1412000237 - calibration event performed on 04/06/2014. Certificate No. 1412000237 1214 C7. Issuance date 09/06/2014. Flow meter with S/N 1412000238 - calibration event performed on 04/06/2014. Certificate No. 1412000238 1214 C7. Issuance date 09/06/2014.
/16/	Naka Comércio e Indústria de Instrumentação Ltda.: Calibration certificate for Pressgage pressure sensor (Serial No. 43608). Certificate No. R-0154/14. Calibration event date: 10/03/2014. Certificate issuance date: 18/03/2014.
/17/	Naka Comércio e Indústria de Instrumentação Ltda.: Calibration certificate for Pressgage STP-100 temperature sensor. Certificate No. T-202/14. Calibration event date: 11/03/2014. Certificate issuance date: 17/03/2014.

/18/	Naka Comércio e Indústria de Instrumentação Industrial Ltda.: Calibration certificates for the installed thermocouples NKTC-3000, type N, manufactured by Naka Comércio e Indústria de Instrumentação Industrial Ltda. *Thermocouple 099156 used for measuring $T_{EG,m,flare-1}$:* Calibration Certificate No. T-0198-14. Calibration event date: 11/03/2014. Certificate issuance date: 17/03/2014. *Thermocouple 099157 used for measuring $T_{EG,m,flare-2}$:* Calibration Certificate No. T-0196-14. Calibration event date: 11/03/2014. Certificate issuance date: 17/03/2014. *Thermocouple 099158 used for measuring $T_{EG,m,flare-3}$:* Calibration Certificate No. T-0201-14. Calibration event date: 11/03/2014. Certificate issuance date: 17/03/2014. *Thermocouple 099159 used for measuring $T_{EG,m,flare-4}$:* Calibration Certificate No. T-0200-14. Calibration event date: 11/03/2014. Certificate issuance date: 17/03/2014.
/19/	SELCON Sistemas Eletrônicos de Controle Ltda.: Specification sheet for the UV Flame detector SEL-SV-UL-K4. Available online: http://www.selcon.com.br/produtos/sensores/SELUO2K4.pdf
/20/	SELCON Sistemas Eletrônicos de Controle Ltda.: Specification sheet for the UV Flame detector SEL-SV-210230-K6. Available online: http://www.selcon.com.br/produtos/sensores/SEL-SV.....K6_ft.pdf
/21/	Honeywell Analytics Ltd.: Specification sheet for the UV Flame detector C7061. Available online: https://eccap.honeywell.cn/CatalogDocuments/Combu%20C7061-65-0223.pdf
/22/	Essencis Soluções Ambientais S.A.: Set of 27 internal calibration notes for the Infrared CH_4 content gas analyzer unit CENTRUM AG 4000 with serial number NS 53159. Dates of the performed calibration events: - 11/06/2014 - 18/06/2014 - 25/06/2014 - 02/07/2014 - 10/07/2014 - 17/07/2014 - 23/07/2014 - 31/07/2014 - 07/08/2014 - 14/08/2014 - 21/08/2014 - 28/08/2014

	- 04/09/2014 - 11/09/2014 - 18/09/2014 - 25/09/2014 - 02/10/2014 - 10/10/2014 - 17/10/2014 - 10/11/2014 - 19/11/2014 - 26/11/2014 - 04/12/2014 - 12/12/2014 - 19/12/2014 - 26/12/2014 - 05/01/2015
/23/	Naka Comércio e Indústria de Instrumentação Industrial Ltda.: Calibration certificate for electricity meter model MULT K (Serial No. 234215) "ME Plant", manufactured by KRON Instrumentos Elétricos Ltda. Certificate No. R-0701/12. Calibration event date: 19/03/2012. Certificate issuance date: 03/04/2012.
/24/	IBG – Indústria Brasileira de Gases Ltda.: Set of certificates for the cylinder of pattern gases used for the calibration of the CH_4 content gas analyzer unit: - Gas cylinders with 99.999% N_2 pattern gas: cylinder n° 395939 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG04220814, dated 04/08/2014. - Gas cylinders with 99.999% N_2 pattern gas: cylinder n° 395749 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG00760114, dated 06/02/2014. - Gas cylinders with 5.01% O_2 pattern gas: cylinder n° 3933516 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG00590114, dated 30/01/2014. - Gas cylinders with 59.95% CO_2 pattern gas: cylinder n° 4849733 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG04170814, dated 04/08/2014. - Gas cylinders with 59.96% CH_4 pattern gas: cylinder n° 1118 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG00580114, dated 30/01/2014. - Gas cylinders with 60% CO_2 pattern gas: cylinder n° 877597 (supplied by IBG – Indústria Brasileira de Gases Ltda.). Certificate Number IBG00570114, dated 30/01/2014.
/25/	Essencis Soluções Ambientais S.A.: Completed Modalities of Communication (MoC) form for the CDM project activity "Caieiras landfill gas emission reduction" Latest version dated 29/10/2014.
/26/	EPIC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 9th verification (monitoring period from 13/12/2013 to 12/06/2014, draft/working version. EPIC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 8th verification (monitoring period from 13/12/2013 to

	12/06/2014, draft/working version.
/27/	Cia Ultragaz S.A.: Communication explaining the adopted procedure at Cia Ultragaz S.A. for measuring quantity of LPG regularly delivered to Essencis Soluções Ambientais S.A. including confirmation of supplied amount of LPG during the period from March 2013 to December 2014. Dated December 10/02/2015.
/28/	KRON Instrumentos Elétricos Ltda.: Technical Specification sheet for the electricity meters MULT K. "Multimedidor Mult-K / Ficha técnica – K0001", rev. 6, dated 17 February 2009. Available online: http://www.bagarel.com.br/coel/boletins%20tecnicos/Boletim_MICO.pdf
/29/	Naka Comércio e Indústria de Instrumentação Industrial Ltda.: Calibration certificate for electricity meter model MULT K (Serial No. 465025) "ME Blower 4", manufactured by KRON Instrumentos Elétricos Ltda. Certificate No. R-0702/12. Calibration event date: 19/03/2012. Certificate issuance date: 03/04/2012
/30/	Mettler-Toledo Inc.: User manual for the weight scale 2180. Available online: http://www.toledobrasil.com.br/files/manuais/MU_2180_Portatil.pdf
/31/	Contech Indústria e Comércio de Equipamentos Eletrônicos Ltda.: Operation and maintenance instruction / manual for the FT-2 flow meter. Available online: http://www.contechind.com.br/catalogos/medidor-de-vazao-tipo-thermal.pdf
/32/	Elektro Eletricidade e Serviços S.A.: Monthly invoices/sales receipts of grid-sourced electricity purchase by Essencis Soluções Ambientais S.A. (months Jun 2014, Jul 2014, Aug 2014, Sep 2014, Nov 2014, Dec 2014).
/33/	EPIC: Working procedures for performance of CDM verification assessments.
/34/	CDM-EB: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02). EB41/Annex 11.
/35/	EPIC: List of Findings for the 10th verification of the CDM project activity "Caieiras landfill gas emission reduction". Dated 04/03/2015.
/36/	EPIC: Verification Questionnaire for the 10th verification of the CDM project activity "Caieiras landfill gas emission reduction". Dated 12/03/2015.
/37/	Designing a Landfill Gas to Energy Project: Rules of Thumb and Questions to Ask. Intermountain CHP Application Center Workshop - Intermountain Workshop. CHP Bioenergy for Landfills and for and Wastewater Treatment Plants. SCS Engineers. Dated 2005-08-11. Available online: http://www.intermountaincleanenergy.org/events/landfills/050811/presentations/pierce-designing.pdf
/38/	Landfill Gas Collection System Efficiencies (2007). Solid Waste Association of North

	America (SWANA). Report dated 2007.
/39/	California Environmental Protection Agency. Evaluation of Landfill Gas Collection Efficiency. Appendix D. Dated year 2009. Available online: http://www.arb.ca.gov/regact/2009/landfills09/appd.pdf
/40/	UNFCCC / CDM-EB: "Tool to calculate the emission factor for an electricity system". Version 04.0.
/41/	Essencis Soluções Ambientais S.A.: Internal service and maintenance log book (with details about historical of interventions, service and instrument/equipment calibration and replacement in the project activity "Caieiras landfill gas emission reduction").
/42/	Pressgage instrumentos de Medição e Controle: Specification details for the pressure sensor model TPI-PRESS. Available online: http://www.pressgage.com.br/wp-content/uploads/2015/02/transmissor-de-press%C3%A3o.pdf
/43/	Brazil's Interministerial Commission on Global Climate Change (DNA of Brazil): CO_2 emission factors for electricity generation in Brazil National Interconnected System – Base year 2014. Available online: http://www.mct.gov.br/index.php/content/view/307492.html
/44/	Pressgage instrumentos de Medição e Controle Ltda.: Specification details for the temperature sensor model STP-100. Available online: http://www.pressgage.com.br/wp-content/uploads/2015/01/Sensor-de-temperatura.pdf
/45/	BGM Instrumentação Controle e Automação Ltda.: Gas Analyzer CENTRUM AG 4000, User Manual 1st edition, dated March 2012. Available online: http://www.bgm.com.br/?r=produtos/view&id=4
/46/	Ecosampling Ambiental Ltda.: Set of 2 Technical Reports for determination of methane destruction efficiency in the flares of the project activity "Caieiras landfill gas emission reduction". Report titles: - *"Teste de eficiência jun 14.pdf".* Dated June 2014. - *"Teste de eficiência dez 14.pdf".* Dated December 2014.,
/47/	GLC: CDM Verification and Certification Reports for the CDM project activity "Caieiras landfill gas emission reduction". 2nd, 3rd, 4th, 5th, 6th and 7th periodic verifications.
/48/	Naka Comércio e Indústria de Instrumentação Industrial Ltda.: Specification sheet for the thermocouple NKTC-3000. Available online: http://nakainstrumentacao.com.br/docs/8001395759135termopar_nktc.pdf
/49/	California Analytical Instruments, Inc.: Technical specification sheet for the gas

	analyzer 600 MHFID. Available online: http://www.rental.cleanair.com/californiaanalyticalinstruments600mhfidmethanethcanalyzer
/50/	Essencis Soluções Ambientais S.A.: Internal records of expenditures with fuel type LPG during the period from March 2013 to December 2014 + dates of delivery of fuel LPG at the project site (data retrieved from the financial/accounting management financial system of Essencis Soluções Ambientais S.A on 03/03/2015).
/51/	Empresa Brasileira de Pesquisa Energética (EPE): Balanço Energético Nacional 2014 | Ano base 2013. Brazilian Energetic Balance Report year 2014 (base year 2013). Available online: https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_2014.pdf
/52/	Cepollina Engenheiros Consultores Ltda.: Dclaration document reporting the outcome of the technical evaluation performed at the CTR Caieiras landfill comparing the management practices at the CTR Caieiras landfill vis-a-vis the previously concived design of the landfill. Dated 02/12/2014.
/53/	Essencis Soluções Ambientais S.A.: Internal Certificates of Training for performance of calibration events in the CH_4 content gas analyzer CENTRUM AG 4000 manufactured by BGM Instrumentação Controle e Automação Ltda., Jan 2014.
/54/	UNFCCC / CDM-EB: Clean Development Mechanism Project Standard. Version 07.0, as per EB 79.
/55/	Brazilian National Agency of Petroleum, Natural Gas and Biofuels (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - ANP*): Resolution 15 (18/05/2005). Available online: http://nxt.anp.gov.br/nxt/gateway.dll/leg/resolucoes_anp/2005/maio/ranp%2015%20-%202005.xml
/56/	BGM Instrumentação Controle e Automação Ltda.: Communication with ref.: "*CA.BG.01.05-Rev 09 – Calibração Analisador de Gases*" Submitted to Essencis Soluções Ambientais S.A.. Dated 08/07/2014.
/57/	Mayer-Brown / Tauil & Chequer: Legal update / interpretation: Regulation of Brazil's National Policy on Waste Management Available online: http://www.tauilchequer.com.br/publications/article.asp?id=10261&nid=13012
/58/	Instituto de Pesos e Medidas do Estado de São Paulo IPEM-SP: Certificate of Calibration No. MA124/2012 valid for weight scale used by Cia Ultragaz S.A. for measuring mass of delivered LPG cylinders in years 2012, 2013 and 2014 (as per communication/clarification issued by Cia Ultragaz S.A.) Dated 21/06/2012.
/59/	CETEC – Centro Tecnológico do Instituto de Pesos e Medidas do Estado de São Paulo: Certifications of calibrations for the pattern standard weights internally used by Cia Ultragaz S.A. for the performance of regular calibration events of weight scales.

	Certificate No. MA038/2014. Dated 27/08/2014.
/60/	Cia Ultragaz S.A.: Internal working procedure ”Monitoramento dos equipamentos de envazamento e controle” (*Monitoring of measurement/control and bottleing equipment*). Doc. Code: IT-CO-61.0008; Rev. 4
/61/	EPIC / Essencis Soluções Ambientais S.A.: Comparative emission reduction calculation spreadsheets for the project activity “Caieiras landfill gas emission reduction” – monitoring period from 13/06/2014 to 31/12/2014. Created as part of the *Data authenticity checking* procedure performed during the verification. File names: *“062014 - for checking.xls”* *“072014 - for checking.xls”* *“082014 - for checking.xls”* *“092014 - for checking.xls”* *“102014 - for checking.xls”* *“112014 - for checking.xls”* *“122014 - for checking.xls”* *“MR 10 - Caieiras - V.2 - 05.03.2015 - for checking.xls”*
/62/	EPIC / Essencis Soluções Ambientais S.A.: Comparative spreadsheets with monitoring records for the project activity “Caieiras landfill gas emission reduction” – monitoring period from 13/06/2014 to 31/12/2014 .Created as part of the *Data authenticity checking* procedure performed during the on-site visit. File names: *“jun-14 - for checking.xls”* *“jul-14 - for checking.xls”* *“aug-14 - for checking.xls”* *“sep-14 - for checking.xls”* *“oct-14 - for checking.xls”* *“nov-14 - for checking.xls”* *“dec-14 - for checking.xls”*
/63/	Essencis Soluções Ambientais S.A. Blank version of the emission reduction calculation spreadsheets applied for the project activity “Caieiras landfill gas emission reduction” – monitoring period from 13/06/2014 to 31/12/2014.

	File names: "*MMYYYY - blank.xls* " *"MR 10 - Caieiras - V.2 - 04.03.2015 - FE - blank.xls"* *"MR 10 - Caieiras - V.2 - 04.03.2015 - blank.xls"*
/64/	UNFCCC / CDM-EB: - AM_CLA_0116: Further clarification on AM_ CLA_ 0092 – Alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/clarifications/40239 - AM_CLA_0092: Clarification on a conflict between ACM0001 and the 'Tool to determine project emissions from flaring gases containing methane' relating to the measurement of methane fraction and flow rate of landfill gas (wet or dry basis). Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/clarifications/71831
/65/	UNFCCC / CDM-EB: Clean development mechanism project cycle procedure, version 07.0, as per EB 79.
/66/	Chapple, Mike. "SQL Fundamentals". *Data bases*. About.com. Available online: http://data bases.about.com/od/sql/a/sqlfundamentals.htm
/67/	Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke: Fundamentals of Classical Thermodynamics; 3rd Edition 1996, John Wiley & Sons, Inc. Table A-4: Saturated Water-Temperature. Available online: http://fireflylabs.com/disted/courses/m275-data(all%20years)/SaturatedWaterTables-T&P.pdf
/68/	INMETRO: Licensing information/status for the inspection service company "Ecosampling Ambiental Ltda." vis-a-vis accreditation requirements from INMETRO Available online: http://www.feam.br/images/stories/rafael/Laboratorios/planilhacompletasitelaboratorioshomologadosouacreditados2806.xls
/69/	UNFCCC / CDM-EB: "Tool to calculate the emission factor for an electricity system". Version 3.0.0.

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ANNEX 1: RESOLUTION OF CORRECTIVE ACTIONS AND CLARIFICATION REQUESTS (LIST OF FINDINGS)

Description of finding (CAR, CL, FAR)	Summary of project participant response	EPIC's Assessment and final conclusion
CAR 1 (04/03/2015): While as per the applicable "Instructions for filling out the monitoring report form" details about relevant dates for the implementation of the project activity (e.g. construction, commissioning, continued operation periods, etc.) are expected to be indicated in Section A.1 of the Monitoring Report, details about construction, testing and commissioning of the project activity are indicated in other Section of the Monitoring Report.	**05/03/2015:** As a response to the raised CAR, details about construction, testing and commissioning of the project activity are moved to Section A.1 in the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team that performed related modifications in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.
CAR 2 (04/03/2015): Section A.1 of the Monitoring Report wrongly indicates that there are 5 installed centrifugal blowers with LFG collection capacity of up to 4,000 Nm^3/h each as part of the project activity.	**05/03/2015:** As a response to the raised CAR, related project design details were corrected in Section A.1 of the revised version of the Monitoring Report. There are 3 installed centrifugal blowers with LFG collection capacity of up to 4,000 Nm^3/h each and 2 installed centrifugal blowers with LFG collection capacity of up to 7,000 Nm^3/h each as part of the project activity.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.
CAR 3 (04/03/2015): The power output of the electric motors used in the centrifugal blowers is not indicated in SI unit.	**05/03/2015:** As a response to the raised CAR, related project design details were complemented in Section B.1 of the revised version of the Monitoring	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and

	Report. The power output values for the electric motors used in the centrifugal blowers are also indicated in kilowatt (kW) in the revised version of the Monitoring Report.	sufficiently address the raised CAR. This CAR is closed.
CAR 4 (04/03/2015): Section D.1 of the Monitoring Report does not highlight that the ex-ante determined parameters "Temperature at normal conditions" (T_n) and "Total pressure at normal conditions" (P_n) are not considered in the context of the determination of baseline emissions (since measurements of LFG flow are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions)).	**05/03/2015:** As a response to the raised CAR, related baseline determination aspects were complemented in Section D.1 of the revised version of the Monitoring Report with the inclusion of disclaimers under the detail tables for the ex-ante determined parameters "Temperature at normal conditions" (T_n) and "Total pressure at normal conditions" (P_n)	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.
CAR 5 (04/03/2015): Source of data and monitoring outcome for the monitoring parameter "Management of SWDS" for the considered monitoring period are not reported in Section D.2 of the Monitoring Report with the required completeness.	**05/03/2015:** As a response to the raised CAR, details about the monitoring parameter "Management of SWDS" were entirely revised in Section D.2 of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.
CAR 6 (04/03/2015): Details about required calibration frequency for the installed CH_4 content gas analyzer unit (as per the application of the monitoring plan and recommendations from the equipment manufacturer) are not presented in Section D.2 of the Monitoring Report (in the table with details for the monitoring parameter $v_{CH4,t,wb}$).	**05/03/2015:** As a response to the raised CAR, the required calibration frequency for the installed CH_4 content gas analyzer unit (as per the application of the monitoring plan and recommendations from the equipment manufacturer) is indicated as being every 3-month in the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related improvements in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team confirmed that the indicated every 3-month frequency is indeed correct. This CAR is closed.

CAR 7 (04/03/2015): Section D.2 of the Monitoring Report does not highlight that data records for the monitoring parameters "Pressure of the gaseous stream in time interval t" (P_t) and "Temperature of the gaseous stream in time interval *t*" (T_t) are not required to be considered in the context of the determination of baseline emissions (since measurements of LFG flow are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions)).	**05/03/2015:** As a response to the raised CAR, related baseline determination aspects were complemented in Section D.2 of the revised version of the Monitoring Report with the inclusion of disclaimers under the detail tables for the monitoring parameters "Pressure of the gaseous stream in time interval t" (P_t) and "Temperature of the gaseous stream in time interval *t*" (T_t).	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.
CAR 8 (04/03/2015): Values reported for the monitoring parameter "Amount of grid electricity consumed by the project activity during the year *y"* ($EC_{PJ,y}$) are not in accordance with documented evidences made available to the EPIC's verification team. Furthermore, the applied value for the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ does not represent the value applicable for year 2014.	**05/03/2015:** As a response to the raised CAR, it is acknowledged that previously reported values for consumption of grid-sourced electricity by the project activity are incorrect. Correct values are indicated in the revised version of the Monitoring Report. Furthermore, the applicable value for the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ is also applied in the revised version of the Monitoring Report. The determination of project emissions due to the consumption of grid-sourced electricity by the project activity was also revised accordingly.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.
CAR 9 (04/03/2015): Values reported for the monitoring parameter "Quantity of LPG consumed by the project activity in year y" ($FC_{LPG,y}$) are not in accordance with documented evidences made available to the EPIC's	**05/03/2015:** As a response to the raised CAR, it is acknowledged that previously reported values for consumption of fossil fuel LPG by the project activity are incorrect. Correct values are indicated in the revised version of the Monitoring Report. The	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. This CAR is closed.

verification team.	determination of project emissions due to the consumption of fossil fuel LPG by the project activity was also revised accordingly.	
CAR 10 (04/03/2015): Source of data and monitoring outcome for the monitoring parameter "Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t*" ($F_{CH4,EG,t}$) for the considered monitoring period are not reported in Section D.2 of the Monitoring Report with the required completeness.	**05/03/2015:** As a response to the raised CAR, details about the monitoring parameter "$F_{CH4,EG,t}$" were entirely revised in Section D.2 of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.
CAR 11 (04/03/2015): Details about the specifications and maintenance/calibration requirements for the UV flame detectors utilized for monitoring the parameter "Flame detection of flare in the minute *m*" ($Flame_m$) during the considered monitoring period are not reported in Section D.2 of the Monitoring Report with the required completeness.	**05/03/2015:** As a response to the raised CAR, details about the specifications and maintenance/calibration requirements for the UV flame detectors utilized for monitoring the parameter "Flame detection of flare in the minute *m*" ($Flame_m$) during the considered monitoring period were added in Section D.2 of the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.
CAR 12 (04/03/2015): Details about major maintenance events performed in the project's LFG destruction facility during the considered monitoring period are not reported in Section D.2 of the Monitoring Report (in the table with details for the monitoring parameter "Maintenance events completed in year *y* as monitored by the project participants" ($Maintenance_y$)) with the required completeness.	**05/03/2015:** As a response to the raised CAR, details about relevant maintenance events performed in the project's LFG flaring infrastructure were added in Section D.2 of the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.

CAR 13 (04/03/2015): While the monitoring parameter "Saturation pressure of H_2O at temperature T_t in time interval *t*" ($p_{H20,t,Sat}$) is considered in the context of the determination of the methane mass flow in the residual gas (in a dry basis) for each minute *m* of the two time periods in year *y* during which the flare efficiency is measured (parameter $F_{CH4,RG,t}$), monitoring details for $p_{H20,t,Sat}$ are not included in Section D.2 of the Monitoring Report.	**05/03/2015:** As a response to the raised CAR, all required details for the monitoring parameter $p_{H20,t,Sat}$ were added in Section D.2 of the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.
CAR 14 (04/03/2015): Reported values for "Mass flow of methane in the residual gas on a dry basis at reference conditions in the time period *t*" ($F_{CH4,RG,t}$) are not correctly determined and reported in the Monitoring Report and emission reduction calculation spreadsheets.	**05/03/2015:** As a response to the raised CAR, the determination of values for $F_{CH4,RG,t}$ was revised. Related determination details were also revised in Section E.1 of the Monitoring Report. Baseline emissions were also revised accordingly.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report and emission reduction calculations are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team verified referred documented evidences and was able to confirm that all added monitoring details are correct. This CAR is closed.
CAR 15 (04/03/2015): While as confirmed by the EPIC's verification team, flares not operating as per manufacturer's specifications (operational requirements) for temperature and/or flow rate also represent an aspect/condition which is a decrease factor of reported emission reductions for the considered monitoring period (when compared against the *ex-ante* estimation of emission reduction for the same period in the PDD), this aspect is not listed in	**05/03/2015:** As a response to the raised CAR, the list with aspects/conditions which is a decrease factor of reported emission reductions for the considered monitoring period (when compared against the *ex-ante* estimation of emission reduction for the same period in the PDD) was revised accordingly in Section E.6 of the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team was able to confirm that all added details are correct. This CAR is closed.

Section E.6 of the Monitoring Report.		
CAR 16 (04/03/2015): While the monitoring report indicates that the monitoring parameters "Volumetric flow of LFG stream in time interval *t* on a dry basis" ($V_{t,db}$), "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis" ($v_{CH4,t,db}$) and "Mass flow of the LFG stream in time interval *t* on dry basis" ($M_{t,db}$) were not monitoring during the considered monitoring period as the methodological options for which they are applicable were not selected as the monitoring or calculation approaches for the determination of baseline emissions achieved by the project activity, the EPIC's verification team has confirmed that these parameters were in fact used for the determination of the methane mass flow in the residual gas (in a dry basis) for each minute *m* of the two time periods in year *y* during which the flare efficiency is measured (parameter $F_{CH4,RG,t}$).	**05/03/2015:** As a response to the raised CAR, a disclaimer about the utilization of the parameters $V_{t,db}$, $v_{CH4,t,db}$ and $M_{t,db}$ for the determination of the methane mass flow in the residual gas (in a dry basis) for the two time periods during which the flare efficiency is measured was added in a footnote Section D.2 of the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team was able to confirm that all added details are correct. This CAR is closed.
CAR 17 (04/03/2015): Details about the installed temperature sensor to measure the temperature of collected LFG, pressure sensor to measure the pressure of collected LFG and CH_4 content gas analyzer unit are not in accordance with documented evidences made available to the EPIC's verification team.	**05/03/2015:** As a response to the raised CAR, details about the LFG temperature sensor and pressure sensor and the CH_4 content gas analyzer unit were corrected in the revised version of the Monitoring Report.	**09/03/2015:** OK. It is the opinion of the EPIC's verification team performed related corrections in the Monitoring Report are reasonable, correct and sufficiently address the raised CAR. The EPIC's verification team was able to confirm that all added details are correct. This CAR is closed.

Verification checklist

Project name : **Caieiras landfill gas emission reduction -0171-10th Verification**

TABLE 1: VERIFICATION REQUIREMENTS BASED ON CDM VALIDATION AND VERIFCATION STANDARD VERSION 7.0

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1. Compliance of the project implementation with the registered project design document					
1.1 Was an on-site visit conducted for this verification? If no, please justify the rationale of the decision.	VVS	262	Yes, on-site visit was performed on 03/03/2015 and 04/03/2015.	OK	OK
1.2 Are all physical features of the CDM project activity proposed in the registered PDD in place?	VVS	262	Yes, all physical features of the CDM project activity as proposed in the registered PDD are in place. Adopted technology, the project equipment, as well as the monitoring and metering equipment were implemented and operated during the monitoring period in accordance with the project design and monitoring details as described in the PDD. As also established by the PDD, the project activity's electricity demand was entirely met by imports of grid	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			electricity (without any captive electricity generator fuelled by fossil fuel being used) during the whole verification period.		
1.3 Have the project participants operated the proposed CDM project activity as per the registered PDD or any approved revised PDD?	**VVS**	**262 & 265**	**The PP had operated the proposed CDM project activity as per the registered PDD during the current monitoring period. During the verification, EPIC did not find any other significant changes to the project activity compared with the registered PDD.**	**OK**	**OK**
1.4 For this monitoring period, what is the status of the implementation of the project? **For project activities that consist of more than one site, the DOE shall describe the status of implementation and starting date of operation for each site.**	**VVS**	**263 (a)**	**The project is fully commissioned and operational since 01/02/2007. All the physical features of the project activity as oer the registered PDD are in place and have operated during the whole monitoring period.**	**OK**	**OK**
For project activities with phased implementation, what is the progress of the proposed project activity achieved in each phase under verification. If the phased implementation is delayed, describe the reasons and present the expected implementation dates;	**VVS**	**263 (a)**	**The project activity is fully commissioned and operational as described above.** ***CAR 1 was raised.***	**CAR 1**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1.5 Describe the actual operation of the project activity.	**VVS**	**263 (b)**	**In accordance with the conceived project design, the CDM project activity was designed and implemented and has operated along the monitoring period by collecting and combusting LFG under efficient and controlled conditions in the installed 4 high temperature enclosed flares. Also in accordance with the project design, the unique purpose of the project activity has been avoiding emissions of LFG into the atmosphere. The project activity has not promoted any commercial or economic utilization of collected LFG.** **In accordance to the project design, all project's electricity demand has been met during the considered monitoring period by imports of electricity sourced by the National Electricity Grid of Brazil that is the electricity grid for which the project activity is connected to. As confirmed by the EPIC's verification team, no backup captive off-grid electricity generator has ever been used for meeting the project's electricity demand under circumstances of planned or unplanned temporary interruption of supply of grid-sourced electricity to the project activity. Whenever the supply of grid-sourced electricity to the project activity is interrupted, the project's operation is also been interrupted.** **As confirmed by the EPIC's verification team, during the considered monitoring period, the project activity encompassed the operation of the following project**	**CAR 2** **CAR 3**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			infrastructure: - **Three LFG condensation traps to separate liquids in the collected LFG (leachate and condensate);** - **One LFG centrifugal blower, manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 125 HP (93.2 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h.** - **Two LFG centrifugal blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 100 HP (74.5 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h of LFG** - **Two LFG centrifugal blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 200 HP (149.1 kW) and nominal LFG pumping capacity for 7,000 Nm^3/h of LFG.** - **LFG monitoring equipment/instruments[16]:** • **Four LFG mass flow meter (one flow meter for each individual flare),** • **One LFG temperature sensor,** • **One LFG pressure sensor,**		

[16] Details about the specifications of the installed monitoring instruments/equipment are included in Section 4.1.3.

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			• One continuous $CH_4/CO_2/O_2$ content gas analyzer unit, • Four thermocouples (to measure temperature in the exhaust gases of each one of the installed flares), • Four UV flame detectors (to monitor operational and flame status of each one of the installed flares). - Four enclosed high temperature flares (of which main specifications are correctly outlined in the registered PDD), - Two electricity meters (to measure the consumption of grid-sourced electricity by the project activity's related equipment). During the monitoring period, the project's LFG collection system also encompassed about 320 operational vertical LFG collecting wells connected through a high-density polyethylene (HDPE) pipeline network. As the part of the typical operation of the CTR Caieiras landfill, some of the LFG extracting wells are normally temporarily disconnected from the LFG collection system in order to allow MSW disposal, compacting and movement of equipments (wheel loaders and excavators) and trucks. The project activity was implemented and remains being operated without having any collected LFG being sold to a local industry or being internally used as gaseous fuel for electricity generation.		

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			CARs 2 and 3 were raised.		
1.6 Any information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD or any approved revised PDD? (that has caused an increase in estimates of the emission reductions in the current monitoring period or is highly likely to increase the estimates of emission reductions in the future monitoring)	**VVS**	**263 (c)**	**Information provided by PP in MR are not different from the data and variables stated in registered PDD.** ***CAR 4 was raised.***	**CAR 4**	**OK**
2. Compliance of the monitoring plan with the monitoring methodology including applicable tool(s)					

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
The monitoring plan of the proposed CDM project activity shall comply with the applied methodology.					
2.1 For monitoring aspects that are not specified in the methodology and where applicable the standardized baseline, particularly in the case of small-scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency), these should be brought to the attention of the Board issues which may enhance the level of accuracy and completeness of the monitoring plan.	**VVS**	**266**	**No such aspects were observed in the project activity during site visit, document review and interview with PP.**	**OK**	**OK**
3. Compliance of monitoring activities with the registered monitoring plan. **Determine whether the monitoring of parameters related to the GHG emissions reductions in the project activity has been implemented in accordance with the monitoring plan contained in the registered PDD or any accepted revised monitoring plan.**					
3.1 Is the monitoring plan of the CDM	**VVS**	**268**	**During the document review and the on-site visit, the**	**OK**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
project activity complying with the methodology applied by the registered CDM project activity or an approved revised PDD?			EPIC's verification team has reviewed the application of the implemented monitoring plan vis-à-vis the monitoring requirements of the PDD along the considered monitoring period. Moreover the application of the monitoring plan during the monitoring period was also compared against the applicable requirements of the monitoring methodology ACM0001 (version 13.0.0) in order to verify its compliance. Based on this review, the verification team confirms that the monitoring plan was applied during the whole monitoring period in conformance with the provisions of the PDD. Moreover, the applied monitoring plan also sufficiently meets the requirements of the baseline and monitoring methodology ACM0001 (version 13.0.0) and applicable tools.		
3.2 Has the monitoring plan been properly implemented and followed by the project participants?	VVS	269 (a)	Yes. See 3.1.	OK	OK
3.3 Have all parameters stated in the monitoring plan, and relevant CDM Executive Board decisions been sufficiently monitored and updated as applicable, including: i) project emission parameters	VVS	269 (b)	Yes. The EPIC's verification team was able to confirm that all monitoring parameters of which monitoring is required by the monitoring plan of the PDD were monitored during the considered monitoring period. Project emissions monitored parameters:	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			- Amount of grid electricity consumed by the project activity ($EC_{PJ,y}$) - Operation margin CO_2 emission factor in year y = DIspatch data analysis operating margin CO_2 emission factor in year y ($EF_{grid,CM,y}$) - Quantity of LPG consumed by the project activity in year y ($FC_{LPG,y}$) - Net calorific value of the LPG ($NCV_{LPG,y}$) - CO_2 emission factor of fuel LPG in year y (($EF_{CO2,LPG,y}$)		
ii) baseline emission parameters			Baseline emission monitored parameters: - Management of the SWDS (Management of SWDS) - Volumetric flow of LFG stream in time interval t on a wet basis ($V_{t,wb}$) - Volumetric fraction of CH_4 in the collected LFG in time interval t on a wet basis ($v_{VH4,t,wb}$) - Temperature of LFG stream in time interval t (T_t) - Pressure of the LFG stream in time interval t (P_t)] - Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t ($F_{CH4,EG,t}$) - Temperature in the exhaust gas of the	CAR 5 CAR 7 CAR 13 CAR 16	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			enclosed flare in minute m ($T_{EG,m}$) - Flame detection of flare in the minute m ($Flame_m$) - Maintenance events completed in year y as monitored by the project participants ($Maintenance_y$) - Saturation pressure of H_2O at temperature T_t in time interval t ($p_{H20,t,Sat}$) The monitoring plan of the PDD also includes the following monitoring parameters of which monitoring was not required during the considered monitoring period since the methodological options for which they are applicable were not selected. - Volumetric flow of LFG stream in time interval *t* on a dry basis ($V_{t,db}$) - Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db}$) - Mass flow of the LFG stream in time interval *t* on dry basis ($M_{t,db}$) ***CARs 5, 7, 13 and 16 were raised.***		
iii) leakage parameters			No leakage emissions are applicable for this project activity.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
iv) Management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan?			EPIC has confirmed that responsibilities and authorities for monitoring and reporting in the MR are in accordance with those stated in the registered PDD.	OK	OK
3.4 Has the equipment used for monitoring is in accordance with section 4 below and is controlled and calibrated in accordance with the monitoring plan, the applied methodology, the applied standardized baseline, the Board guidance, local/national standards, or as per the manufacturer's specification?	VVS	269 (c)	Yes. All the monitoring equipment which were installed and operated during the considered monitoring period are in accordance with the monitoring plan of the PDD and ACM0001 (version 13.0.0). For further details see Section 4. *CAR 17 was raised.*	CAR 17	OK
3.5 Are monitoring results consistently recorded as per approved frequency?	VVS	269 (d)	Yes. All monitoring parameters were measured, recorded and reported in accordance with the monitoring plan of the PDD and ACM0001 (version 13.0.0). *CARs 10 and 12 were raised;*	CAR 10 CAR 12	OK
3.6 Have quality assurance and quality control procedures been applied in accordance with the monitoring plan or revised monitoring plan?	VVS	269 (e)	Yes. QA/QC procedures are described in the MR and consistently applied in accordance with the monitoring plan. As verified by the EPIC's verification team, competent	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			and sufficiently trained staff are recruited for operating the project activity and handling related monitoring data. Such employees are found with knowledge not only about the operation of the project activity but also with sufficient knowledge and competence to ensure the application of all related QA/QC procedures for data recording and storage. Furthermore, for the 10th periodic verification, the host-country project participant and project operator Essencis Soluções Ambientais S.A. was also supported with consultancy and advisory services in CDM and LFG management related issues by the consultancy service company named UniCarbo Energia e Biogás Ltda. As confirmed by the EPIC's verification team, the technical team from UniCarbo Energia e Biogás Ltda. has contributed for the development of related documentation (e.g. Monitoring Report and emission reduction calculation spreadsheets) and also supported Essencis Soluções Ambientais for addressing all raised outstanding issues (raised CARs). As also assessed by the EPIC's verification team, the project activity has been operated by sufficiently trained staff by correctly following guidance and instructions of internal documented working procedures and with high quality technical support from external CDM and LFG management consultants. **During the conducted on-site visit to the project site, the EPIC's verification team was also able to verify that the operational structure of the project activity is**		

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			also in line with the information made available in the PDD and in the Monitoring Report. EPIC was also able to verify that detailed management and operational work procedures are in place. In summary, it was confirmed that an operational structure for the project activity is established with responsibilities clearly identified. Moreover trained staff is employed to ensure data quality. As a conclusion, EPIC was thus able to verify that a reliable and robust monitoring mechanism was established, implemented and has been followed by Essencis Soluções Ambientais S.A.		
4. Compliance with the calibration frequency requirements for measuring instruments. **Determine whether the calibration of those measuring equipments that have an impact on the claimed emission reductions is conducted by the project participants at a frequency specified in the applied monitoring methodology, the applied standardized baseline and/or the monitoring plan.**					

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
4.1 Identify if there is any monitoring equipment not calibrated in accordance with the monitoring plan, the applied monitoring methodology, the Board guidance, local/national standards, or as per the manufacturer's specification?	**VVS**	**272**	**All monitoring equipment were calibrated in accordance with the monitoring plan.** ***CARs 6 and 11 were raised.***	**CAR 6 CAR 11**	**OK**
4.2 If there is delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), has the following conservative approach adopted in the calculation of emission reductions: **(a) Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or** **(b) Applying the error identified in**	**VVS**	**283**	**All monitoring equipment were calibrated in accordance with the monitoring plan.**	**OK**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment.					
4.3 Confirm that the error has been applied: (a) In a conservative manner, such that the adjusted measured values of the delayed calibration shall result in fewer claimed emission reductions; (b) For all measured values taken during the period between the scheduled date of calibration and the actual date of calibration.	VVS	283	All monitoring equipment were calibrated in accordance with the monitoring plan.	OK	OK
4.4 In cases where the results of the delayed calibration are not available, or the calibration has not been conducted at the time of verification, the verification team, prior to finalizing verification, shall request the project participants to conduct the required calibration and shall determine whether the project participants have calculated the emission reductions conservatively using the approach mentioned in paragraph 4.2 above.	VVS	275	All monitoring equipment were calibrated in accordance with the monitoring plan.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
4.5 In cases where the verification team determines that it is not possible for the project participants to conduct the calibration at a frequency specified by either the applied methodology, the applied standardized baseline, guidance provided by the Board, and/or the registered monitoring plan due to reasons beyond the control of project participants (For example, due to the contractual terms between the project participant and purchasing/selling entities), the verification team, shall follow the requirements for post registration changes in section of E of the VVS.	VVS	276	All monitoring equipment were calibrated in accordance with the monitoring plan.	OK	OK
4.6 In cases where neither the applied monitoring methodology, where applicable, the applied standardized baseline nor the monitoring plan specify any requirements for calibration frequency for measuring equipments, the verification team shall determine whether the equipments are calibrated either in accordance with the specifications of the local/national standards, or as per the manufacturer's specification. If neither local/national standards nor the manufacturer's specification are available, international	VVS	277	EPIC has confirmed that the monitoring equipment for which calibration frequencies are not specified in the monitoring plan were consistently calibrated in accordance with manufacturer's specifications.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
standards may be used. Refer to appendix 1 of the VVS for an illustrative example to apply the above requirements.					
5.0 Assessment of data and calculation of emission reductions **Assess the data and calculations of GHG emission reductions achieved by/resulting from the project activity by the application of the selected methodology and, where applicable, the applied standardized baseline.**					
5.1 Is a complete set of data for the specified monitoring period is available?	**VVS**	**280 (a)**	**Yes. As part of the implemented project's monitoring procedure, 7 monthly generated MS-Excel format "raw-data" files resulted from regular data exports were thus used as primary monitoring input data for the emission reduction calculations.** **Baseline emissions for each month of the verification period were partially calculated through application of the the *blank* version of the spreadsheet template developed by the project participant Essencis**	**OK**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			Soluções Ambientais S.A. and termed "monthly emission reduction calculation spreadsheet template". This spreadsheet template uses the following data/information as input data for the determination of every-minute and accumulated monthly values for the calculation parameters "Amount of methane in the LFG which is flared and/or used in the project activity" ($F_{CH4,PJ,y}$) and "Amount of methane in the LFG that would be flared in the baseline scenario (absence of project activity)" ($F_{CH4,BL,y}$): - **Monitoring records included in the 7 MS-Excel format "raw-data" spreadsheet files valid for the verification period** - **the *ex-ante* determined parameters as per the PDD** - **the calculated values of Flare efficiency (parameter $\eta_{flare,calc,m}$)** **It is noteworthy that the calculations for the determination of the applicable values for the monitoring parameter Flare efficiency ($\eta_{flare,calc,m}$) are performed in a separate calculation spreadsheet termed "*FE calculation spreadsheet*" (file name "*MR 10 - Caieiras - V.2 - 05.03.2015 - FE.xls*"). For the current monitoring period encompassing 7 months of years 2014, 7 monthly calculated spreadsheet (termed "*monthly emission reduction calculation spreadsheets*") were thus generated as a result of the use of the spreadsheet template for each individual month encompassed by the considered monitoring**		

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			period. **An additional calculation spreadsheet (termed "Summarized emission reduction calculation spreadsheet") (file name "*MR 10 - Caieiras - V.2 - 05.03.2015.xls*") correctly summarizes the achieved baseline emissions due to destruction of methane by the project activity during the considered monitoring period (by summing the accumulated monthly values for the calculation parameters $F_{CH4,PJ,y}$ and also summing the accumulated monthly values for the calculation parameters $F_{CH4,BL,y}$ from each one of the 7 monthly emission reduction spreadsheets).**		
5.2 If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, the verification team shall raise a CAR for the project participants to comply with the requirements of Appendix 1 of the Project Standard or submit a request for deviation prior to submitting the request for issuance, if appropriate;	**VVS**	**280 (a)**	**Complete data set are available for verification.**	**OK**	**OK**
5.3 Has information provided in the monitoring report been crosschecked with other sources such as plant log books, inventories, purchase records, laboratory analysis?	**VVS**	**280 (b)**	**Yes. EPIC has assessed documents and evidences which proved the authenticity of data presented in the monitoring report for all the monitoring parameters.** **Furthermore, a *data authenticity checking* was performed for all every minute basis measurement**	**CAR 8** **CAR 9**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			records of all LFG and flaring related monitoring parameters (incl. sub-parameters) in order to demonstrate and ensure that only authentic/not modified monitoring data was used as input data for the emission reduction calculations for the considered monitoring period. ***CARs 8 and 9 were raised.***		
5.4 Have calculations of baseline emissions, proposed CDM project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan, the applied methodology and where applicable, the applied standardized baseline?	**VVS**	**280 (c)**	**Yes. Baseline and project emissions were calculated in accordance with the formulae and methods described in the monitoring plan, ACM0001 (version 13.0.0) and applicable tools.** ***CARs 14 and 15 were raised.***	**CAR 14 CAR 15**	**OK**
5.5 Any assumptions used in emission calculations? If yes, they been justified?	**VVS**	**280 (d)**	**All data are based on measured and recorded values or default values as per the applicable guidance of ACM0001 (version 13.0.0) and applicable tools. No assumptions have been considered.**	**OK**	**OK**
5.6 Have appropriate emission factors, IPCC default values and other reference values been correctly applied?	**VVS**	**280 (e)**	**Yes. EPIC has confirmed that all default values were correctly applied as per the applicable guidance of ACM0001 (version 13.0.0) and applicable tools**	**OK**	**OK**

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
5.7 For a registered CDM project activity using an approved standardized baseline that standardizes baseline emissions, have the standardized value(s) of the parameter(s) are applied using the correct version of the applied standardized baseline in accordance with the Project standard.	VVS	280 (f)	NA	OK	OK

6. Post registration changes					
Temporary deviations from the registered monitoring plan, monitoring methodology and/or standardized baseline					

6.1 Where the deviation is identified during verification, the DOE shall indicate in the verification report how the monitoring report reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan, the applied methodology and /or the applied standardized baseline.	**VVS**	**290**	**NA**	**NA**	**OK**
6.2 Where the deviation is identified prior to verification, the DOE shall state its opinion on whether the deviation reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan, the applied methodology and /or the applied standardized baseline and as per the applicable provisions of the Project Standard.	**VVS**	**291**	**NA**	**NA**	**OK**
Corrections					
6.3 If the DOE identifies that the project participants have made corrections to project information or parameters determined at validation, the DOE shall determine whether: **(a) The corrected information is an accurate reflection of actual project information; and/or**	**VVS**	**293 A**	**NA**	**NA**	**OK**

6.4 (b) The corrected parameters are in accordance with the applied methodology the monitoring plan and /or the applied standardized baseline.	**VVS**	**293 b**	**NA**	**NA**	**OK**
Changes to the start date of the crediting period					
6.5 The DOE shall indicate if the requirements in the Project standard have been met and shall submit a request for post registration changes in accordance with the Project cycle procedure.	**VVS**	**296**	**NA**	**NA**	**OK**
Permanent changes from the registered monitoring plan or monitoring methodology					
6.6 The DOE shall determine whether the changes to the monitoring plan contained in the registered PDD proposed by the project participants are in compliance with the applied methodology and, where applicable, the applied standardized baseline and do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.	**VVS**	**298**	**NA**	**NA**	**OK**

6.7 In cases where the proposed changes refer to a later version of the applied methodology and /or the applied standardized baseline in the registered PDD, the DOE shall determine whether the application of any later version of the applied methodology any applicable tool(s) and/or the applied standardized baseline does not impact the conservativeness of the monitoring and verification process, including the related emission reduction calculations.	**VVS**	**299**	**NA**	**NA**	**OK**
6.8 If the DOE identifies that the project participants are unable to implement the monitoring plan contained in the registered PDD and it will not be possible to monitor the registered CDM project activity in accordance with a monitoring plan that would comply with the applied methodology any applicable tools, and, where applicable, the standardized baseline or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the permanent changes in accordance with the section on post registration changes in the Project cycle procedure.	**VVS**	**300**	**NA**	**NA**	**OK**

6.9 The DOE shall determine whether the permanent changes are likely to lead to a reduction in the accuracy of the calculation of emission reductions. In cases where the DOE considers that the permanent changes will lead to a reduction in the accuracy of the calculation of emission reductions, the DOE shall request the project participants to apply conservative assumptions or discount factors to the calculations to the extent required to ensure that emission reductions will not be over-estimated as a result of the permanent change.	**VVS**	**301**	**NA**	**NA**	**OK**
<u>Changes to the project design of a registered project activity</u>					
6.10 If the DOE identifies that the project design in the implementation or operation of the project activity does not conform with the description contained in the registered PDD or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the proposed or actual changes in accordance with the section on post registration changes in the Project cycle procedure.	**VVS**	**305**	**NA**	**NA**	**OK**

6.11 In case of actual changes, the DOE shall, by means of an on-site visit and review of the submitted revised PDD by the project participants, which describes the nature and extent of the actual changes, determine whether this description accurately reflects the implementation, operation and monitoring of the modified project activity.	**VVS**	**306**	**NA**	**NA**	**OK**
6.12 The DOE shall conduct an on-site inspection to assess the impacts of the actual changes on the compliance of the monitoring plan, the level of accuracy of the monitoring activity, the applied monitoring methodology and including applicable tool(s) and/or, where applicable, the applied standardized baseline.	**VVS**	**307**	**NA**	**NA**	**OK**

6.13 The DOE shall, by means of reviewing the revised PDD against applicable additionality and methodological requirements, determine whether the proposed or actual changes would adversely affect the conclusions of the validation report of the registered PDD with regard to: **(a) Additionality of the project activity;** **(b) Scale of the project activity;** **(c) Applicability and application of the approved baseline methodology and, where applicable, the approved standardized baseline under which the project activity has been registered; or** **(d) The compliance of the monitoring plan with the applied monitoring methodology and, where applicable, the applied standardized baseline**	**VVS**	**308**	**NA**	**NA**	**OK**
6.14 If the proposed or actual changes affect the additionality of the project activity then the DOE shall confirm that: **(a) In the case of investment analysis, project participants have only modified the key parameters in the original spreadsheet calculations affected by the proposed or actual changes to the project activity;** **(b) In the case where only barriers have been claimed to demonstrate additionality, project participants have demonstrated that the barriers are still valid under the new**	**VVS**	**309**	**NA**	**NA**	**OK**

circumstances.					
6.15 For registered CDM project activity using an approved standardized baseline that standardizes additionality:- **If the proposed or actual changes affect the additionality of the project activity then the DOE shall confirm that the project activity complies with the positive list of the applied standardized baseline in the registered PDD.**	**VVS**	**309**	**NA**	**NA**	**OK**
6.16 The DOE shall confirm that the applied methodology including applied tools and/or the applied standardized baseline do not impact the conservativeness of the monitoring and verification process and the related emission reduction calculations in cases where: **(a) The proposed or actual changes impact the implementation of the project activity;** **(b) The original methodology and/or the original standardized baseline would no longer be applicable; and** **(c) The project participant applies:** **(i) A later version of the methodology and/or the standardized baseline; or** **(ii) Another methodology and/or another standardized baseline that is(are) applicable**	**VVS**	**310**	**NA**	**NA**	**OK**

to the project activity.					
6.17 The DOE shall assess whether the revised PDD complies with: **(a) The applied methodology, tools and/or standardized baseline;** **(b) Any later version of the methodology and/or the standardized baseline; or** **(c) The requirements of another methodology and/or another standardized baseline that is(are) applicable to the project activity.**	**VVS**	**311**	**NA**	**NA**	**OK**