CDM VALIDATION REPORT

Industrias de Biogás S.A.

VALIDATION OF THE PROJECT ACTIVITY:

Zona 3 Landfill Gas Project

AENOR REFERENCE: 2011/081/CDM/14

VERSION:2

Validation Report:	AENOR Reference nº:	Version of this report:	Date:	
	2011/081/CDM/14	2	26/12/2012	
PDD:	Title:	GSC publication date:	Comments received:	
	Zone 3 Landfill Gas Project	15/05/2008	☐ Yes* ☒ No	
Parties involved:	Host Party:	Other involved Parties:		
	Guatemala			
Project Participant(s):	In host Party:	In other involved Parties:		
	Industrias de Biogás S.A.			
Size of the project activity:	☐ Small scale ☒ Large scale			
Applied methodology/ies:	Title:	Code:	Nº version	Scope:
	Flaring or use of landfill gas	ACM0001	13	13
Applied tools:	Title:	Version:		
	Emissions from solid waste disposal sites	06.0.1		
	Title:	Version:		
	Combined tool to identify the baseline scenario and demonstrate additionality	05.0.0.		
	Title:	Version:		
	Project emissions from flaring	02.0.0		
	Title:	Version:		
	To calculate the project or leakage CO2 emissions from fossil fuel combustion	02		
	Title:	Version:		
	To calculate baseline, project and/or leakage emissions from electricity consumption	1		
	Title:	Version:		
	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	2.0.0		

* The comments are detailed in Section 4 of this Validation Report

	Title:		Version:	
	To calculate the emission factor for an electricity system		03.0.0	
Emission reductions *(ER)*: ☒**Annual average of the ER *(tCO_2e)*** ☐ **Total ER *(tCO_2e)***		GSC PDD:	Final PDD:	
		159,080	141,597	
Previous versions of this document:			Version:	Date:
			1	11/12/2012
			2	
			3	
			4	
Report prepared by:	Climate Change Unit. AENOR			

Abbreviations

ACM0001 *(ver.13)*	Flaring or use of landfill gas
BM	Build Margin
CAR	Corrective Action Requested
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CL	Clarification
DECISION 3/CMP.1	Modalities and Procedures for a Clean Development Mechanism as Defined in Article 12 of the Kyoto Protocol
DNA	Designated National Authority
EB	Executive Board of the CDM of the Kyoto Protocol
EIA	Environmental Impact Assessment
GSC	Global Stakeholder Consultation
GHG	Greenhouse Gasses
GWhe	Electrical Giga Watt hour
GWht	Thermal Giga Watt hour
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MWH	Mega Watts hour
PDD	Project Design Document
tC	Carbon tonnes
tCO2e	Carbon dioxide equivalent tonnes
TJ	Tera Joules
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

Table of Contents ***Page***

1 INTRODUCTION

1.1 Objective

This validation concerns a project implemented by the Project Participant, Industrias de Biogás S.A. (hereinafter) INBIO, in Guatemala to reduce emissions from the decomposition of municipal solid waste that would otherwise be emitted to the atmosphere. The objectives of the validation exercise are to confirm that the project meets the necessary CDM criteria, follows the approved methodology, and that the proposals presented by PP in the PDD will lead to a realistic determination of the emissions reductions.

- The project participants included in the first versión of PDD submitted for global stakeholder consultation were the following companies:
- Guatecarb S.A. (Guatemala)
- ProCan S.A. (Switzerland)
- Brascarb S.A. (Brasil)
- Carbon Trade Ltd (United Kingdom)

Due to different changes in the above mentioned companies, the final project proponent of the Zone 3 Landfill Gas Project is the company INBIO.
The different changes in the project proponents were dully communicated to the DOE and to the DNA as well.

The PP has commissioned AENOR to validate this project activity. The purpose of such a validation is to have an independent, third party assess the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host country issues and criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is a requirement for all CDM projects and is considered essential in providing quality assurance for the project.

UNFCCC criteria refer to the Kyoto Protocol criteria and the CDM rules and modalities as agreed to in the Bonn Agreement and the Marrakech Accords.

1.2 Scope

The scope of the validation covers the additionality assessment, the Environmental Impact Study and the stakeholder consultation. In addition, it covers the baseline methodology, the calculation of the emission factor (ex-ante) and the monitoring methodology to quantify the emissions reductions during the operational life of the project.

The following documents were reviewed as part of the scope of the activity:

- PDDs (First version and final version, including baseline study and monitoring plan.
- Approved Methodology: ACM0001 version 13
- Decision 3/CMP.1 and relevant decisions from the EB
- Tool Emissions from solid waste disposal sites. Ver. 6.0.1
- Combined tool to identify the baseline scenario and demonstrate additionality. Ver. 05.0.0.
- Tool Project emissions from flaring. ver. 02.0.0

- To calculate the project or leakage CO2 emissions from fossil fuel combustion. ver 02
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption. ver. 1
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream, ver .2.0.0.
- Emission reductions calculation.
- Financial analysis calculation.
- Guatemala national grid emission factor calculations.
- Associated documentation *(*environmental requirements, investment analysis, etc.*)*
- Letter of approval.

The validation scope is defined as an independent and objective review of the PDD, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. AENOR, based on the Specific Instruction for the Processing and Conducting of Validation, Registration, Verification and Certification of Kyoto Protocol CDM Project Activities *(*IE/DTC/0039*)*, has used a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consultancy services to the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the PDD.

2 METHODOLOGY

The project assessment aims at being a risk based approach and is based on the methodology developed in the Validation and Verification Manual (version 01.2), an initiative of Designated and Applicant Entities, which aims to harmonize the approach and quality of all such assessments.

The validation of the project was started in May 2008 and concluded in December 2012. The validation was performed in several phases, starting with a desk review of the PDD against the approved methodology and CDM and other relevant criteria. The desk review was followed by a site visit to the project site and main stakeholders in Guatemala.

In order to ensure transparency, a validation protocol was customized for the project, according to Specific Instructions IE/DTC/0039. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results derived from validating the identified criteria.

The sequence of the validation is given in the table 1 below:

Topic	Date
Submission of PDD for global stakeholder consultation process	**15/05/2008**
On-site visit	**23-25/06/2008**
Validation Protocol - Version 01.	**04/09/2008**
Final Validation Report	**26/12/2012**

Table 1: Sequence of the main validation activities

2.1 Appointment of team members and technical reviewers

The list of involved personnel and the qualification status are summarized in the table below:

Name	Qualification	
	Position in the team	Technical areas
Jose Luis Fuentes Perez	Chief validator	TA 13.1
Luis Robles Olmos	Validator and Technical Expert	TA 1.1 TA 13.1
Pablo Taboada Utrera	Validator	TA.13.1
Mª Carmen González Galán	Technical reviewer	TA.13.1; TA 1.1
José Antonio Gesto Vilacoba	Technical reviewer	TA.13.1

Table 2: List of the personnel involved

Technical areas (TA) mentioned above correspond to the following:

TA code	Technical area
TA 1.1	Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)
TA 1.2	Energy generation from renewable energy sources
TA 2.1	Electricity distribution
TA 2.2	Heat distribution
TA 3.1	Energy demand
TA 4. 1	Cement sector (COMPLEX)
TA 4.2	Aluminum (COMPLEX)
TA 4.3	Iron and steel (COMPLEX)
TA 4.4	Refinery (COMPLEX)
TA 5.1	Chemical process industries (COMPLEX)

TA 6.1	Construction.
TA 7.1	Transport.
TA 8.1	Mining and mineral processes, excluding those included in TA 8.2 below;
TA 8.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX).
TA 9.1	Metal production.
TA 10.1	Mining and mineral processes, excluding those included in TA 10.2 below;
TA 10.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX).
TA 11.1	Chemical process industries (COMPLEX);
TA 11.2	GHG capture and destruction.
TA 12.1	Chemical process industries (COMPLEX).
TA 13.1	Waste handling and disposal;
TA 13.2	Animal waste management.
TA 14.1	Forestry
TA 15.1	Agriculture
TA 15.2	Animal waste management.

2.2 Document review

The Project Design Document submitted by the PPs was reviewed against the approved methodology and against CDM and other relevant criteria. Additional background documents related to the project design, baseline and financial analysis were also made available before and during the on-site visit in Guatemala.

To address the corrective actions and clarification requests that arose from the desk review and on-site visit, the consultants revised the project design document submitted in May 2008 to GSC and developed a final version (version 2 dated on 20/12/2012).

2.3 Follow-up actions

The AENOR validation team composed of José Luis Fuentes Pérez and Pablo Taboada Utrera conducted interviews with project developers in Guatemala to confirm selected information and to resolve issues identified in the document review.

On 23-25 June 2008, the AENOR validation team carried out the visit to the project site. During these days, representatives from Project Participants were interviewed, in addition to relevant local stakeholders.

The main topics of the interviews are summarized in Table 3.

Interviewed organisation Person/Position	Interview topics
• Adrian Loening: Carbon Trade. Landfill management • Christian Siliezar: Carbon Trade. Landfill management • Rosario Burgos: Direction of Environment. Municipality of Guatemala. • Raúl Castañeda. DNA Guatemala. • Sonia de Roche: Santa Clara Children Garden. • Evelyn Reyna: Nature Defender´s Foundation. • Ernesto Gil: EcoPlast S.A. • Fredy Maldonado: Safe Passage NGO • Several members of the recyclers association	➢ Project design. ➢ Compliance with environmental law. ➢ Permits and authorizations applicable to landfill projects. ➢ Additionality assessment. ➢ Ex-ante baseline determination. ➢ Consultation with municipality's authorities, land owners and other stakeholders.

2.4 Findings

The objective of this validation phase was to resolve the requests for corrective actions and clarifications and any other outstanding issues that needed to be clarified for AENOR's positive conclusion on the project design. The corrective action requests (CARs) and clarification requests (CLs) raised by AENOR were resolved during communications with the project participants. To guarantee the transparency of the validation process, the concerns raised and responses given are described in this report and also documented in the validation protocol in Annex 1.

Since modifications to the Project design were necessary to resolve AENOR's concerns, the Client decided to revise the documentation and finally resubmitted a final project design document. After reviewing the revised and resubmitted project documentation, AENOR issued this final validation report and opinion.

2.5 Internal Quality Control

As final step of the validation, the validation report and the protocol have to undergo an internal quality control by means of a technical review following the procedures of AENOR. The technical reviewer is a competent person of AENOR, independent from the team that carried out the validation of the project activity.

3 VALIDATION FINDINGS

3.1 Approval

Approval requirements have been validated with the evidence of the LoA requested from the PP in the proposed project activity.

Letter of Approval from Guatemala DNA has been provided to the validation team directly from the Project Participant. The LoA was issued on 23 December 2010 (No. AND 021) by the Ministry of Environment and Natural Resources. AENOR confirms that the LoA is unconditional with respect to the following:

- Guatemala is a Party of the Kyoto Protocol.
- The participation of Guatemala in the CDM and the project is voluntary.
- The LoA authorizes Industrias de Biogás S.A. a voluntary Project Participant and confirmed that the project contributes to Guatemala´s sustainable development.
- The LoA refers to the precise proposed CDM project activity title in the PDD being submitted for registration.

The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Guatemala.

3.2 Participation

Guatemala is the party involved in the project.

AENOR confirms that participation of the PP has been approved by the party involved in the Kyoto Protocol, by means of the LoA issued from DNA. AENOR checked the web site of the UNFCCC and web from Guatemala DNA and confirms that LoA has been issued by the respective DNA, and it is valid for the proposed CDM project activity. AENOR does not doubt the authenticity of the letter of approval received from PP, hence AENOR confirms that LoA is in compliance with paragraphs 45-48 of the VVM v.1.2. No additional specification of the project activity is contained in the LoA.

The project participant has been listed in section A.3 of the final PDD. This information is consistent with the information provided in Annex 1. AENOR confirms that no entities other than those approved as project participants are included in these sections of the final PDD.

3.3 Project Design Document

Due to the clarifications and corrective actions requested during the validation process, the Project Participants have made a final version of the PDD, version 2 dated on 20 December 2012, which includes all issues raised to the PPs either corrected or clarified. The first PDD version was submitted for GSC.

The PDD is compliant with relevant form and guidance of the VVM as provided by UNFCCC. Relevant information was provided by the participant in the PDD sections. The PDD is in accordance with the applicable CDM requirements for completing PDDs. Completeness was assessed through the checklist included as Annex 1 of this report.

The relevant changes in the final PDD respect to the PDD for GSC are the following:

Issue	Information in PDD for GSC	Information in final PDD
Description of the project		
Project participants	- Guatecarb S.A. (Guatemala) - ProCan S.A. (Switzerland) - Brascarb S.A. (Brasil) - Carbon Trade Ltd (United Kingdom)	Industrias de Biogás S.A.

ER	159,080 tCO_2e (annual average)	141,597 tCO_2e (annual average)
Additionality		
Starting date, crediting period	Starting date 01/09/2008/ Crediting period 01/09/2008	Starting date 01/06/2011/ Crediting period 01/03/2013
Others		

3.4 Project description

Title of the project activity: Zone 3 Landfill Gas Project.

Project Participants: Industrias de Biogás S.A. The participation of the Project Participant has been approved by the Party involved by the letter of approval.

Host Party: Guatemala.

Description:

The following description of the project as per PDD could be verified based on available documents, cross-check references, interviews and on-site inspections.

The main purpose of the Project is to reduce GHG emissions through the capture, flare and utilization of methane gas generated at Zone 3 Landfill site located in Guatemala City for generating electricity.

The capturing, flaring and utilization of landfill gas instead of passively venting will result in measurable reductions of GHG emissions that deliver long-term benefits to the mitigation of climate change. The project will also result in mitigation of climate change by displacing or avoiding energy from other sources. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The installations of the LFG capture and collection and destruction system are composed by the following sub-systems:

- Collection: consists of a set of wells installed into the refuse, where the LFG is extracted from the inside.
- Extraction and piping: conformed by a network of pipes and equipment to extract the LFG to the power generation and/or to the flare units.
- Monitoring, analysis and cleaning of biogas: An automatic system assures a stable flow for the methane gas previous to be introduced to the power generation and/or to the flare units.
- Electricity production: Four engines of 1,200 kW will be installed at the project site. The electricity produced using the LFG recovered will be used for project activity self-consumption purposes as well as for its selling to the local distribution network under a power purchase agreement.
- Flaring: Two high temperature enclosed flares stack (1,100 ºC and 0.3 seconds retention time) will be used in order to destroy the methane gas that is not sent to the power generation plant. The enclosed flaring system will be used, with a continuous monitoring

of the methane destruction efficiency of the flare. Flare efficiency *(*$\eta_{flare,h}$*)* is expected to exceed 99.9%.

During the validation process clarifications were requested to the PP to provide further information about the equipment and technology to be employed by the project activity and provide evidence to check the information in the PDD concerning the description of the project. As a result, the sections A.2 and A.4.3 have been completed with more detailed information on different equipment and facilities to be implemented by the PP at landfill site, along with a more clear description of the project. This information has been supported by the evidence such as information of management of the landfill by the Operator, feasibility study, technical specifications of the equipment, authorisation *(*see references in section 6*)* provided to AENOR which confirmed the description in PDD.

No historical records of waste disposal rates exist at Zone 3 landfill, although landfill is receiving wastes since 1966. Hence, waste input data has been provided by a third party study carried out by SCS Engineers Inc. *(*SCS*)* under contract to USAID and the US Environmental Protection Agency Landfill Methane Outreach Program in 2005.

The current situation before the project implementation is the complete atmospheric release of landfill gas, as the site contains no control for capture of landfill gas. Hence, baseline scenario is the atmospheric release of the landfill gas and no use of the electricity is needed. All these specifications where confirmed during the site visit to the landfill by AENOR.

The project is expected to reduce an annual average of **141,597** tCO_2 and a total of **991,181** tCO_2 for the first crediting period of 7 years, by reducing methane emissions in flares and electricity generators and by displacing of electricity generated by power plants connected the Guatemalan National Electricity Grid.

The landfill is situated in Zone 3 of Guatemala City. The site is located in the Barranca Canyon which is bounded to the West by Zone 7 Colonia Landivar and to the East by Zone 3. The site is intersected by Calle 30 running between Zone 3 and Zone 7. The former name of the landfill site was "El Trebol"

The geographical coordinates of the project have been detailed in the final PDD in decimals format to comply with the CDM requirements: 14.6247 North -90.5322 West.

The average yearly emission reduction estimated from the project area is **141,597** CO2e over the selected 7 years of the first renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The project start date is properly defined as 1 June 2011 as it is justified in section 3.6.1. of the present report. The start date of the crediting period has been determined as 01/03/2013 or registration date, whichever is later, to comply with the CDM requirements and project´s schedule.

The information presented in the PDD on the technical design is consistent with the actual planning and implementation of the project activity as confirmed by:

• Review of data and information *(*see reference section*)*, cross check the same with other sources.

• An on-site visit has been performed and relevant stakeholder and personnel with knowledge of the project were interviewed, in case of doubt further cross checks through additional communication have been done.

• Finally information related to similar projects or technologies as the CDM project activity have been used to confirm the accuracy and completeness of the project description.

In light of the above, AENOR confirms that the project description as included to the PDD is sufficiently accurate and complete in order to comply with the requirements of the CDM.

3.5 Baseline methodology

3.5.1 Applicability of the selected methodology to the project activity

The PDD describes the baseline methodology, which complies with the approved consolidated baseline methodology ACM0001 (Version 13).The version of the methodology has been correctly addressed in the final PDD and calculations validated by the AENOR validation team.

The ACM0001 version 13 is considered applicable to this type of project, because is applicable to project activities which:

(a) Install a new LFG capture system in a new or existing SWDS;

(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:

(i) Generating electricity;

(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.

The proposed project activity involves the installation of a new LFG capture system in an existing SWDS (option a). Furthermore, it is intended to flare the LFG and/or use the captured LFG to generate electricity, which corresponds to option c, point (i). Also, it is not the purpose of this project to reduce the amount of organic waste that would be recycled in the absence of the project activity.

The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:

(a) Release of LFG from the SWDS; and
(b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln;

(i) For electricity generation: that electricity would be generated in the grid

The methodology is applicable because the most plausible baseline scenario is the release the LFG from the SWDS (option a) and, as the LFG is used in the project activity for generating electricity, the generation of electricity from the grid.

The methodology is not applied in combination with other approved methodologies and under the project activity management of the SWDS will not be changed from the situation prior to the implementation of the project activity in order to increase the methane generation. The Zone 3 landfill will continue to receive and dispose of urban residual waste into dedicated and prepared cells and these practices will not be changed during the crediting period.

The captured gas used to supply consumers through natural gas distribution networks, and to generating heat has not been considered since these are not components of the envisaged project activity at the Zona 3 landfill site.

In addition, the applicability conditions of the applied tools as outlined in B.1 of the PDD are also met. The assessment was carried out during the on site visit for each applicability criteria and included among others the compliance check of the local project setting with the applicability conditions in regard to baseline setting and eligible project measures. This assessment also included the review of secondary sources which sustain that applicability conditions are complied with.

The protocol included to the Annex 1 documents the assessment process, including the steps taken. The results on the compliance check are presented in annex 1.

AENOR confirms that the chosen baseline and monitoring methodology as well as applicable tools are applicable to the project activity.

Based on site visits, interviews with stakeholders and relevant documents provided by PP during the validation process and mentioned in this validation report, AENOR confirms the applicability conditions of the selected methodology to the project activity, as well as, the version of this methodology used.

3.5.2 Project boundary

The description of the project boundaries stated in the PDD is in compliance with the methodology, which reads: "The project boundary is the site of the project activity where the gas is captured and destroyed/used, and includes all the power generation sources connected to the Interconnected National System to which the project activity is connected". The spatial extent of the project boundaries described in the PDD was clearly observed during the site visit.

In addition, all emission sources and gases related to the baseline scenario, project scenario, and leakage are clearly identified and described in a complete manner in section B.3 of the final PDD. CH4 is the main emission source and is included in the baseline, as well as CO2 from electricity consumption. CO2 emissions from thermal energy generation have not been considered in the baseline as thermal energy is not used in baseline. CO2 project emissions from on site electricity use will be considered in case the project uses electricity from the grid. Leakage is not considered according to the applicable methodology.

Emission sources which are not addressed by the applied methodology and which are expected to contribute more than 1% of the overall expected average annual emissions reduction have not been identified.

3.5.3 Baseline identification

The most plausible baseline scenario is the release of the LFG to the atmosphere and the electricity demand being acquired from the national grid.

In accordance to ACM001 version 13.0.0 and to the "Combined tool to identify the baseline scenario and demonstrate additionality", the procedure for the selection of the most plausible scenario is described in detail in section B.5 of the PDD and assessed in the present report section 3.6.2 "Annalysis of the additionality".

3.5.4 Algorithms and/or formulae used to determine emission reductions

All steps of the applicable methodology ACM0001 version 13 have been quoted in the final PDD with the same formulae and same nomenclature than those appearing in the mentioned methodology and the applicable versions of the tools.

The methodology ACM0001 version 13 is applied exactly as prescribed and inputs used for the emission reduction projection as well as default values available in the applied methodology were verified to be correct. The PDD clearly states which equations were used in calculating baseline emission, as detailed below.

Baseline emissions are determined according to equation 1 of ACM0001 and comprise the following sources:

(A) Methane emissions from the SWDS in the absence of the project activity;

(B) Electricity generation using fossil fuels or supplied by the grid in the absence of the project activity;

$BE_y = BE_{CH4,y} + BE_{EC,y}$

Where:
BE_y = Baseline emissions in year *y* (tCO_2e/yr)
$BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year *y* (tCO_2e/yr)
$BE_{EC,y}$ = Baseline emissions associated with electricity generation in year *y* (tCO_2/yr)

Baseline emissions associated with heat generation and with natural gas are equal to zero, since it is not part of the project activity ($BE_{HG,y} = BE_{NG,y} = 0$).

Step A: Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

Baseline emissions of methane from the SWDS are determined as follows, based on the amount of methane that is captured under the project activity and the amount that would be captured and destroyed in the baseline (which is zero). In addition, the effect of methane oxidation (OX_{top_layer}) that is present in the baseline and absent in the project is taken into account:

$$BE_{CH4,y} = \left(1 - OX_{top\_layer}\right) \cdot \left(F_{CH4,PJ,y} - F_{CH4,BL,y}\right) \cdot GWP_{CH4}$$

Where:

$BE_{CH4,y}$ = Baseline emissions of LFG from the SWDS in year *y* (tCO_2e/yr)
OX_{top_layer} = Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)
$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (tCH_4/yr)
$F_{CH4,BL,y}$ = Amount of methane in the LFG that would be flared in the baseline in year *y* (tCH_4/yr)
GWP_{CH4} = Global warming potential of CH4 ($tCO_2e/\ tCH_4$)

Step A.1: Ex-post determination of $F_{CH4,PJ,y}$

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (tCH_4/yr)
$F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year *y* (tCH_4/yr)

$F_{CH4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year *y* *(*tCH_4/yr*)*

Amount of methane in the LFG which is used for electricity generation *(*$F_{CH4,EL,y}$*)*

$F_{CH4,EL,y}$ is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" and monitoring the working hours of the power plant*(s)*, so that no emission reductions are claimed for methane destruction during nonworking hours.
Considering the measure meters used in this project, the Option A *(*volume flow dry basis and volumetric fraction dry basis*)* is applied for measuring Fi,t, in this case $F_{CH4,EL,y}$. Under Option A, flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option.
For the Zona 3 landfill project activity, temperature under 60ºC *(*option b*)* will be demonstrated and absolute humidity will not be measured

The mass flow of methane *(*Fi,t*)* will be determined for the mass flow of methane sent to flare, as well as for mass flow of methane sent to each electric engine, as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t} \quad \text{with} \quad \rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$

Where:

$F_{i,t}$ = Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* *(*kg gas/h*)*
$V_{t,db}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis *(*m^3 dry gas/h*)*
$v_{i,t,db}$ = Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis *(*m^3 gas i/m^3 dry gas*)*
$\rho_{i,t}$ = Density of greenhouse gas i in the gaseous stream in time interval t *(*kg gas i/m^3 gas i*)*
P_t = Absolute pressure of the gaseous stream in time interval t *(*Pa*)*
MM_i = Molecular mass of greenhouse gas i *(*kg/kmol*)*
R_u = Universal ideal gases constant *(*Pa.m^3/kmol.K*)*
T_t = Temperature of the gaseous stream in time interval t *(*K*)*

The following requirements apply:

- $F_{CH4,EL,y}$ is calculated as the sum of mass flows to each item of electricity generation,
- CH_4 is the greenhouse gas for which the mass flow is determined *(*hence i= CH_4*)*,
- The simplification offered for calculating the molecular mass of the gaseous stream is valid *(*equations 3 or 17 in the tool*)*,

- The mass flow should be calculated on an hourly basis for each hour h in year y (hence t = hour), and
- The mass flow calculated for hour h is 0 if the equipment is not working in hour h ($Op_{j,h}$=not working), the hourly values are then summed to a yearly unit basis.

Hence in this step the parameters that will need to be monitored are Opj,h; Vt,db; vi,t,db; Pt and Tt for gaseous streams going to each electric engine, t=hour and i=CH4.

Amount of methane in the LFG which is destroyed by flaring ($F_{CH4,flared,y}$)

$F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare and any methane emissions from the flare, as follows:

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

Where:

FCH4,flared,y	Amount of methane in the LFG which is destroyed by flaring in year y (tCH4/yr)
FCH4,sent_flare,y	Amount of methane in the LFG which is sent to the flare in year y (tCH4/yr)
PEflare,y	Project emissions from flaring of the residual gas stream in year y (tCO2e/yr)
GWPCH4	Global warming potential of CH4 (tCO2e/tCH4)

$F_{CH4,sent\_flare,y}$ is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". As for $_{FCH4,EL,y}$ determination, the same Option A (volume flow dry basis and volumetric fraction dry basis) is applied for measuring Fi,t, in this case $F_{CH4,sent\_flare,y}$.

Under Option A, flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:
For the project activity, temperature under 60ºC (option b) will be demonstrated and absolute humidity will not be measured.

In this case, the tool is applied to the LFG delivery pipeline to the flares, as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t} \quad \text{with} \quad \rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$

Where:

$F_{i,t}$ = Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas/h)

$V_{t,db}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m³ dry gas/h)

$v_{i,t,db}$ = Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m³ gas i/m³ dry gas)

$\rho_{i,t}$ = Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m³ gas i)

P_t = Absolute pressure of the gaseous stream in time interval t (Pa)

MM_i = Molecular mass of greenhouse gas i (kg/kmol)

R_u = Universal ideal gases constant (Pa.m³/kmol.K)

T_t = Temperature of the gaseous stream in time interval t (K)

The following requirements apply:

- FCH4,sent_flare,y is calculated as the sum of mass flows to each flare,
- CH4 is the greenhouse gas for which the mass flow is determined (hence i= CH4),
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool),
- The mass flow should be calculated on an hourly basis for each hour h in year y (hence t = hour), and
- The mass flow calculated for hour h is 0 if the equipment is not working in hour h (Opj,h=not working), the hourly values are then summed to a yearly unit basis.

Hence in this step the parameters that will need to be monitored are $V_{t,db}$; $v_{i,t,db}$; P_t and T_t for gaseous stream going to flare, being t=hour and i=CH_4.

$PE_{flare,y}$ is determined using the tool "Project emissions from flaring".

The tool is applicable to Zona 3 project activity as enclosed flares will be installed and methane is the component with the highest concentration in the flammable residual gas, which comes from a biogenic source (landfill gas).

The calculation of the project emissions from flaring the LFG ($PE_{flare,y}$) is based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

The project emissions calculation procedure is given in the following steps:

STEP 1: *Determination of the methane mass flow of the residual gas;*

STEP 2: Determination of the flare efficiency;
STEP 3: Calculation of project emissions from flaring.

STEP 1: Determination of the methane mass flow of the residual gas

The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is used to determine the mass flow of methane in the residual gaseous stream in the minute *m* parameter *($F_{CH4,RG,t}$)*.

As for $F_{CH4,sent\_flare,y}$, *Option 2 "Simplified calculation without measurement of the moisture content"* and *option A (volume flow dry basis and volumetric fraction dry basis)* are selected to calculate the mass flow of methane in the residual gaseous stream, which corresponds to the amount of methane sent to flare *($F_{CH4,sent\_flare,y}$)* explained before.

Also, the following requirements apply to $F_{CH4,RG,t}$:

- The gaseous stream tool shall be applied to the residual gas *(*which is equivalent to the gaseous stream sent to flare*);*
- The flow of the gaseous stream shall be measured continuously;
- CH4 is the greenhouse gas i for which the mass flow should be determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid *(*equations 3 and 17 in the tool*);* and
- The time interval t for which mass flow should be calculated is every minute m.

$F_{CH4,m}$, which is measured as the mass flow during minute m, is used to determine the mass of methane in kilograms fed to the flare in minute m *($F_{CH4,RG,m}$)*. $F_{CH4,m}$ is determined on a dry basis.

STEP 2: Determination of the flare efficiency

Project participant will install an enclosed flare. The flare efficiency will be measured and hence, Option B: "Measure the flare efficiency" of the tool is chosen. As the flare efficiency in the minute m is a measured value *($\eta_{flare,m} = \eta_{flare,calc,m}$)* the next conditions must be met to demonstrate that the flare is operating:

(1) The temperature of the flare *($T_{EG.m}$)* and the flow rate of the residual gas to the flare *($F_{RG,m}$)* is within the manufacturer's specification for the flare *($SPEC_{flare}$)* in minute m;

(2) The flame is detected in minute m *($Flame_m$)*; and

Otherwise ηflare,m is 0%.

When applying Option B, the project participants has chosen to determine $\eta_{flare,calc,m}$ using Option B.2. Under Option B.2 the flare efficiency is measured in each minute.

Under Option B.2, the flare efficiency *($\eta_{flare,calc,m}$)* is determined based on monitoring the methane content in the exhaust gas, the residual gas, and the air used in the combustion process during the minute m in year y, as follows:

$$\eta_{flare,calc,m} = 1 - \frac{F_{CH4,EG,m}}{F_{CH4,RG,m}}$$

Where:

$\eta flare,calc,m$ = Flare efficiency in the minute m

$F_{CH4,EG,m}$ = Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute m *(kg)*

$F_{CH4,RG,m}$ = Mass flow of methane in the residual gas on a dry basis at reference conditions in the minute m *(kg)*

$F_{CH4,RG,m}$ is calculated according to Step 1 and $F_{CH4,EG,m}$ is determined according to Steps 2.1 - 2.4 below:

Step 2.1: Determine the methane mass flow in the exhaust gas on a dry basis

The mass flow of methane in the exhaust gas is determined based on the volumetric flow of the exhaust gas and the measured concentration of methane in the exhaust gas, as follows:

$F_{CH4,EG,m} = V_{EG,m} * fc_{CH4,EG,m} * 10^{-6}$

Where:

$F_{CH4,EG,m}$ = Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m (kg)*

$V_{EG,m}$ = Volumetric flow of the exhaust gas of the flare on a dry basis at reference conditions in minute *m* (m^3)

$fc_{CH4,EG,m}$ = Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in minute *m* (mg/m^3)

Step 2.2: Determine the volumetric flow of the exhaust gas (VEG,m)

It is calculated as follows:

$V_{EG,m} = Q_{EG,m} * M_{RG,m}$

Where:

$V_{EG,m}$ = Volumetric flow of the exhaust gas on a dry basis at reference conditions in minute *m* (m^3)

$Q_{EG,m}$ = Volume of the exhaust gas on a dry basis at reference conditions per kilogram of residual gas on a dry basis at reference conditions in minute *m* (m^3 exhaust gas/kg residual gas)

$M_{RG,m}$ = Mass flow of the residual gas on a dry basis at reference conditions in the minute *m* (kg)

Step 2.3: Determine the mass flow of the residual gas ($M_{RG,m}$)

Project participant selected to calculate $M_{RG,m}$ based on the volumetric flow and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

$M_{RG,m} = \rho_{RG,ref,m} * V_{RG,m}$

Where:

$M_{RG,m}$ = Mass flow of the residual gas on a dry basis at reference conditions in minute m (kg)

$\rho_{RG,ref,m}$ = Density of the residual gas at reference conditions in minute m (kg/m3)

$V_{RG,m}$ = Volumetric flow of the residual gas on a dry basis at reference conditions in the minute m (m3), and

$$\rho_{RG,ref,m} = \frac{P_{ref}}{\frac{R_u}{MM_{RG,m}} \times T_{ref}}$$

Where:

$\rho_{RG,ref,m}$ = Density of the residual gas at reference conditions in minute m (kg/m3)

P_{ref} = Atmospheric pressure at reference conditions (Pa)

R_u = Universal ideal gas constant (Pa.m3/kmol.K)

$MM_{RG,m}$ = Molecular mass of the residual gas in minute m (kg/kmol)

T_{ref} = Temperature at reference conditions (K)

Use the equation below to calculate $MM_{RG,m}$. When applying this equation, the project participant chooses to use the measured volumetric fraction of each component i of the residual gas. The next equation applies, irrespective of which option is selected.

$$MM_{RG,m} = \sum_i (v_{i,RG,m} \times MM_i)$$

Where:

$MM_{RG,m}$ = Molecular mass of the residual gas in minute m (kg/kmol)

MM_i = Molecular mass of residual gas component i (kg/kmol)

$v_{i,RG,m}$ = Volumetric fraction of component i in the residual gas on a dry basis at reference conditions in the hour h.

i = Components of the residual gas (where i = CH4, CO, CO2, O2, H2, H2S, NH3 and N2).

Step 2.4: Determine the volume of the exhaust gas on a dry basis at reference conditions per kilogram of residual gas ($Q_{EG,m}$)

$Q_{EG,m} = Q_{CO2,EG,m} + Q_{O2,EG,m} + Q_{N2,EG,m}$

Where:

$Q_{EG,m}$ = Volume of the exhaust gas on a dry basis per kg of residual gas on a dry basis at reference conditions in the minute m (m3/kg residual gas)

$Q_{CO2,EG,m}$ = Quantity of CO2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m3/kg residual gas)

$Q_{N2,EG,m}$ = Quantity of N2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m3/kg residual gas)

$Q_{O2,EG,m}$ = Quantity of O2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m3/kg residual gas)

With

$$Q_{O2,EG,m} = n_{O2,EG,m} * VM_{ref}$$

Where:

$Q_{O2,EG,m}$ = Quantity of O_2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m^3/kg residual gas)

$n_{O2,EG,m}$ = Quantity of O_2 (moles) in the exhaust gas per kg of residual gas flared on a dry basis at reference conditions in minute m (kmol/kg residual gas)

VM_{ref} = Volume of one mole of any ideal gas at reference temperature and pressure (m^3/kmol)

$$Q_{N2,EG,m} = VM_{ref} \times \left\{ \frac{MF_{N,RG,m}}{2 \times AM_N} + \left(\frac{1 - v_{O2,air}}{v_{O_2,air}} \right) \times \left[F_{O2,RG,m} + n_{O2,EG,m} \right] \right\}$$

Where:

$Q_{N2,EG,m}$ = Quantity of N_2 (volume) in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m^3/kg residual gas)

VM_{ref} = Volume of one mole of any ideal gas at reference temperature and pressure (m^3/kmol)

$MF_{N,RG,m}$ = Mass fraction of nitrogen in the residual gas in the minute m

AM_N = Atomic mass of nitrogen (kg/kmol)

$v_{O2,air}$ = Volumetric fraction of O_2 in air

$F_{O2,RG,m}$ = Stochiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in minute m (kmol/kg residual gas)

$n_{O2,EG,m}$ = Quantity of O_2 (moles) in the exhaust gas per kg of residual gas flared on a dry basis at reference conditions in minute m (kmol/kg residual gas)

$$Q_{CO_2,EG,m} = \frac{MF_{C,RG,m}}{AM_C} \times VM_{ref}$$

Where:

$Q_{CO2,EG,m}$ = Quantity of CO_2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute m (m^3/kg residual gas)

$MF_{C,RG,m}$ = Mass fraction of carbon in the residual gas in the minute m

AM_C = Atomic mass of carbon (kg/kmol)

VM_{ref} = Volume of one mole of any ideal gas at reference temperature and pressure (m^3/kmol)

$$n_{O2,EG,m} = \frac{v_{O_2,EG,m}}{\left(1 - (v_{O_2,EG,m}/v_{O_2,air})\right)} \cdot \left[\frac{MF_{C,RG,m}}{AM_C} + \frac{MF_{N,RG,m}}{2 \times AM_N} + \left(\frac{1 - v_{O_2,air}}{v_{O_2,air}} \right) \times F_{O2,RG,m} \right]$$

Where:

$n_{O2,EG,m}$ = Quantity of O_2 (moles) in the exhaust gas per kg of residual gas flared on a dry basis at reference conditions in minute m (kmol/kg residual gas)

$v_{O2,EG,m}$ = Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute m

$v_{O2,air}$ = Volumetric fraction of O_2 in the air

$M_{FC,RG,m}$ = Mass fraction of carbon in the residual gas in the minute m
AM_C = Atomic mass of carbon *(kg/kmol)*
$MF_{N,RG,m}$ = Mass fraction of nitrogen in the residual gas in the minute m
AM_N = Atomic mass of nitrogen *(kg/kmol)*
$F_{O2,RG,m}$ = Stochiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in minute m *(kmol/kg residual gas)*

$$F_{O2,RG,m} = \frac{MF_{C,RG,m}}{AM_C} + \frac{MF_{H,RG,m}}{4AM_H} - \frac{MF_{O,RG,m}}{2AM_O}$$

Where:

$F_{O2,RG,m}$ = Stochiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in minute m *(kmol/kg residual gas)*
$MF_{C,RG,m}$ = Mass fraction of carbon in the residual gas in the minute m
AM_C = Atomic mass of carbon *(kg/kmol)*
$MF_{O,RG,m}$ = Mass fraction of oxygen in the residual gas in the minute m
AM_O = Atomic mass of oxygen *(kg/kmol)*
$MF_{H,RG,m}$ = Mass fraction of hydrogen in the residual gas in the minute m
AM_H = Atomic mass of hydrogen *(kg/kmol)*

Determine the mass fractions of carbon, hydrogen, oxygen and nitrogen in the residual gas, using the volumetric fraction of component i in the residual gas and applying the equation below. In applying this equation, the project participants have chosen option a*)* "use the measured volumetric fraction of each component *i* of the residual gas", being *i* CH_4, CO, CO_2, O_2, H_2, H_2S, NH_3 and N_2*.*:

$$MF_{j,RG,m} = \frac{\sum_i v_{i,RG,m} \times AM_j \times NA_{j,i}}{MM_{RG,m}}$$

Where:

$MF_{j,RG,m}$ = Mass fraction of element j in the residual gas in the minute m
$v_{i,RG,m}$ = Volumetric fraction of component i in the residual gas on a dry basis in the minute m
AM_j = Atomic mass of element j *(kg/kmol)*
$NA_{j,i}$ = Number of atoms of element j in component i
$MM_{RG,m}$ = Molecular mass of the residual gas in minute m *(kg/kmol)*
j = elements C, O, H and N
i = Component of residual gas *(*where i = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_3 and N_2*)*.

STEP 3: Calculation of project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions for each minute m in year y, based on the methane mass flow in the residual gas ($F_{CH4,RG,m}$) and the flare efficiency ($\eta_{flare,m}$), as follows:

$$PE_{flare,y} = GWP_{CH4} \times \sum_{m=1}^{525600} F_{CH4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

$PE_{flare,y}$ = Project emissions from flaring of the residual gas in year y (tCO_2e)

GWP_{CH4} = Global warming potential of methane valid for the commitment period (tCO_2e/tCH_4)

$F_{CH4,RG,m}$ = Mass flow of methane in the residual gas in the minute m (kg)

$\eta_{flare,m}$ = Flare efficiency in minute m

Hence in this step the next parameters will need to be monitored:

- At the residual gas: $P_{m,\ flame}$; $T_{m,\ flame}$; $V_{RG,m,flame}$; $v_{i,RG,m,flame}$, with m = minute and i=CH_4, CO, CO_2, O_2, H_2, H_2S, NH_3, N_2.
- At the exhaust gas: $fc_{CH4,EG,m}$; $V_{O2,EG,m}$; $T_{EG,m}$, with m = minute.
- At the flare: $Op_{j,h}$; $Flame_m$

Step A.1.1: Ex ante estimation of $F_{CH4,PJ,y}$

An ex ante estimate of $F_{CH4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS (according to equation ACM0001 (2)) in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} / GWP_{CH4}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year y (tCH_4/yr)

$BE_{CH4,SWDS,y}$ = Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y ($t\ CO_2e/yr$)

η_{PJ} = Efficiency of the LFG capture system that will be installed in the project activity

GWP_{CH4} = Global warming potential of CH_4 *(*t CO_2e/t CH_4*)*

An efficiency of 50% as efficiency of the degassing system which will be installed in the project activity *(*η_{PJ}*)* has been taken as default value for this project activity which is considered suitable by AENOR team

No historical records of waste disposal rates exist at Zone 3 landfill, although landfill is receiving wastes since 1966. Hence, waste input data has been provided by a third party study carried out by SCS Engineers Inc. *(*SCS*)* under contract to USAID and the US Environmental Protection Agency Landfill Methane Outreach Program in 2005, which has been based on Parsons Report from 1999 for being considered the best source of information until this date. Based on SCS engineers' study, the project participant considers that waste deposited before 1985 is now too old to be generating significant quantities of methane and therefore this wastes are not included in the gas models. Also, SCS engineers study provides an estimation of amount of SWDS until 2018. From 2019, data have been estimated by project participant by increasing the total amount of SWDS in a 3.35% annually, according to Parson Report forecast gathered in SCS engineers' study.

The landfill waste disposal history, along with the waste composition data were requested during the validation process. The project proponent who is the current operator of the landfill provided data of waste disposal gathered from the provided report of Zona 3 landfill by SCS Engineers which also details the waste composition. Thus, data used in final ER calculation are consistent with the credible data sources provided by the PP, then accepted by AENOR. Thus, the amount of methane that would have been destroyed/combusted during the year, in tonnes of methane in project scenario, is estimated ex-ante by using the tool "Emissions from solid waste disposal sites" and a multi-phased first order methane emissions model as follows:

$BE_{CH4,SWDS,y}$ is determined taken into account the following when applying the tool:

- fy in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology;
- In the tool, x begins with the year that the SWDS started receiving wastes *(*e.g. the first year of SWDS operation, that means for Zona 3 landfill project 1985*)*; and
- Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies *(*SGS engineers' study from 2005*)*.

The amount of methane generated by the site annually *(*yearly model is chosen*)* is calculated as follows:

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot (1-e^{-k_j}) \cdot e^{-k_j \cdot (y-x)}$$

Where:

$BE_{CH4,SWDS,y}$ = Baseline, project or leakage methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y *(*tCO2e/yr*)*

φ = Model correction factor to account for model uncertainties for year y *(*0.75*)*

f = Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y *(*0*)*

GWP_{CH4} = Global Warming Potential of methane *(*21*)*

OX = Oxidation factor *(*reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste*) (*0.1*)*

F = Fraction of methane in the SWDS gas *(*volume fraction*) (*0.5*)*

DOC_f = Fraction of degradable organic carbon *(*DOC*)* that can decomposes under the specific conditions occurring in the SWDS for year y *(*weight fraction*) (*0.5*)*

MCF = Methane correction factor for year y *(*1*)*

$W_{j,x}$ = Amount of solid waste type j disposed or prevented from disposal in the SWDS in year x *(*see data provided in Table 2 Appendix 4 of PDD*)*.

DOC_j = Fraction of degradable organic carbon in the waste type j *(*weight fraction*) (*Default values from tool, see data provided in Table 5*)*

k_j = Decay rate for the waste type j *(*1/yr*)*

x = Years in the time period in which waste is disposed at the SWD, extending from the first year in the time period *(*x = 1*)* to the year y *(*x = y*)*.

y = Year of the crediting period for which methane emissions are calculated *(*y is a consecutive period of 12 months*)*.

For application A as defined in tool "Emissions from solid waste disposal site", as it is Zona 3 case, this time period may begin before the start of the project activity and typically starts when the SWDS starts receiving waste. In this case the time period starts in 1985.

Under the tool "*Emissions from solid waste disposal sites*" version 6.0.1, application A is chosen as "*The CDM project activity mitigates methane emissions from a specific existing SWDS*". So, the amount of wastes is based on information from the SWDS, collected by SCS engineers' study from 2005. The model correction factor *(φ_y)* is determined based on default value *(*option 1*)*, for Application A, 0.75.

The following parameters were validated during the site visit: "The value for the Oxidation factor" *(*reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste*)* was initially chosen as 0, but changed to 0.1 after site visit because the landfill is covered with soil cover. The methane correction factor *(*MCF*)* was chosen to be 1, due to the fact

that Zona 3 Landfill is a managed disposal site with controlled placement of waste, cover material, as AENOR could validate during the visit. The values of DOCj and Kj were corrected in section B.6.2 and annex 4 of the PDD and in calculation, based on evidence provided such as the SGS engineers' study and source for climatic information which served for clarifying the information in local climate and Kj values applied in the model.
AENOR has checked that calculation of the $BE_{CH4,SWDS,y}$ was correct in the PDD and the ER spreadsheets.

Step A.2: Determination of $F_{CH4,BL,y}$

This step provides a procedure to determine the amount of methane that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, or to address safety and odour concerns (collectively referred to as requirement in this step). In Zone 3 Landfill the LFG is not captured but released to the atmosphere as no regulation related to this matter are applicable in Guatemala and there are no safety and odour contractual requirements between the project developer and the municipality. This information was confirmed by the validation team during the onsite visit to the landfill and the interviews maintained with local authorities. Therefore, "Case 1: No requirements to destroy methane exists and no existing LGF capture system" applies. In this situation:
FCH4,BL,y = 0
Where:
FCH4,BL, y = Amount of methane in the LFG that would be flared in the baseline in year y (tCH4/yr)

Step B: Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) is calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".
When applying the tool:

- The electricity sources k in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and
- $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year y ($EG_{PJ,y}$).

In the absence of the project activity, this electricity would have been produced by power plants connected to the grid. Hence, scenario A described in the Tool applies for the calculation in the following equation:

$$BE_{EC,y} = \sum_{k} EC_{BL,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$

Where

$BE_{EC,y}$	Baseline emissions from electricity generated in year y *(*tCO_2/yr*)*
$EC_{BL,k,y}$	Quantity of electricity generated in year y using LFG *(*MWh/yr*)*
$EF_{EL,k,y}$	Emission factor for electricity generation for source *k* in year *y (*tCO_2/MWh*)*
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source *k* in year *y*
k	Sources of electricity generated in the baseline

Data sources and assumptions for the estimation of the $EC_{BL,k,y}$ have been correctly quoted in the PDD and evidence provided supporting data. The power plant efficiency *(*42%*)* and the nominal capacity of 1.2 MW considered in calculations are taken from the power manufacturer technical specifications .

Operation hours of the engines *(*8000 h*)* have been estimated by the operator. AENOR has cross-checked that other similar landfill gas project registered such as reference numbers 2271 and 1920 used the same estimation of operation hours, thus, it is accepted as credible. Moreover, the net generation provided to the grid is calculated discounting the electricity installation self-consumption. The methane NCV used is 0.0504 TJ/t as per ACM0001.

Following the option A1 of the scenario A, the $EF_{EL,k,y}$ will be determined by following the "Tool to calculate the emission factor for an electricity system" and $EF_{EL,k,y}$ = $EF_{grid,CM,y}$. This calculation is presented in appendix 4 of PDD and results in a value of 0.602 tCO2/MWh, which will be a fixed value during the first crediting period.

Also, the default value of 13.55% will be used for TDLk,y, according to host country specific data Source: http://www.nationsencyclopedia.com/WorldStats/WDI-electric-power-transmission-output.html

The grid emission factor has been finally calculated as per the tool "Tool to calculate the emission factor for an electricity system" version 03.0.0, following the 6 steps defined in the tool. Calculations were provided to AENOR and included in Appendix 4 of the PDD. It was confirmed that data used in those calculations from 2004 to 2006 were the most updated data at the time of submission of the PDD to the DOE for validation in May 2008 *(*that was confirmed by AENOR by mean of a communication with the AMM *(*Guatemalan National Electric Grid Operator*)* and checking the AMM website. Hence, they are from an official source, then, AENOR deems as credible and reliable. AENOR has reproduced the calculation to obtain the same results that those appearing in the PDD.

As it is explained above, the emission factor has been calculated following the 6 steps of the tool. Both, the Operating margin and Build Margin have been calculated ex-ante. For calculating the Operating Margin, the simple OM has been used as low cost/must run for the five most recent years considered *(*2002-2006*)* constitute less than 50% *(*49.05%*)*. The Simple OM Emission Factor is calculated as the generation-weighted average emissions per electricity unit of all generating sources serving the system, not including low-cost and must-run power plants. It has been calculated following the "Option A" mentioned in the Step 4 of the tool. This option is based on the total net electricity generation and the CO2 emission factor for each power unit. Option A is used because no fuel consumption data are available in Guatemalan AMM. The emission factor of each power plant is determined per option A2, since no fuel consumption data were available in AMM sources.

Calculating the average operating margin emission factor of the years 2004, 2005 and 2006, and weighting these three emission factors by the non low-cot/must-run plants generation plus the imports, an operating margin emission factor of 773.93 tCO2/GWh is obtained.

For calculating the Build Margin emission factor, in terms of vintage of data, option 1 has been followed and the sample group of power units "m" is determined as per the version 03.0.0 of the tool. For Guatemala, the $SET_{\geq 20\%}$ has been selected as it comprises a larger annual generation than the set of five power plants that have been built most recently. Then, SET_{sample} corresponds to $SET_{\geq 20\%}$. As none of the plants started supplying electricity to the grid more than 10 years ago, the sample group of power units m used to calculate the Build Margin is the resulting set: $SET_{\geq 20\%}$. Then, as per the tool the SET_{sample} is used for calculating the build margin. The CO2 emission factor of each power unit is determined using the option A2. The Build Margin emission factor obtained is 0.43024 t CO2/MWh.

Finally, the combined margin is determined as per option a*)*, i.e, weighted average*:* CM=0.5*OM+0.5*BM, resulting the following*:*

CM=0.5*0.77393 t CO2/MWh +0.5*0.43024 t CO2/MWh =**0.602 t CO2/MWh**.

Formulae and factors used to calculate the Operating Margin and the Build Margin are properly described in the final PDD and they are considered correct and transparent. Efficiency factors for plants and self-use rates are obtained in a conservative way.

AENOR has reproduced the calculation to obtain same results. Formulae are well used and data from official sources *(*AMM*)* and IPCC are correct. Then, AENOR deems the $EF_{EL,k,y} = EF_{grid,CM,y}$ =0.602 t CO2/MWh to be correct.

Step C: Baseline emissions associated with heat generation (BEHG,y)

Step not taken since it will not be covered any heat generation in this project activity.

Step D: Baseline emissions associated with natural gas use (BENG,y)

Step not taken since it will not be covered any natural gas use from LFG in this project activity.

Project emissions

According to the methodology ACM0001, project emissions are calculated as follows*:*

$PE_y = PE_{EC,y} + PE_{FC,y}$

Where*:*

PEy = Project emissions in year y *(*tCO2/yr*)*

$PE_{EC,y}$ = Emissions from consumption of electricity due to project activity in year y *(*tCO2/yr*)*

$PE_{FC,y}$ = Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y *(*t CO2/yr*)*. As no fossil fuels will be used due to the implementation of the project activity, this value is zero *(*0*)*.

Hence, $PEy = PE_{EC,y}$

The project emissions from consumption of electricity by the project activity ($PE_{EC,y}$) is calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

When applying the tool:

• $EC_{PJ,k,y}$ in the tool is equivalent to the amount of electricity consumed by the project activity in year y ($EC_{PJ,y}$); and

• If in the baseline a proportion of LFG is destroyed (FCH4,BL,y> 0), then the electricity consumption in the tool (ECP),j,y) should refer to the net quantity of electricity consumption (i.e. the increase due to the project activity).

The determination of the amount of electricity consumed in the baseline is transparently documented in the CDM-PDD. Project emissions are released as per the electricity consumed by the flares from the grid when the power plant will not be providing electricity. as a conservative assumption since all 4 engines are not expected to be simultaneously unavailable, it it assumed that during 760 h/yr, the extracted methane will not be used for electricity generation and will be automatically destroyed by flaring (that means the difference between the 8000 working hours/year of the power engines and the 8760 working hours/year of the flares) . Hence, during this period, landfill will have to consume electricity from the grid, instead of self-consuming the one generated by the engines. Calculations are well detailed on Appendix 4 of the PDD. The flaring system consumption from the grid is 114 MWh/yr. The PDD clearly documents how each equation is applied and the actual calculations are clearly presented in the CER Spreadsheet. AENOR has reproduced the calculation to obtain same results.

When applying the tool:

$$PE_{EC,y} = \sum_{k} EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$$

Where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y(MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y
	Sources of electricity consumption in the project
j	

For ex-post project emissions, $EC_{PJ,j,y}$ will be monitored.

The "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" provides 3 scenarios for different sources of electricity consumption. Since the electricity generated through the proposed project is consumed from grid, scenario A is applicable. Following the option A1 of the scenario A, the $EF_{EL,j,y}$ will be determined by following the "Tool to calculate the emission factor for an electricity system" and $EF_{EL,j,y} = EF_{grid,CM,y.}$ This calculation is presented in appendix 4 of the PDD and results in a grid emission factor of 0.602 tCO2/MWh, which will be a fixed value during the first crediting period.

Also, for ex ante calculations purpose the default value of 13.55% is used as for baseline emissions calculations.

Leakage

No leakage effects are accounted for under this methodology.

Emission reductions

Emission reductions are calculated as follows:

ERy = BEy –PEy

Where:

ERy = Emission reductions in year y (tCO2e/yr)

BEy = Baseline emissions in year y (tCO2e/yr)

PEy = Project emissions in year y (tCO2/yr)

As the energy component is intended to be implemented since the first year of the project activity, then the energy component is not excluded from the ex-ante estimation of baseline emissions or the determination of the baseline or demonstration of additionality.

AENOR has checked that assumptions in the PDD and calculations are consistent with data sources and they are deemed reasonable and credible.

Projections were found to be in line with the time schedule for the project's implementation provided and the indicated renewable crediting period of 7 years. The table required for the indication of projected emission reductions (Section B.6.4) has been correctly applied. It lists emission reductions starting on 1 March 2013 till 28 February 2020, which is in line with the crediting period stated in Section C.2.2.2 of the PDD as 7 years renewable, and reflects the values presented in section of ex-ante calculation of emission reductions.

AENOR confirms that all assumptions and data used by the PP are listed in the final PDD, including their references and sources. Furthermore, all documentation used by the project participant as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD, they are correct and appropriate and all values used in the PDD are considered reasonable in the context of the proposed CDM project activity that result in a conservative estimate of emission reductions.

Hence, the annual average emission reductions from the project are estimated to be 141,597 tCO2e over a 7-years renewable crediting period which represents an estimation lower than 159,080 t CO2 considered in the PDD to GSC, but accepted by AENOR because the final estimation is consistent with the credible and feasible data sources provided and checked, and calculations have been carried out to be in compliance with the applicable methodology and tools.

The baseline methodology ACM0001 and the tools have been applied correctly to calculate project emissions, baseline emissions, leakages and emission reductions. All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.

3.6 Additionality

3.6.1 Starting date of the project activity and prior consideration of the CDM

The starting date in the final PDD is 1 June 2011 which replaces to the initial one (1 September 2008) considered in the PDD submitted to GSC

The PP was requested to provide the main milestones of the project and their evidence in order to confirm whether the start date of the project was defined according to the current definition of the "Starting date" as stated in the "Glossary of the CDM terms" v.7 and how the prior consideration of the CDM was considered according to the "Guidelines on the demonstration and assessment of prior consideration of the CDM" v.4.

As a result, the PP has provided suitable evidence in order to assess whether the starting date of the project is appropriate according to the Glossary of CDM terms, as well as a timeline of the project in order to assess whether the selected date is the earliest date at which either implementation or construction or real action of the project begins. See table below.

Date	Date
Pump-test	25/10/2005
SCS engineers "Report of the pump test and pre-feasibility study for landfill gas recovery and utilization at the el Trébol landfill, Guatemala". El trebol is Zone 3.	December 2005
Start of stakeholders consultation process	08/12/2006
EIA approval	10/10/2007
Time of investment decision: Agreement for LFG extraction	21/12/2007
PDD public information in UNFCCC web	15/05/2008
Creation of Industrias del Biogás S.A Society (INBIO)	26/08/2009
Withdrawal of Guatecarb as PP, communication to the Guatemalan DNA	7/05/2010
Purchase of INBIO by BBE (Borealia Biogas Energy)	04/10/2010
Contract between EBB/Inbio with consultant company for carrying out PDD revision and updating	26/11/2010
Contract BBE/Inbio with DOE for PDD validation	13/01/2011
Starting date: date when the contract of engineering works was signed	01/06/2011
Obtention of the environmental license	16/08/2011

According to the schedule provided, also included in the PDD, the earliest date at which the real implementation of the project activity begins, takes place on 1 June 2011. This date represents the signature of the engineering works. No other contracts or purchases committing expenditures have been occurred before that date. As this milestone represents the earliest date which involves the first expenditure commitments for the implementation of the project, AENOR validation team deems appropriate and credible the starting date defined. Hence, it is accepted by AENOR.

This date replaced the initial one considered in the PDD to GSC (1 September 2008) since as per PP´s explanations that date was not fixed based on the Glossary of the CDM terms. No implementation or construction or real action of the project begun at that moment. In fact, in the PDD for GSC, that date also matches with the start date of the crediting period.

It is important to highlight that gap of time between the investment decision date and start date of the project has been mainly caused due to resignation of initial PPs, including Guatecarb S.A, the initial PP of the host country in the PDD submitted to GSC.

Regarding the prior consideration of the CDM and taking into account the "guidelines on the demonstration and assessment of prior consideration of the CDM" v.4, as the project starting date is after 02 August 2008 and, the PDD was submitted for global stakeholder consultation on 15 May 2008, id est, before the starting date, then, this action prove that the CDM was seriously considered

in the decision to implement the project activity. This date of 15 May 2008 is even before the initial start date of the project in the first PDD.

On the other hand, the starting date of the crediting period has been updated to be 1 March 2013 or registration date, whichever is later, taking into account the schedule of the project and to be in compliance with the CDM requirements.

3.6.2 Analysis of the additionality

The additionality of the proposed project activity as required by ACM0001 version 13.0.0 is demonstrated by applying the "Combined tool to identify the baseline scenario and demonstrate additionality" v 5.0.0.

During the validation process inputs, evidences, data sources and calculations were requested and provided to AENOR. Based on checks carried out by AENOR, the new assumptions are explained in the subsequent paragraphs.

The different steps of the combined tool have been applied as follows:

Step 0: Demonstration whether the proposed project activity is the First-of-its-kind

The proposed porject activity is a "First-of-its-kind". There are no similar projects in Guatemala according to the letter from the Guatemalan DNA provided to the validation team which certifies it.

There is only one more similar project to the proposed project activity (AMSA landfill gas project) but under CDM scheme at validation stage, being AENOR the DOE, as well.

Despite, the additionality will not be demonstrated by this way as a renewable crediting period has been selected, instead of a maximum 10 years crediting period.

Step 1: Identification of alternative scenarios

Using the "Combined tool to identify the baseline scenario and demonstrate additionality" version 05.0.0 and the requirements of the ACM0001 version 13.0.0, the alternative scenarios that are available to the project participant, that cannot be implemented in parallel to the proposed project activity and that provide the same outputs as the proposed project activity, include:

LFG1: The project activity implemented without being registered as a CDM project activity.

Alternative LFG1 for itself implies investments in equipment and operation for a LFG capture and flaring system. However, LFG1 is a possible alternative to the project activity when it is combined with alternative E1 (electricity generation using the LFG; which is further discussed). This alternative will be valid for the project activity and shall be developed in the following steps.

LFG2: Atmospheric release of the LFG.

The atmospheric release of the LFG is considered to be an alternative as it matches with baseline and current scenario. As no regulations force LFG collection and flaring in landfills in the country, no partial capture and destruction of LFG would be carried out.

LFG3: LFG is partially not generated because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS.

LFG4: LFG is partially not generated because part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS; and

LFG5: LFG is partially not generated because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.

Those alternatives which consist on not disposing in the SWDS part of the organic waste for being recycled, composted or incinerated are not considered a plausible alternative to the project activity as it is not the main object of the Zone 3 landfill and the waste management system in Guatemala is not so developed.

In addition to the alternatives identified for the destruction of LFG, alternative scenarios for the use of LFG, particularly for the electricity generation, are:

E1: Electricity generation from LFG, undertaken without being registered as CDM project activity.

This is a credible alternative for Zone 3, which will be in line and combined with option LFG1, as the production and sale of electricity from landfill gas generates incomes which could pay for the investments for the landfill gas capture system. Option LFG1 on its own is not a credible alternative as it does involve investments in equipment and operation without any financial return. The financial viability of alternative LFG1+E1 will be assessed in the investment analysis below.

E2: Electricity generation in existing or new renewable or fossil fuel based captive power plant(s).

In the absence of the project activity where LFG is entirely released to the atmosphere, the equivalent electricity would not be generated by captive power plants. Thus this alternative will not be considered.

E3: Electricity generation in existing and/or new grid-connected power plants.

In the absence of the project activity where LFG is entirely released to the atmosphere, the equivalent electricity would be generated by the power plants connected to the Guatemalan national grid.

The project does not include thermal energy generation or supply of LFG to a natural gas distribution network, the project activity only proposes to generate electricity with LFG.

Thus, the alternative scenarios to the proposed project activity are a combination of capture of LFG being used for electricity generation purposes (LFG1 + E1), alternative I, equivalent to the proposed project undertaken without being registered as a CDM project activity and the atmospheric release of the landfill gas and electricity generation in existing and/or new grid-connected power plants (LFG2+E3), alternative II, equivalent to current practice and to baseline scenario.

Step 1b: Consistency with mandatory applicable laws and regulations

There are no mandatory laws or regulations requiring the control or landfill gas (methane) emissions based either on GHG mitigation or odour control or other health and safety concerns. There are no precedents or common practice set by other landfill sites within Guatemala. Since the landfill was opened there have been no attempts or projects to control the emission of methane from the site and there have been no legal actions taken to enforce methane recovery.

As there are no laws requiring the capture of methane from landfill, or the generation of energy through the use of methane captured from landfill, both identified alternative scenarios I and II are consistent with mandatory laws and regulations. Therefore both scenarios are credible and realistic alternatives to the project.

Step 2: Barrier analysis

No barriers that would prevent the implementation of the alternative scenarios have been identified. The barrier analysis has not been carried out.

Step 3: Investment analysis

According to the "Combined tool to identify the baseline scenario and demonstrate additionality" version 05.0.0, in case of alternative scenarios that not involves any investment costs, operational costs or revenues (case of alternative scenario II corresponding to LFG2+E3): "either NPV or IRR must be used as financial indicator in the analysis, if the financial indicator is the NPV: assume a value of NPV equal to zero, if the financial indicator is the IRR: use as the IRR the financial benchmark".

In this case, equity IRR is chosen as financial indicator for the project activity. Hence, equity IRR for alternative scenario II (LFG2+E3) is considered to be equal to the financial benchmark that is defined below.

Taking into account the combined tool and guidelines on investment analysis, an equity IRR benchmark analysis has been used to demonstrate the additionality of the Project activity.

It has been demonstrated that the project equity IRR post-tax without CDM revenues is estimated to be -1.76%, which is lower than the IRR benchmark of 12.5% adopted by the Project Participant, while with the CDM revenues it will be of 39.11%, surpassing the financial indicator chosen.

As per the combined tool a relevant benchmark for a project's equity IRR can be derived from Government bond rates, increased by a suitable equity risk premium to determine the final return on the equity investment.

Values in the appendix of the guidelines on the investment analysis were not available at the investment decision date in December 2007, hence, the PP has provided the calculation of benchmark available at the investment decision date. This is based on the Guatemalan Government 10 year's bond: 9.8% plus an equity risk premium of 6.445%, resulting in a final value of 16.2%.

The rate of 9.8% corresponds to the Guatemalan Government Bonds for a 10 years published by the International Monetary Fund Working Paper-Public Debt Markets in Central America, Panama and the Dominican Republic in 2007. The Equity risk premium of 6.445% is provided by Bloomberg Finance L.D at the investment decision date.

Both values have been checked by AENOR validation team against the sources and the suitability for this project can be confirmed due to data obtained from Bloomberg Finance L.P and the International Monetary Fund and provided to AENOR. Hence, it can be confirmed that the benchmark determined at the investment decision date is correct and suitable for the project activity in compliance with paragraph 12, Annex 5 of the EB62 report and paragraph 114 (b) of the VVM version 1.2.

The benchmark of 16.2% in the final PDD is slightly higher than benchmark gathered in the PDD to GSC (15.8%) as the equity risk premium considered in the first PDD was 6% instead of 6.445%. However, the final benchmark calculated of 16.2% is accepted by AENOR since values provided to calculate it are consistent with sources, meanwhile the value initially considered of 6% was not supported by any evidence.

As the benchmark determined at the decision making (16.2%) is quite higher than the value provided in the appendix of the guidelines on assessment on investment analysis from EB 62, Annex 5 (12.5%), for sake of conservativeness in additionality context, the value of 12.5% is used, then it is accepted by AENOR. This benchmark is an equity post tax, in real terms, then, it is an appropriate benchmark for the equity project IRR calculated post tax and without inflation.

The validation team verified that taxes and depreciation used in the investment analysis comply with the Guatemalan legal requirements i.e. 31% value of the income tax and depreciation periods of 10 years according to the Guatemalan law order in council 26.92, "Ley sobre el impuesto de la renta", articles 72 and 19g, respectively which were checked by AENOR to confirm that assumptions chosen are correct.

A tax´s holiday of 10 years is applied to be in compliance with applicable laws in Guatemala as AENOR checked.

Following Annex 5 of EB62 "Guidelines on the Assessment of Investment Analysis", it has been validated that the project equity IRR calculation reflects the expected operation of the underlying project activity (an operational lifetime of 14 years). This operational lifetime of the project is determined by the contract signed with landowners of the landfill. As depreciation of equipment is 10 years, then, for the operational lifetime of the project this equipment are fully depreciated, then, the fair value at the end of the assessment period is zero.

The capital cost of the assets and their depreciation as an expense to the project were not treated both to constitute a double counting of this cost and the cost of financing expenditures (i.e. loan repayments and interest) was included in the calculation of project equity IRR as a cost in the PDD and the IRR calculation spreadsheet [50]. Moreover, in the calculation of equity IRR only the portion of investment costs which is financed by equity is considered as the net cash outflow, thus, the portion of the investment costs which is financed by debt was not treated to constitute a double counting of this cost.

A structure 50%/50% for Debt/Equity has been applied in the financial model. This is the default value given by the guidelines on assessment on investment analysis when information is not available for the sector in the country. Then, it is accepted by AENOR. The debt amortization is 10 years. AENOR has checked that this period is reasonable for this kind of projects based on the SCS pre-feasibility study of the project and the SCS feasibility study of other landfills such as South Wake landfill. The interest rate applied in the financial model is 12.82%. AENOR checked that value is consistent with the official source, Bank of Guatemala and applicable at the investment decision time as it is the average from January to November 2007. Then, it is accepted.

AENOR has verified and confirmed that the values used in the financial analysis are consistent with the value of the sources and that this information was available before the starting date of the Project and at the date the investment decision making. References are included in the PDD and IRR calculation spreadsheet.

Finally the data, rationales, assumptions, justifications and documentation provided have been checked using local knowledge and sectoral and financial expertise. Data used in the financial model have been cross-checked with evidence provided and detailed in the PDD which show the costs of the active gas collection and extraction system, flaring equipment, electricity system, and OM costs.

Based on this validation steps we can confirm that the documentation assessed is appropriate for this project.

The financial worksheets have been evidenced and verified to be correct. The assumptions used, the base documents and the financial calculations have also been verified.

In addition, during the assessment of this project, the reasonableness of the parameters used in the project equity IRR calculation were analyzed by comparison with similar projects signed as CDM project in the same area and public available data, as follows:

Power tariff

The tariff for the proposed project activity (89.6 USD/MWh) has been defined considering the average monthly tariff in the spot market for the whole year 2007. Tariff is provided by the official

source "Administrador del Mercado Mayorista" (AMM, Wholesale Market Administrator) since a power purchase agreement was not signed.

AENOR has checked the source and considers that value provided in the financial model is consistent. Based on data provided from AMM and checked by AENOR and taking into account the exchange rate applicable the tariff applied is 89.6 USD/MWh.

AENOR checked that AMM tariff applied in the calculations corresponds to the 2007 average monthly tariff, then, considering the month of December. This is conservative in additionality context as AENOR checked, since the chosen tariff of 89.6 USD/MWh is higher than average monthly tariff from January to November (87.64 USD/MWh), but also, value applied in the financial model is higher than the average monthly tariff in the spot market for the two years 2006 and 2007 (83.3 USD/MWh) and higher than average monthly tariff in 2006 (77 USD/MWh).

Moreover, AENOR has cross-checked the official information from CNEE (Electric Energy National Commission) for the last tender from the Guatemalan government for renewable energy generation, PEG-1-2010. The opening of financial bids of the bidders took place in February 2012. The average electricity price offered was 79.44 USD/MWh, being the lowest tariff 20.13 USD/MWh and the highest one 99 USD/MWh. Thus, tariff applied is well higher than average in this last tender and it is within the range of offers.

In addition, according to the report "Guatemalan Market Analysis renewable energy" 2009 under ARECA project by the Central American Bank for Economic Integration (BCIE), United Nations Program for Development (UNDP), Global Environment Facility (GEF) the average price paid to renewable generators during the period 1995-2007 has ranged historically between US$ 60 to 90/MWh. Thus, the applied tariff in the proposed project is in line with information in this report.

Electricity price corresponds to the fixed price that will be paid for each MWh delivered to the grid. Price for electricity generation is the only party included in the income cash flow (without CER revenues), as there will be no additional incomes related to energy sale or capacity guarantee. Thus, tariff due to capacity is ruled out as there is no guarantee that capacity will be and how long it can be maintained.

On the other hand, AENOR has checked the revenue per MWh generated of other renewable projects generation electricity sold to the grid in Guatemala.

Project	Capacity (MW)	US$/MWh
Project 172: Matanzas Hydroelectric Plant	11.70	Not available
Project 174: San Isidro Hydroelectric Plant	3.92	Not available
Project 604: Candelaria Hydroelectric Project	4.30	53.30
Project 606: El Canadá Hydroelectric Project	43.0	Not available
Project 5942: Palo Viejo Hydroelectric Project	88.3	102.12

Project	Capacity (MW)	US$/MWh
Montecristo Hydroelectric Project (at validation stage by AENOR)	13.07	58.91
Zone 3 landfill	4.8	**89.6**

Considering that data used for selected tariff is from an official source, that value used in the financial model is consistent with the sources, it is in the range of tariffs gathered in the Expansion Plan of CNEE 2008-2022 checked by AENOR and higher than average electricity price offered in the last tender, and it is in line with other renewable projects in Guatemala, AENOR considers that the value for the tariff used for the equity IRR calculation as has been done in the PDD in a transparent manner, it is credible and reasonable and it was valid and applicable at the time of the investment decision.

Operating hours and collection efficiency

The generation equipment capacity factor of 91% (8000h/8760h=91.3%) and the collection system efficiency of 50% were found to be in line with other similar projects in the region, mainly, with similar projects in Guatemala. Hence, it is accepted by AENOR validation team. The value of 50% is the default value given by the applicable methodology ACM0001 version 13, since a specific value is not available, whereas the operating hours of engines is determined in the Pro2 manufacturer´s specifications.

Comparison of the annual running hours and collection efficiency among similar registered CDM projects in the region.

Project	Operating hours	Load Factor (%)	Collection Efficiency (%)
Project 1240 : Hasars Landfill Gas Project (Mexico)	7,972	95	65
Project 1242 : Tultitlan- EcoMethane Landfill Gas to Energy Project (Mexico)	7,972	91	50
Project 1307 : Durango – EcoMethane Landfill Gas to Energy Project (Mexico)	7,446	91	65
Project 1920 : Verde Valle Landfill Gas Project (Mexico)	7,972	91	60
Project 2186 : Monterrey II LFG to Energy Project (Mexico)	8,147	85	70

Project	Operating hours	Load Factor *(%)*	Collection Efficiency *(%)*
Project 2271 : Tecamac – EcoMethane Landfill Gas to Energy Project *(*Mexico*)*	8,000	91	85
Project 3074 : Coyula Landfill Gas Project *(*Mexico*)*	6,964	93	65
Project 3127 : Culiacan Northern Landfill Gas Project *(*Mexico*)*	6,964	91	45
Project 3378: Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León *(*Mexico*)*	8,322	79	65
Project 3877 : Relleno Norte Landfill Gas Project *(*Mexico*)*	7,972	79	75
Project 6771: Garcia Landfill Gas Project *(*Mexico*)*	8,000	91	65
AMSA landfill gas project in Guatemala at validation stage	7,446	85%	60
Project 0037 : Rio Azul landfill gas and utilization project in Costa Rica	Not available	Not available	50
Project 4682 : Los Mangos landfill gas capture and flaring project in Costa Rica	No energy	No energy	72.6
Zone 3 landfill gas project	**8,000**	**91%**	**50**

Source: CDM web site.

Investment cost of the LFG power plant

The total investment costs has been quoted by third party entities, Tracsa Energía S.A de C.V and Pro2 Anlagentechnik GMBH which provided quotations in June 2007 of US$ 2,623,000, corresponding to the electricity system and US$ 3,652,940 for four power engines, respectively. The PP has provided evidence of these investment costs and AENOR's validation team has checked that the total figure matches with the amount stated in the financial model and data were available at the investment decision date.

The comparison results confirm that the investment of 1,307,487 US$/MW stated in the PDD is within the range of the investment per MW for the registered CDM projects in the region. See Table below.

Comparison of investment per MW among similar registered CDM projects.

Project	Nominal Capacity MW	Investment Electrical Plant US$	Investment/MW US$
Project 1240 : Hasars Landfill Gas Project	4.00	7,000,000	1,750,000
Project 1242 : Tultitlan- EcoMethane Landfill Gas to Energy Project	1.30	1,251,050	962,346
Project 1307 : Durango – EcoMethane Landfill Gas to Energy Project	2.00	2,693,100	1,346,550
Project 1920 : Verde Valle Landfill Gas Project	5.00	9,499,440	1,899,888
Project 2186 : Monterrey II LFG to Energy Project	5.30	6,550,000	1,235,849
Project 2271 : Tecamac – EcoMethane Landfill Gas to Energy Project	1.95	1,652,977	847,680
Project 3074 : Coyula Landfill Gas Project	1.00	1,873,500	1,873,500
Project 3127 : Culiacan Northern Landfill Gas Project	1.00	1,500,000	1,500,000
Project 3378 : Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León	5.60	11,610,267	2,073,262
Project 3877 : Relleno Norte Landfill Gas Project	1.60	1,411,455	882,159
Project 6771: Garcia Landfill Gas Project	3.20	6,150,000	1,921,875
AMSA landfill gas project in Guatemala at validation stage	1 MW	1,120,000	1,120,000
Project 6786: Intermunicipal Matamoros-Torreon Landfill Gas Project	3.20	6,000,000	1,875,000
Zone 3 landfill gas project	**4.8**	**6,275,940**	**1,307,487**

Source: CDM web site

According to above project discussion and since the value used in the financial analysis is consistent with the value of the source, and it is in the range of values for similar projects in the region, in AENOR´s opinion the total LFG power plant investment used in the PDD was reasonable, valid and applicable at the time of the investment decision.

Investment cost of the Collection System and Flare Station

The investment cost of the Collection System and Flare Station was determined based on the quotations provided by Pro2 Anlagentechnik GMBH for the flare station of USD 873,494 and quotations by Consultoria y Constructora del Kyrios of USD 70,462 in February 2007; by Toppro (Professional Topography) of USD 7,985 in July 2006; by RODIO Swissboring of USD 250,541 in February 2007 and Representaciones Plasticas Industriales S.A de C.V (REPSA) of USD 440,852, in September 2007, accounting a total of 769,840 USD corresponding to the LFG collection and extraction system. The PP has provided evidence of these investment costs and AENOR's validation team has checked that the total figure matches with the amount stated in the financial model and data were available at the investment decision date.

In addition to verify if the report and data considered were appropriate for the project activity, the reasonableness of the applied investment costs of 86,491 US$/Ha were found to be within the range of similar registered CDM projects in the region, especially in Guatemala, thus, it is accepted by the validation team of AENOR.

Comparison of LFG collection and flaring system investment per hectare among registered CDM projects in the region

Project	Ha	Investment LFG US$	Investment/Ha US$
Project 1240 : Hasars Landfill Gas Project	70.00	3,324,125	47,488
Project 1920 : Verde Valle Landfill Gas Project	50.00	2,812,400	56,248
Project 2271 : Tecamac – EcoMethane Landfill Gas to Energy Project	20.74	1,558,242	75,130
Project 3074 : Coyula Landfill Gas Project	47.00	1,435,300	30,538
Project 3127 : Culiacan Northern Landfill Gas Project	33.00	1,342,457	40,681
Project 3378 : Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León	25.00	1,593,305	63,732
Project 3877 : Relleno Norte Landfill Gas Project	16.00	1,978,490	123,656
Project 6771: Garcia Landfill Gas Project	38.00	1,098,450	28,907
Zone 3 landfill gas project	19	1,643,334	86,491

Source: CDM web site

Thus, the ratio for the proposed project is within the range of similar projects. However, it is also important to highlight in order to assess the validity of these investment costs, that Zone 3 landfill has an specific characteristic which is its high deep (100 mts) and its location in a cliff. These specific conditions of Zone 3 increase the investment costs of the extraction and collection system. Moreover, as a consequence of this high depth the risks for "Guajeros" (people working in the landfill) is high due to displacements of cells. These conditions provoke numerous accidents in the place as AENOR checked during the site visit, as few days before an accident.

Hence, according to above project discussion and since the value used in the financial analysis is consistent with the value of the source, in AENOR´s opinion the total LFG collection and flaring system investment used in the PDD was reasonable, valid and applicable at the time of the investment decision.

O&M Costs

The applied O&M power plant costs of 0.024 USD/KWh were taken from the quotation in March 2007 of Tracsa Energia SA de C.V. The OM costs for the collection and flaring system are reported to be USD 164,333 per year which represents the 10% of the investment costs according to the SCS engineering study. Overhauls costs were taken from the previous experience in Queretaro landfill in Mexico. Thus, the average yearly OM costs are 34.21 USD/MWh and 37.01 USD/MWh including general expenses which represent around 1.3% of the total investment costs per year.

AENOR has checked that values in the financial model match with sources provided. AENOR's validation team has checked that the figures match with the amounts stated in the financial model.

In addition to verify if the evidence and data considered were appropriate for the project activity, the reasonableness of the applied average annual O&M costs of 34.21 USD/MWh or 3.421 cUS$/KWh were found to be within the range of similar projects signed as CDM project in the region, mainly in Guatemala, hence accepted by the validation team of AENOR.

Comparison of O&M costs among similar registered CDM projects.

Project	Nominal Capacity (MW)	O&M costs (cUS$/KWh)
Project 1240 : Hasars Landfill Gas Project	4.00	3.57
Project 1242 : Tultitlan- EcoMethane Landfill Gas to Energy Project	1.30	6.24
Project 1307 : Durango – EcoMethane Landfill Gas to Energy Project	2.00	5.58
Project 1920 : Verde Valle Landfill Gas Project	5.00	2.48
Project 2186 : Monterrey II LFG to Energy Project	5.30	5.53
Project 2271 : Tecamac – EcoMethane Landfill Gas to Energy Project	1.95	4.33

Project	Nominal Capacity (MW)	O&M costs (cUS$/KWh)
Project 3074 : Coyula Landfill Gas Project	1.00	5.61
Project 3127 : Culiacan Northern Landfill Gas Project	1.00	6.54
Project 3378 : Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León	5.60	6.55
Project 3877 : Relleno Norte Landfill Gas Project	1.60	2.88
Project 4598 : Monterrey I LFG to Energy Project	7.42	6.15
Project 6771: Garcia Landfill Gas Project	3.20	5.42
Zone 3 landfill gas project	**4.8**	**3.42**

Source: CDM web site.

Taking into account the documents provided by the PP and the different cross-checks carried out by the AENOR validation team, the applied annual operational costs and the assumptions made were considered reasonable and appropriate.

Regarding royalties, they represent a total of 35% on electricity sales revenues. These payments are fixed in contracts signed between the project participant, INBIO, and landowners of the landfill Zone 3, Rellenos de Guatemala S.A and Carlos Antonio Hoegg Bosley which establish a 10% royalty, respectively and the contract signed between INBIO and business manager of the landfill, Ricardo Asturias which establishes a royalty of 15%. All these contracts were provided to AENOR and percentages considered in the financial model were consistent with sources, then, accepted by AENOR.

AENOR checked that PP is managing similar royalties (35%, 49%) to the landowners in other landfill such as landfill in Queretaro (Mexico) and El Henequen (Colombia), respectively. On the other hand, if all expenses are considered, including royalties, the ratio is 6.83 cUS$/KWh which is also in line with similar projects. Then, it is accepted by AENOR.

Project	Costs cUS$/KWh
Project 3332: Bionersis LFG project Colombia 2	5.5 cUS$/kwh
Project 3995: El Guacal Landfill Gas Flaring Project in Colombia.	7.1 cUS$/kwh
Project 5402: La Glorita Landfill gas project (requesting registration in Colombia)	6.6 cUS$/kwh

Project	Costs cUS$/KWh
Project 3643 : Proactiva Tlalnepantla Landfill Gas to Energy project (Mexico)	6.0 cUS$/kwh
Project 3127 : Culiacan Northern Landfill Gas Project	6.5 cUS$/kwh
Project 3378 : Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León	6.5 cUS$/kwh
Proposed Project	**6.8 cUS$/kwh**

Sensitivity Analysis

The PDD includes a sensitivity analysis to demonstrate that the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions.

For this purpose, variations in the range of +/- 10% for the parameters of electricity tariff, total investment costs, electricity generation, OM costs and royalties have been considered, since that range is reasonable for the project context and these variables constitute more than 20% of either total project costs o total project revenues.

The sensitivity analysis shows that without the income from CERs sales the IRR of the proposed project is also lower than the benchmark, even when the possible variations of the main parameters are considered. It was confirmed that the conclusion obtained in the analysis mentioned above was robust to conclude that the project activity is unlikely to be financially attractive.

However AENOR has validated that higher variations in the parameters, that would make the project IRR reach the benchmark, are not likely to occur: due to the following facts:

- 39.5% decrease in total investment cost: The main part of the total investment is the acquisition of the electrical engines and electricity project (79%). In this regard, AENOR has checked that the investment cost per MW of the project was found to be in line with similar registered projects in the region; therefore, it is unlikely that the total investment will decrease by 39.5%, such that the project equity IRR reaches the benchmark. Moreover, AENOR has checked the report of the International Renewable Energy Agency (IRENA) "Working Paper June 2012" which estimates that capital costs for power generation with landfill gas is between USD 1 920 and USD 2 440/kW, which is much higher than cost for Zone 3 landfill 1,308 USD/kW. Hence, actual costs are even higher than costs considered at the investment decision time, which it is conservative in additionality context and it is unlikely a decrease of investment costs.
- 43.6% decrease in O&M costs: This scenario is unlikely to occur due to O&M cost per KWh of the project was found to be within the range of similar registered projects in the region. Moreover, according to the recently IRENA Working Paper from June 2012, landfill gas systems have fixed O&M costs which can be between 10% and 20% of initial capital costs per year, while Zone 3 project estimated O&M total costs of around 14%. Therefore, it is unlikely that total O&M costs will decrease by 43.6%, such that the project IRR reaches the benchmark.
- 46.4% decrease in royalties on electricity sales: This scenario is not possible to occur as royalties percentages on electricity sales were fixed in advance by signed contracts with

land owners Rellenos de Guatemala S.A. and Carlos Antonio Hoegg Bosley, and with the in-situ business manager of the landfill Ricardo Asturias. Hence no variation can be expected in this parameter.

- 24.8% increase in electricity price. This scenario is unlikely to occur. As explained above, AENOR has cross-checked the official information from CNEE for the last tender from the Guatemalan government for renewable energy generation, PEG-1-2010. The electricity price considered for the proposed project at investment decision date of 89.6 USD/MWh is in the range of prices offered and quite higher than average offered prices in the opening of bids in February 2012, as well as it is in the range of other renewable projects in Guatemala. Moreover, according to the "Expansion Plan 2008-2022 of Electric System of Guatemala" by CNEE, the expected spot price is around 80-90 USD/MWh from end 2010 onwards. Thus, such increase is unlikely to occur as it is well higher than the average of prices offered in the last tender of CNEE and it is in the range of prices estimated by CNEE for operational years of the project.
- 42.2% increase in electricity generation. This scenario is unlikely to occur as annual running hours of engines are within the range of similar projects. Moreover, no more engines than expected will be installed, and since the engines are expected to work 8,000 hours/year of the 8,760 total hours/year, which was found to be higher than most of those observed in similar Projects in the region.

Moreover, since values of sources provided at the investment decision date are credible and reasonable to similar projects in the region, and other reports (IRENA, CNEE...) AENOR can corroborate that values used to demonstrate the additionality are still valid and applicable.

In summary, it is AENOR's opinion that the additionality of the project is sufficiently demonstrated based on the investment analysis and thus it is sufficiently demonstrated that the project is not a likely baseline scenario and those emission reductions are therefore additional.

Barrier analysis

The barrier analysis has not been selected to demonstrate the additionality.

Common practice analysis

Common practice analysis has been demonstrated according to "Combined tool to identify the baseline scenario and demonstrate additionality" v. 5.0.0. As per evidence provided from Guatemalan DNA (official letter nº 020/2011/ONDL/RECI/me) the proposed project activity is the first of its kind in the country. Nevertheless, the common practice analysis has been carried out in order to support this statement.

The proposed CDM project activity applies to measure "Methane destruction" listed in the definitions of combined tool, hence Step 4 (a) is followed, and Step 4 (b) is not applicable:

Step 4a: The proposed CDM project activity(s) applies measure(s) that are listed in the definitions section above.

As per combined tool, the "Guidelines on common practice" version 02.0 is applied:

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

The estimated power generation capacity of the project activity is 4.8 MW. So the applicable capacity range +/- 50% is 2.4-7.2 MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Taking into account these inputs, similar projects would be those located in the host country (Guatemala), applying methane destruction, using as energy source the landfill gas to produce electricity with a capacity range 2.4-7.2 MW and starting commercial operation before 15/05/2008, when the project was submitted for GSC.

Therefore, taking into account evidence provided from Guatemalan DNA, the proposed project activity is a foik. The official letter confirms that there are not projects in Guatemala capturing, treating and using the biogas of a sanitary landfill.

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall.

Nall = 0, as per explanations above. Although, it is important to highlight that subsequently to Zone 3, one more landfill gas energy project (AMSA landfill gas project) is searching the CDM scheme with 1 MW of installed capacity. This project was submitted to GSC on 19 August 2008.

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number Ndiff.

Ndiff = 0

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F = 1 - Ndiff/ Nall

Nall-Ndiff = 0

The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndiff is greater than 3.

As F is smaller than 0.2 and Nall-Ndiff=0, smaller than 3, this project activity is not a common practice in Guatemala.

The step 4b of the combined tool is not applicable to the proposed project activity.
Outcome of Step 4: As outcome of Step 4 is that the proposed project activity is not regarded as "common practice" then the proposed project activity is additional.

3.7 Monitoring Plan

3.7.1 Compliance of the monitoring plan with the approved methodology

The Project uses the approved consolidated monitoring methodology ACM0001 v.13 for landfill gas project activities.

During the validation process a CAR was requested from the PP to include in the PDD all parameters to be monitored and applicable to the proposed project activity as required by the applicable methodology and associated tools. In addition to, include further information regarding the quality control and quality assurance of the monitoring activities. Finally, all issues requested to the PP have been resolved in opinion of the validation team. Therefore the CAR has been solved.

In this regard, the section B.7 has been appropriately completed in the final PDD. All parameters required by the methodology and associated tools have been considered. Monitoring plan of the PDD states the calibration and operation conditions of the equipment for monitoring activities, in compliance with the applicable methodology (ACM0001 v.13), and all the applicable tools. Based on them, all required parameters have been included.

Accordingly, the following parameters are considered in section B.7.1 of the final PDD:

- Management of SWDS.
- Operation hours of the power plant.
- $EG_{PJ,y}$ Amount of electricity generated using LFG by the project activity in year y
- $EG_{EC,y}$ Amount of electricity consumed by the project activity in year y
- Vt,db Volumetric flow of the gaseous stream in time interval t on a dry basis (measured before each flare and each engine)
- Vi,t,db Volumetric fraction of greenhouse gas i in the gaseous stream in time interval t on a dry basis (measured before each flare and each engine)
- Tt Temperature of the gaseous stream in time interval t
- Pt Absolute pressure of the gaseous stream in time interval t
- $V_{RG,m}$ Volumetric flow of the residual gas on a dry basis at reference conditions in the minute m
- $v_{i,RG,m}$ Volumetric fraction of component i in the residual gas on a dry basis at minute m where i = CH4, CO, CO2, O2, H2, H2S, NH3 and N2.
- $T_{EG,m}$ Temperature in the exhaust gas of the enclosed flare (n) in minute m
- $v_{O2,EG,m}$ Volumetric fraction of O2 in the exhaust gas on a dry basis at reference conditions in the minute m
- $fc_{CH4,EG,m}$ Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute m
- $Flame_m$ Flame detection of flare in the minute m
- $Maintenance_y$ Maintenance events completed in year y

Operational and management responsibilities are described in the PDD. Calibration requirements have also been considered for the equipment and installations. Relevant equipment and installations will be calibrated and maintained as per manufacturer´s recommendations.

Furthermore, the monitoring plan includes information to gather, record, process, and manage data to calculate the emission reductions, considers training actions, details responsibilities and authorities of monitoring activities, defines procedures for collecting, archiving, measuring and calculation procedure, and establishes different tools for improving the system such as internal audits, corrective actions.

In the opinion of the AENOR team all necessary parameters required by the selected approved methodology are contained in the monitoring plan. They are clearly described and the means of monitoring described in the plan comply with the requirements of the methodology. Thus, the monitoring plan is in compliance with the applicable methodology. The assessment team checked all the parameters presented in the monitoring plan against the requirements of the methodology; no deviations relevant for the project activity could be found in the plan.

3.7.2 Implementation of the Monitoring Plan

After the review of evidence provided by the PP, the interview and communications with PP and consultants, AENOR confirms that monitoring arrangements described in the monitoring plan are feasible within the project design and that the means considered for the implementation, including data management, quality and assurance control procedures, are sufficient to ensure that the emission achieved resulting from the proposed CDM project activity can be reported ex post and verified.

Therefore, in opinion of the AENOR validation team the PP will be able to implement the monitoring plan.

3.8 Comments by Local Stakeholders

A one day training course in the technology, development and environmental benefits of landfill gas collection and utilisation for the Guatemalan Ministry of Environment was held on 8 December 2006.

A public stakeholders meeting was held in Guatemala City on 28 February 2008.

In order to assess the adequacy of the local stakeholder consultation, during the on-site visit the AENOR team requested the PP to provide evidence about the consultation process, but also to hold interviews with the local stakeholders relevant for the project activity as local authorities. With regard to this, it was requested to provide evidence about the consultation process. As a result, evidence of the event performed on 28 February 2008 was provided such as questionnaires filled by stakeholders, receipt of meeting invitation and list of attendants to the meeting, thus CL is closed.

By means of documents reviewed and the interviews performed, AENOR considers that the summary of the comments received during the consultation process, along with the PP responses included in section E.2 and E.3 of the PDD are complete. The main conclusions of the meetings and opinions collected are included in the PDD, section E.2. A summary of the comments received during the process is included in the PDD. But also, the information in section E.3 of the PDD gives a summary of how the comments received from local stakeholders were considered.

Hence, in the opinion of the AENOR team the local stakeholder consultation process was suitability performed.

3.9 Environmental Impacts

The Ministry of Environment (MARN) in the host country (Guatemala) determined that a full Environmental Impact Assessment was not required for methane collection projects. A "*Plan de Gestión Ambiental*" (Environmental Management Plan) was required and has been submitted and approved. Documentation related to the PGA is publicly available on the MARN web site (year: 2007 and number: F-40).

By means of the interviews maintained during the onsite visit with the local environmental authorities and several NGOs, and the web site of the MARN as well, the validation team considers:

Zona 3 landfill project activity shall assist Guatemala in achieving sustainable development

Environmental impacts are not considered significant. Project has a major net environmental benefit

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

According to Decision 3/CMP.1, the validator shall make publicly available the PDD and receive, within 30 days, comments on the validation requirements from parties, stakeholders and UNFCCC accredited NGOs and make them publicly available.

AENOR published the project documents on CDM website (http://unfccc.cdm.int) on 15 May 2008 and invited comments by parties, stakeholders and non-governmental organisations. No comments were received.

5 VALIDATION OPINION

AENOR has performed a validation of the **Zone 3 Landfill Gas Project** in Guatemala. The validation process was performed on the basis of all issues and criteria of UNFCCC for CDM projects, the host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting. The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) the resolution of outstanding issues and the issuance of the final validation report and opinion. In the course of the validation process, several corrective actions and clarifications were raised and all of them successfully closed.

The Project participant used the "Combined tool to identify the baseline scenario and demonstrate additionality" version 05.0.0, and the "Guidelines on the demonstration and assessment of prior consideration of the CDM" version 04 to demonstrate the additionality of the Project. In line with these documents as well as the guidance in the ACM0001 v.13 methodology, the PDD provides an analysis to determine that the project activity itself is not the baseline scenario and not economically attractive over other credible alternatives identified. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The review of the project design documentation and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and review of comments by parties, stakeholders and NGOs have provided AENOR with sufficient evidence to validate the fulfillment of the stated criteria.

In detail the conclusions can be summarised as follows:

- The project is in line with all relevant host country criteria of DNA of Guatemala and all relevant UNFCCC requirements for CDM.

- The project additionality is sufficiently justified in the PDD using investment analysis with all input parameters that were valid, appropriate, conservative and applicable at the time of investment decision making.

- The monitoring plan is transparent and adequate.

- The calculation of the project emission reductions is carried out in a transparent and conservative manner, so that the average calculated emission reductions of **141,597** tCO_{2e} per year are most likely to be achieved within the crediting period.

In our opinion, the project correctly applies and meets the relevant UNFCCC requirements for the CDM and the relevant host country criteria. The validation is based on the information made available to us and the engagement conditions detailed in this report.

The validation has been performed using a risk based approach, as described above. The only purpose of this report is its use during the registration process as part of the CDM project cycle. Hence, AENOR cannot be held liable by any party for decisions made or not made based on the validation opinion, which goes beyond the purpose.

Madrid, 26 December 2012

Luis Robles Olmos
Authorized Person

Jose Luis Fuentes Pérez
Validation Team Leader

6 CORRECTIVE ACTION REQUESTS, CLARIFICATIONS AND FORWARD ACTION REQUESTS

FINDING	**Nº 1**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The tool "Tool to calculate the emission factor for an electrical system" has to be updated to the version in force		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº2		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The justification of the choice of the methodology and why is applicable to the project has to be detailed as required by the methodology ACM0001 ver.13		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The explanations included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº3		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The description of the sources and gases included in project boundary has some incoherence in the different gases.		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº4		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	In section B.6.1 *(*Explanation of methodological choices*)* It shall be explained how the procedures, in the approved methodology to calculate project emissions, baseline emissions, leakage emissions and emission reductions are applied to the proposed project activity. It shall be clearly stated which equations will be used in calculating emission reductions. It shall be explained and justified all relevant methodological choices		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The explanations included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	**Nº5**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Parameters included in section B.6.2. (Data and parameters that are available at validation) do not correspond to which are included in the approved baseline and monitoring methodology and methodological tools applied to the project activity		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº6		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The table with the summary of the ex ante estimation of emission reductions included in PDD does not correspond to the model included in the approved PDD Form.		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 7		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The starting date of the project activity included in PDD does not correspond with the definition included in the approved CDM Glossary and the UNFCCC rules. Main milestones of the project will be provided and detailed in the PDD in order to check if start date is defined as per Glossary CDM Terms..		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 8		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The expected operational lifetime of the project activity is not coherent neither with the starting date of the project activity nor with the starting date and the length of the crediting period		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	PDD has been updated accordingly		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. The modifications included in the last version of PDD are correct. This CAR is closed		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	**Nº 9**		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The PP has to identify if the project equity IRR is post or pre tax. In addition, evidence has to be provided to justify the benchmark.		
PP RESPONSE #1			
It shall address the corrective action taken in details	Equity IRR used in investment analysis is pos tax. Benchmark has been established according to Guidelines of assessment on investment analysis. Such benchmark is post tax.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	An equity IRR post tax is used, evidence and explanations were provided, then CAR is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 10		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	No reference to the period of assessment considered in the investment analysis is included in the PDD. Please, clarify. Moreover, it shall be provided spreadsheet calculation for financial analysis consistent with PDD		
PP RESPONSE #1			
It shall address the corrective action taken in details	Period assessment is included in PDD and calculation provided.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Assessment is for 14 years, which is credible and appropriate according to explanations and evidence provided. Calculations have been provided, then CAR is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 11		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Sensitive analysis shall be performed according to the requirements of the tool for demonstration of additionality and considering the guidelines on investment analysis.		
PP RESPONSE #1			
It shall address the corrective action taken in details	Sensitivity analysis has been updated.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Additionality is carried out as per Combined tool to identify the baseline scenario and demonstrate additionality. Sensitivity analysis is carried out according to the guidleines on investment analysis. Then CAR is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 12		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Evidence about the appropriateness of the inputs values and assumptions used in the investment analysis shall be provided. In addition, input values used in the investment analysis should be valid and applicable at the time of the investment decision.		
PP RESPONSE #1			
It shall address the corrective action taken in details	Evidence about of the appropriateness of the inputs values and assumptions used in the investment analysis will be provided. Inputs values have been updated in order to be applicable at the time of investment decision in 2007.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Evidence and sources have been provided to AENOR and correctly quoted in the financial model. They have been cross-checked by AENOR and they are valid at the time decision making. Then, CAR is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 13		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	PP shall apply the tool for demonstration of additionality and guidelines on barriers for correctly demonstrate the applicability of barriers with direct impact on the financial returns. Moreover, evidence shall be provided for justifying the appropriateness of identified barriers.		
PP RESPONSE #1			
It shall address the corrective action taken in details	Barrier analysis has not been considered in the latest PDD. Finally, additionality is demonstrated using the Combined tool version 05.0.0		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Additionality is entirely demonstrated by investment analysis. No barrier analysis is used. Then CAR is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 14		
Classification	**CAR** ☒	**CL** ☐	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	PDD shall describe how the CDM alleviates the identified barriers from occurring.		
PP RESPONSE #1			
It shall address the corrective action taken in details	Barrier analysis is finally ruled out.		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	Barriers have been discarded for additionality, then CAR is closed.		
PP RESPONSE #2			
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

FINDING	Nº 1		
Classification	**CAR** ☐	**CL** ☒	**FAR** ☐
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	It shall be clarified whether the calculation of the emission factor of the electricity grid was done with the most recently data available at the moment of the publication of the PDD for the Global Stakeholder Consultation.		
PP RESPONSE #1	*This section shall be filled by the PP.*		
It shall address the corrective action taken in details	Evidence of the correct selection of data has been provided		
It shall provide and indentified the evidences proposed (if applicable)			
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added*	OK. calculations from 2004 to 2006 were the most updated data at the time of submission of the PDD to the DOE for validation in May 2008 (that was confirmed by AENOR by mean of a communication with the AMM (Guatemalan National Electric Grid Operator) and checking the AMM website.. This CL is closed.		
PP RESPONSE #2	*This section shall be filled by the PP.*		
Corrective action			
Evidences proposed			
DOE Assessment #2			
Conclusion *Tick the appropriate checkbox*	**CAR/CL CLOSED** ☒	To be checked during the first periodic verification ☐	

7 REFERENCES

Ref		
1	PDD Zone 3 Landfill Gas Project. First version for GSC	Project participant
2	PDD Zone 3 Landfill Gas Project. Version 2	Project participant
3	Emission reductions calculation	Project participant
4	Financial analysis calculation	Project participant
5	Guatemala national grid emission factor calculations	Project participant
6	Letter of Approval from Guatemala	Ministry of Environment and Natural Resources. Guatemala
7	ACM0001 "Flaring or use of landfill gas" version 13	UNFCCC
8	Tool Emissions from solid waste disposal sites. Ver. 6.0.1	UNFCCC
9	Combined tool to identify the baseline scenario and demonstrate additionality. Ver. 05.0.0.	UNFCCC
10	Tool Project emissions from flaring. Ver. 02.0.0	UNFCCC
11	Tool to calculate the project or leakage CO2 emissions from fossil fuel combustion. Ver 02	UNFCCC
12	Tool to calculate baseline, project and/or leakage emissions from electricity consumption. Ver. 1	UNFCCC
13	Tool to determine the mass flow of a greenhouse gas in a gaseous stream, ver .2.0.0	UNFCCC
14	Specific Instruction IE/DTC/0039	AENOR
15	Tool to calculate the emission factor for an electricity system. Ver.3.0.0	UNFCCC
16	Validation and Verification Manual *(version 01.2)*	UNFCCC
17	Technical specifications of the flare	Pro 2 Anlagentechnik GmbH
18	Technical specifications of the engine	Pro 2 Anlagentechnik GmbH
19	Technical specifications equipment	Tracsa Energía S.A de C.V

Ref		
20	Environmental approval. Resolution 1987-2011/DIGARN/ECM/arg	Ministry of Environment and Natural Resources. Guatemala
21	Report Of The Pump Test And Pre-Feasibility Study For Landfill Gas Recovery And Utilization At The El Trébol (Zona 3) Landfill Guatemala City, Guatemala	SCS Engineers Inc. (SCS) under contract to USAID and the US Environmental Protection Agency Landfill Methane Outreach Program in 2005
22	Pump- tests. October 2005	Zone 3
23	Pre-feasibility study. December 2005	SCS Engineers
24	Minutes of start of stakeholder consultation process. February 2008	Guatemalan Ministry of Environment and Natural Resources.
25	E.I.A approval. 2007	Guatemalan Ministry of Environment and Natural Resources.
26	Municipality agreement for land use. 21 December 2007. Investment decision date.	Guatemala City
27	Creation of INBIO society. 2009	INBIO
28	Guatecarb society gives up CDM project activity. 2010	Guatecarb
29	Purchase of INBIO by BBE (Borealia Biogas Energy).2010	INBIO
30	Contract between BBE/Inbio with consultant company. 2010	INBIO
31	Contract BBE/Inbio with DOE . 2011	
32	Starting date: date when the contract of engineering works was signed. 01/06/2011	INBIO
33	Obtention of the environmental license.2011	Guatemalan Ministry of Environment and Natural Resources.
34	Guatemalan DNA confirming the project is a foik (nº 020/2011/ONDL/RECI/me). 2011	Guatemalan DNA
35	AMSA landfill gas project	UNFCCC
36	Guidelines on assessment on investment analysis	UNFCCC

Ref		
37	Guatemalan Government Bond. 2007	International Monetary Fund
38	Equity risk premium. 2007	Bloomberg Finance L.D
39	Guatemalan law order in council 26.92 ||, "Ley sobre el impuesto de la renta", articles 72 and 19g.	Guatemalan Legislation
40	Landfill Gas-to-Energy and Greenhouse Gas Project Feasibility Study for the South Wake Landfill	SCS Engineers
41	Interest rate. 2007	Bank of Guatemala
42	Average monthly tariff.2007	Wholesale Market Administrator.
43	Tender from the Guatemalan government for renewable energy generation, PEG-1-2010.	Electric Energy National Commission (CNEE)
44	Guatemalan Market Analysis renewable energy" 2009.	ARECA project by the Central American Bank for Economic Integration (BCIE), United Nations Program for Development (UNDP), Global Environment Facility (GEF)
45	Expansion Plan of CNEE 2008-2022	CNEE
46	Project 1240 : Hasars Landfill Gas Project (Mexico)||	UNFCCC
47	Project 1242 : Tultitlan- EcoMethane Landfill Gas to Energy Project (Mexico)||	UNFCCC
48	Project 1307 : Durango – EcoMethane Landfill Gas to Energy Project (Mexico)||	UNFCCC
49	Project 1920 : Verde Valle Landfill Gas Project (Mexico)	UNFCCC
50	Project 2186 : Monterrey II LFG to Energy Project (Mexico)	UNFCCC
51	Project 2271 : Tecamac – EcoMethane Landfill Gas to Energy Project (Mexico)	UNFCCC
52	Project 3074 : Coyula Landfill Gas Project (Guatemala)||	UNFCCC
53	Project 3127 : Culiacan Northern Landfill Gas Project (Mexico)||	UNFCCC
54	Project 3378: Landfill Gas Recovery and Flaring Project in the El Verde Landfill, León (Mexico)||	UNFCCC

Ref		
55	Project 3877 : Relleno Norte Landfill Gas Project (Mexico)//	UNFCCC
56	Project 6771: Garcia Landfill Gas Project(Mexico)//	UNFCCC
57	Project 0037 : Rio Azul landfill gas and utilization project in Costa Rica //	UNFCCC
58	Project 4682 : Los Mangos landfill gas capture and flaring project in Costa Rica//	UNFCCC
59	Investment costs power plant. 2007	Tracsa Energía S.A de C.V
60	Investment costs power plant. 2007	Pro2 Anlagentechnik GMBH
61	Project 6786: Intermunicipal Matamoros-Torreon Landfill Gas Project.	UNFCCC
62	Flare station quotation	Pro2 Anlagentechnik GMBH
63	Quotations for the extraction, and collection system.	Consultoria y Constructora del Kyrios; Toppro; by RODIO Swissboring and REPSA
64	Quotation of OM costs power plant	Tracsa Energía S.A de CV
65	Flaring and collection system OM costs	Pre-feasibility study of SCS Engineers.
66	Overhauls Cost	Records of Queretaro Landfill. INBIO
67	Royalty of 10% in Contract between INBIO and Rellenos de Guatemala S.A	INBIO
68	Royalty of 10% in contract between INBIO and Carlos Antonio Hoegg Bosley	INBIO
69	Royalty of 15% in contract between INBIO and Ricardo Asturias.	INBIO
70	Royalties cross-checked in Queretaro landfill and El Henequen landfill	INBIO
71	Project 3332: Bionersis LFG project Colombia 2	UNFCCC
72	Project 3995: El Guacal Landfill Gas Flaring Project in Colombia.	UNFCCC

Ref		
73	Project 5402: La Glorita Landfill gas project (requesting registration in Colombia)	UNFCCC
74	Project 3643 : Proactiva Tlalnepantla Landfill Gas to Energy project (Mexico)	UNFCCC
75	International Renewable Energy Agency (IRENA) "Working Paper June 2012"	International Renewable Energy Agency
76	Communication of Guatecarb to the Guatemalan DNA for withdrawal of the proposed project. May 2010	Guatecarb

ANNEX 1: CDM VALIDATION PROTOCOL

VALIDATION PROTOCOL
PROJECT: Zone 3 Landfill Gas Project."

PROJECT PARTICIPANT: Industrias de Biogas S.A,

Validation Type	
☒ Validation of a Project Activity	
Validation Team: Jose Luis Fuentes. Chief Validator Pablo Taboada. Validator	
Version of this Validation Protocol: 2	Date: 2012-12-26

CHECKLIST TOPIC / QUESTION	MoV/Ref.*	COMMENTS	Draft Conclusion	Final Conclusion
A. GENERAL DESCRIPTION OF PROJECT ACTIVITY				
A.1. Approval				
A.1.1 Have all the Parties involved in the project activity provided a written Letter of Approval of the project activity?	DR	Yes, LoA has been provided.	OK	OK
A.1.2 Do the Letters of Approval confirm that: • The Party is a Party to the Kyoto Protocol • The participation is voluntary • The CDM project activity contribute to the sustainable development (host Party) • The title of the project activity is precise and coincides with the title included in the PDD?	DR	LoA confirmed that Parties are a Party to the Kyoto Protocol, the participation is voluntary, the CDM project activity contributes to the sustainable development (host Party) and the title of the project activity is precise and coincides with the title included in the PDD.	OK	OK
A.1.3 Has the Letter of Approval be obtained from the project participants or directly from the DNA? In case that it has been obtained from the project	DR	LoA has been provided from PP.	OK	OK

participant, how has been assessed its authenticity?				
A.1.4. If either LoA contains additional specification or conditions of the project activity, then has the request for registration been based on the documents specified in the LoA?	DR	No additional specification appears in LoA.	OK	OK
A.1.5. If the LoA references a specific version of the Validation Report or PDD and this version cannot be submitted, then has either of the following been submitted? a) a statement indicating final LoA has not been received, or b) an updated Validation Report/ PDD	DR	No specific version appears in LoA.	OK	OK
A.2. Project participants				
A.2.1. Is the form of required for the indication of project participants correctly applied in the PDD?	DR	The form required for the indication of project participant has been correctly included.	OK	OK
A.2.2. Is the participation of all project participants approved by a Party to the Kyoto Protocol?	DR	The participation of all project participant is approved by a Party to the Kyoto Protocol.	OK	OK

A.2.3. Is all information on participants / Parties provided in consistency with details provided by further chapters of the PDD (in particular annex 1)?	DR	Contact information of all project participants has been included appropriately	OK	OK
A.2.4. Are any other project participants approved but not listed in the PDD?	DR	No, the project participants that are listed in the PDD are also approved.	OK	OK
A.3. Project Design Document				
A.3.1. Does the used project title clearly enable to identify the unique CDM project activity? Is it consistent in all section of the PDD and in all documents?	DR	Yes, the project title is clear and consistent in all sections of the PDD.	OK	OK
A.3.2. Is there any indication concerning the version number and the date of the version? (*Note: PDDs older than* 6 *months are not acceptable*)	DR	Yes, there is an indication of the version number and the date of the PDD.	OK	OK
A.3.3. Is this consistent with the time line of the project's history?	DR	Data of completion of the application of the baseline study has been addressed in the PDD. This data is consistent with the time line of the project's history.	OK	OK
A.3.4. Is the PDD prepared in accordance with the latest template and requirements from the CDM	DR	Yes, the PDD has been prepared in accordance with a CDM PDD template still in force.	OK	OK

Executive Board?				
A.3.5. Has the PDD been published for Global Stakeholder Consultation (GSC) in UNFCCC website?	DR	Yes, the PDD was made publicly available for Global Stakeholder Consultation (GSC) in the UNFCCC website on 15 May 2008.	OK	OK
A.3.6. Have there been any comments during the GSC process?	DR	No comments have been received during the public information period.	OK	OK
A.3.7. Have them correctly addressed by the validation team?	DR	Not applicable. No comments have been received during the public information period.	N/A	N/A
A.4. Description of the project activity The PDD (section A.2) shall contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity.				
A.4.1. Is the description delivering a transparent overview of the project activities? Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	DR	Yes, the description gives a good overview. The description of the project activity covers all relevant elements.	OK	OK
A.4.2. What proofs are available demonstrating that the project description is in compliance with the actual situation or planning?	DR	Reliable evidence of the proposed implementation plan of the project activity has been provided to the validation team. This issue was also confirmed during the on-site visit.	OK	OK

A.4.3. Is the information provided by these proofs consistent with the information provided by the PDD?	DR	Yes, the proposed implementation plan is consistent with the information included in the PDD.	CL 1	OK
A.4.4. Has the validation team conducted a physical site inspection to confirm the description of the PDD? If not, justify.	DR	Yes, the validation team has conducted an on-site visit to the project activity on 23-25 June 2008.	OK	OK
A.4.5. If the proposed CDM project activity involves the alteration of an existing installation or process, does the project description clearly state the differences resulting from the project activity compared to the pre-project situation?	DR	Yes, the project description includes the pre-project situation and the project scenario.	OK	OK
A.4.6. In the case of greenfield project activity, is the project design described sufficiently by means of specifications, drawings and manuals?	DR	Not applicable, it is an existing activity.	N/A	N/A
A.4.7. Does the PDD explain how the	DR	Yes, the PDD describes correctly how the proposed project activity	OK	OK

proposed project activity reduces greenhouse gas emissions (i.e. what type of technology is being employed, what measures are undertaken as part of the project activity, etc);		reduces greenhouse gas emissions.		
A.5. Technical description of the project activity The PDD (section A.4) shall contain a clear description of the project activity that provides the reader a clear understanding of the technical aspects of its implementation.				
A.5.1. Location of the project activity				
A.5.1.1. Does the information provided on the location of the project activity allow for a clear identification of the site(s)? Are the latitude and longitude on the site indicated (decimal points)?	DR	Yes, the description of the location of the project activity is clear in the PDD	OK	OK
A.5.1.2. How is it ensured and/or demonstrated that the project proponents can implement the project at this site (ownership, licenses, contracts etc.)?	DR	The agreement for landfill gas use and the contract of engineering works and quotations from the equipment suppliers have been provided to the validation team.	OK	OK

A.5.2. Category of the project activity				
A.5.2.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 *(c)* of decision 3/CMP.1 on the modalities and procedures for the CDM?	DR	Not applicable.	N/A	N/A
A.5.2.2. To which category*(ies)* does the project activity belonging to? Is this category correctly identified and indicated?	DR	The project follows the methodology ACM001 that is applicable to large scale projects, and belongs to the following sectoral scopes: Scope number 13: Waste management The category of the project activity has been correctly identified as large scale and indicated in the PDD.	OK	OK
A.5.2.3. Does proposed project activity confirm to one of the project categories defined for small scale CDM project activities?	DR	No, the project is not qualified as a small scale project.	OK	OK
A.5.2.4. In the case of a small scale project activity, is it justified that it is not a debundled component of a larger project activity?	DR	Not applicable.	N/A	N/A
A.5.2.5. In case of small scale project activities, is the estimate of	DR	Not applicable.	N/A	N/A

emissions reductions increasing during the crediting period? In affirmative case, have project participants demonstrated in the CDM-SSC-PDD that the project activity characteristics are defined in a way that precludes project activities to go beyond the limits for SSC Project activities (as stipulated in paragraph 3 of the General Guidelines to SSC CDM methodologies)?				
A.5.3. Technology to be employed by the project activity				
A.5.3.1. Does the description of the technology to be applied provide sufficient and transparent input/information to evaluate its impact on the greenhouse gas balance? And, is the explanation how the project will reduce greenhouse gas emission transparent and suitable?	DR	The project activity is the capture, flare and utilization of methane gas generated for electricity purposes at Zone 3 Landfill site The description of the LFG recovery project and of the project technology has been completed. Furthermore, diagrams of the project activity scenario have been included in the PDD. The explanation on how the project will reduce greenhouse gas emission is transparent and suitable	OK	OK

A.5.3.2. Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period? If so, does the project make provisions for meeting training and maintenance needs?	DR	Yes, training is needed and it has been contemplated in the Monitoring Plan.	OK	OK
A.5.3.3. Is a schedule available for the implementation of the project and are there any risks for delays? Is the schedule consistent with the starting date of the crediting period?	DR	The schedule for the implementation of the project is consistent with the starting date of the crediting period.	OK	OK
A.5.4. Estimated amount of emission reductions over the chosen crediting period				
A.5.4.1. Is the form required for the indication of projected emission reductions correctly applied?	DR	Yes, the form for the indication of the projected emission reductions is correctly applied.	OK	OK
A.5.4.2. Are the figures provided consistent with other data presented in the PDD?	DR	The estimation of the emission reductions has been revised and is consistent along the PDD	OK	OK

A.5.5. Public funding of the project activity				
A.5.5.1. In case of public funding from Annex I Parties is it confirmed that such funding does not result in a diversion of official development assistance?	DR	The project activity will not receive any public funding from Parties included in Annex I.	OK	OK
A.5.5.2. Is all information provided consistent with the details given in remaining chapters of the PDD (in particular annex 2)	DR	Yes, it is consistent.	OK	OK
B. BASELINE AND MONITORING METHODOLOGY				
B.1. Title and reference of the approved baseline and monitoring methodology				
B.1.1. Are reference number, version number, and title of the approved baseline and monitoring methodology clearly indicated?	DR	Yes, the title of the methodology, the reference number and the version number are clearly referenced in the PDD.	OK	OK
B.1.2. Is the applied version the most recent one and / or is this version still applicable?	DR	Yes, the version applied is still in force	OK	OK

B.1.3. Does the PDD refer to the corresponding tools with their latest approved versions?	DR	**CAR 1 : The tool "Tool to calculate the emission factor for an electrical system" has to be updated to the version in force** The final PDD refer to the corresponding tools with their latest approved versions or versions still in force. This CAR is closed	**CAR 1**	OK
B.1.4. Have any sources of greenhouse gas emissions been identified by the DOE ,within the project boundary following project implementation, which are expected to contribute more than 1% of the overall expected average annual emissions reductions, and which are not addressed by the applied methodology?	DR	No greenhouse gas emissions have been identified within the project boundary; no contribution of more than 1% is expected for the annual emission reductions.	OK	OK
B.2. Applicability of the selected methodology to the project activity				
B.2.1. Are the chosen tools considered applicable in accordance with the design of the project and the provisions of the applied methodology?	DR	Yes, according to the methodology the latest versions of the tools have been used in the final PDD.	OK	OK
B.2.2. Is the choice of the	DR	**CAR 2 The justification of the choice of the methodology and why is applicable to the project has to be detailed as required by the**	**CAR 2**	OK

<table>
<tr><td>methodology correctly justified by the PDD and is the project in conformance with all applicability criteria of the applied methodology?</td><td></td><td>methodology ACM0001 ver.13
The methodology is correctly justified in the final version of PDD and the project activity is conformance with all applicability criteria. CAR is closed.</td><td></td><td></td></tr>
<tr><td>B.2.3 Has been applied the specific guidance provided by the CDM Executive Board in respect to the approved methodology?</td><td>DR</td><td>Yes, the specific guidance provided by the CDM Executive Board in respect to the approved methodology has been applied.</td><td>OK</td><td>OK</td></tr>
<tr><td colspan="5">Fill in the required amount of sub checklists for applicability criteria as given by the methodology applied and comment at least every line answered with “No”</td></tr>
<tr><td>B.2.4. Criterion 1 –
The project activity consists in: Install a new LFG capture system in a new or existing SWDS</td><td>DR</td><td><table><tr><th>Applicability checklist</th><th>Yes/No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>YES</td></tr><tr><td>Evidence provided?</td><td>YES</td></tr><tr><td>Compliance verified?</td><td>YES</td></tr></table></td><td>OK</td><td>OK</td></tr>
<tr><td>B.2.5. Criterion 2 –
The project activity consists in: :
Flare the LFG and|or use the captured LFG togenerate electricity</td><td>DR</td><td><table><tr><th>Applicability checklist</th><th>Yes/No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>YES</td></tr><tr><td>Evidence provided?</td><td>YES</td></tr><tr><td>Compliance verified?</td><td>YES</td></tr></table></td><td>OK</td><td>OK</td></tr>
</table>

B.2.6. Criterion 3 – The most plausible baseline scenario is *Release of LFG from the SWDS; and In the case that the LFG is used in the project activity for generating electricity that electricity would be generated in the grid*	DR	**Applicability checklist** / **Yes/No** Criterion discussed in the PDD? YES Evidence provided? YES Compliance verified? YES	OK	OK
B.2.7. Criterion 4 – The methodology is not applied in combination with other approved methodologies	DR	**Applicability checklist** / **Yes/No** Criterion discussed in the PDD? YES Evidence provided? YES Compliance verified? YES	OK	OK
B.2.8. Criterion 5 – Is the management of the SWDS deliberately changed during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity?	DR	**Applicability checklist** / **Yes/No** Criterion discussed in the PDD? YES Evidence provided? YES Compliance verified? YES	OK	OK
B.2.9. Was there a request for clarification, revision or deviation made for the adopted methodology in relation to the proposed project	DR	No, there was not any request for clarification, revision or deviation of the adopted methodology in relation to the proposed project activity.	OK	OK

activity? If so, were the correct procedures provided by the CDM EB followed?				
B.3. Description of the Project Boundary				
B.3.1 Are all the sources and gases included in the project boundary of the project activity (baseline scenario, project scenario and leakage) in accordance with the applied methodology?	DR	**CAR 3 The description of the sources and gases included in project boundary has some incoherence in the different gases.** The table of gases and sources included and not included in the boundary has been correctly included and a justification of gases excluded in baseline and project activity have been completed in section B.3 of the final PDD. CAR is closed.	**CAR 3**	OK
B.3.2. Are the inclusion or exclusion of the sources of gases correctly justified?	DR	Yes, the inclusion and exclusion of the sources of gases has been correctly justified.	OK	OK
B.3.3. Do the spatial and technological boundaries as verified on-site comply with the discussion provided by the PDD?	DR	Yes, the spatial and technological boundaries as verified on-site comply with the discussion provided by the PDD	OK	OK
B.3.4. In case of grid connected electricity projects, is the relevant	DR	The Guatemalan National grid has been included in the project boundaries. The relevant grid has been identified in accordance with the applied methodology and tool.	OK	OK

grid correctly identified in accordance with EB guidance and the underlying methodology?				
B.4. Description of the baseline scenario identification				
B.4.1. Is the baseline scenario clearly described?	DR	The alternative scenarios have been correctly described, and reliable evidences have been provided to the validation team. The baseline scenario has been clearly described	OK	OK
B.4.2. Have there been other alternative scenarios considered? Is it justified the selected scenario as the most likely one?	DR	All plausible alternative scenarios listed in the methodology have been considered. The selected scenario has been correctly justified.	OK	OK
B.4.3. Does the PDD follow the steps to determine the baseline scenario required by the methodology?	DR	Yes, the PDD follows the steps defined in the methodology for determining the baseline.	OK	OK
B.4.4. Has the baseline scenario been determined using conservative assumptions where possible?	DR	Yes, the baseline scenario has been determined using conservative assumptions.	OK	OK
B.4.5. Does the baseline scenario sufficiently take into account	DR	Yes, relevant national and/or sectoral policies and circumstance has been considered in the determination of the baseline.	OK	OK

relevant national and/or sectoral policies? (*Note: refer Annex 3 EB 22*). Are they listed in the PDD?				
B.4.6 If alternatives are excluded: a.- Is sufficient evidence/ justification provided to support every exclusion of alternatives? Is it reasonable? b.- Is it shown that at least one credible and feasible alternative does not face a barrier? Is this reasonable?	DR	Yes, every exclusion of alternatives has been correctly justified and reliable evidences have been provided to the validation team.	OK	OK
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	DR	Yes, the baseline scenario is compatible with the available data and sources are clearly referenced.	OK	OK
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):				
B.5.1 Is the start date defined in accordance with the "Glossary of CDM terms"? What evidence is	DR	**CAR 7 The starting date of the project activity included in PDD does not correspond with the definition included in the approved CDM Glossary and the UNFCCC rules. Main milestones of the project will be provided and detailed in the PDD in order to check if start date is defined as per**	**CAR 7**	OK

provided to verify that this was the official start date? Is this considered reliable and reasonable?		**Glossary CDM Terms.** PDD has been updated and evidence has been provided. Starting date of the project activity is 01/06/2011, date when the contract of engineering works was signed. This CAR is closed		
B.5.2 Is it a new project activity (start date on or after August 2008) or an existing project?	DR	It is a new project activity.	OK	OK
B.5.3 For a new project which does not require a new methodology and has not published its PDD for stakeholder comments prior to the start date, then: a. Have the project proponents informed the DNA and/or UNFCCC secretariat in writing? How has this notification been verified? (i.e. confirmation from the DNA or UNFCCC) b. Was the notification made within 6 months of the project activity start date? c. Does the letter/ notification indicate the precise geographic	DR	PDD was published for GSC before starting date of the project.	OK	OK

location and provide a brief description of the proposed project? d. Have the project proponents informed the DNA and/ or UNFCCC secretariat of the progress of the project activity every subsequent two years after the initial notification?				
B.5.4 For an existing project which has a start date prior to the publication of the PDD for global stakeholder comments, has the project proponent provided the following: a. Evidence of awareness of the CDM prior to the project activity start date and that the benefits of the CDM were a decisive factor in the decision to proceed with the project? (e.g. Board minutes, notes etc) Is this sufficient? b. Reliable evidence that demonstrates real actions were taken to secure CDM status in parallel with the project's implementation? (e.g. contracts with consultants for CDM/PDD/methodology services, ERPAs, correspondence with CER	DR	N/A	OK	OK

buyers, DOEs, DNAs or the UNFCCC). Is this sufficient?				
B.5.5. Is the project additionality assessed according to the applicable methodology? Detail the Tool used to demonstrate the Additionality of the project activity.	DR	The additionality is assessed according to the applicable methodology. The additionality of the project is demonstrated in the latest PDD as per Combined tool to identify the baseline scenario and demonstrate additionality version 05.0.0.	OK	OK
B.5.6. In the case of a small scale project activity, is the additionality justified according to the applicable CDM requirements specific for small scale project activities?	DR	Not applicable. The project is a large scale project.	OK	OK
B.5.7 Have realistic and credible alternatives been identified providing comparable outputs or services?	DR	Yes, realistic and credible alternatives have been identified.	OK	OK
B.5.8. Is the project activity without CDM included in these alternatives?	DR	Yes, it is included.	OK	OK
B.5.9. Is a discussion provided for all identified alternatives concerning the compliance with applicable laws and regulations?	DR	Yes, it is provided.	OK	OK
B.5.10. In case of using a FSR as a basis of the decision, is this analysis made in accordance with the EB	DR	Not applicable. The project activity does not use a FSR as a basis of the decision.	OK	OK

Guidance?				
B.5.11. In case the PDD argues that specific laws are not enforced in the country or region: Is evidence available concerning that statement?	DR	N/A	OK	OK
B.5.12. In case of applying step 2 / investment analysis of the additionality tool: Is the analysis method identified appropriately?	DR	Yes, the analysis method has been identified appropriately	OK	OK
B.5.13. In case of Option I (simple cost analysis): Is it demonstrated that the activity produces no economic benefits other than CDM income? a. Are the assumptions for all alternatives compared consistent (including discount rates if applicable)?	DR	Not applicable since Option I is not considered in the analysis	N/A	OK
B.5.14. In case of Option II (investment comparison analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? a. Are the assumptions for all alternatives compared consistent (including discount rates if	DR	Not applicable since Option II is not considered in the analysis	N/A	OK

applicable)?				
B.5.15. In case of Option III (benchmark analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? a. If an IRR indicator is used, is the choice of benchmark appropriate to the type of IRR calculated? (b. Is the choice of benchmark or discount rate justified with supporting evidence for its appropriateness?	DR	The PP identifies the Project equity IRR as financial indicator. The benchmark is from guidelines on investment analysis, then, it is aaccepted. **CAR 9.- The PP has to identify if the project equity IRR is post-tax or pre-tax. In addition, evidence has to be provided to justify the benchmark.** Latest PDD states sources used to define the applicable benchmark and evidence were provided to AENOR. A conservative post tax equity benchmark has been applied. CAR is closed.	CAR 9	OK
B.5.16 If risk premiums are applied in the development of the benchmark, are they reasonable and justified?	DR	The applicable benchmark is taken from guidelines on assessment on investment analysis. Thus, value is reasonable and it is justified.	CAR 9	OK
B.5.17 Do the project participants justify the period of assessment in the context of the underlying project activity?	DR	**CAR 10.- No reference to the period of assessment considered in the investment analysis is included in the PDD. Please clarify. Moreover, it shall be provided spreadsheet calculation for financial analysis consistent with PDD.** The period of assessment is 14 years as PDD states. A consistent justification is provided in the PDD. In addition, an evidence has been provided to justify it. CAR is closed.	CAR 10	OK
B.5.18 Is the period of assessment appropriate?	DR	Based on evidence provided, the assessment period is appropriate.	CAR 10	OK

B.5.19 Is any residual value of the project activity assets included in the analysis? Are residual value calculations reasonable and justified and consistent with local accounting rules or international best practice?	DR	All equipment is fully depreciated according to the Guatemalan legislation. Therefore, residual value is zero.	CAR 10	OK
B.5.20 Are depreciation and other non-cash items related to the project activity deducted from net profits used for calculating the financial indicator (e.g. IRR, NPV)?	DR	Depreciation and other non-cash items related to the project activity are deducted from net profits used for calculating the financial indicator.	CAR 10	OK
B.5.21 Is the treatment of taxation consistent with the chosen benchmark? (i.e. taxation should only be treated as an expense in the IRR/NPV calculation if the chosen benchmark is intended for post-tax calculations?	DR	The treatment of taxation is consistent with the chosen benchmark. Taxation is only treated as an expense in the IRR calculation since the chosen benchmark is intended for post-tax calculations	CAR 10	OK
B.5.22 Recommenced project: If the implementation of the project ceased and then recommenced due to consideration of the CDM, then: a. Are input values valid and applicable at the time of making the decision to recommence the project? b. Are capital costs incurred prior to	DR	Not applicable. The project activity is not a recommenced project	OK	OK

the revised project activity start date input as the recoverable value of the assets (limited to the potential reuse/ resale of tangible assets)? c. How has the fair market value of the capital expenditures been calculated and validated? (e.g. by chartered specialists). Is this fair market value reasonable and justified?. d.- Is the book value as well as the expectation of the potential profit or loss included in the fair value calculation?				
B.5.23 Has the project participant supplied unprotected and traceable spreadsheet versions of all investment analysis?	DR	The project participant supplied unprotected and traceable spreadsheet versions of all investment analysis.	CAR 10	OK
B.5.24From the investment analysis provided, is it possible to reproduce the results?	DR	Calculations have been reproduced by AENOR to reach same results.	CAR 10	OK
B.5.25 Costs of financing expenditures (i.e. loan repayments and interest) should only be included in the cashflow as costs if an equity IRR is used, not if a project IRR is	DR	Costs of financing expenditures (i.e. loan repayments and interest) have been included in the cashflow as costs as an equity IRR is used. Interest payments have been taken into account in the calculation of tax.	CAR 10	OK

used. Are interest payments taken into account in the calculation of tax, if the benchmark is for after-tax comparison?				
B.5.26 If an Equity IRR has been used, is the debt portion of the investment cost included as a cash outflow? *(*i.e. as well as interest costs and principle repayments – double counting*)*	DR	Only the portion of investment costs which is financed by equity is considered as the net cash outflow. The interest costs and principal repayments are not double counting.	CAR 10	OK
B.5.27 Sensitivity analysis*:* a. Are all variable and critical costs and revenues in the analysis included in the sensitivity analysis? b. Is the assessed range of variations reasonable in light of the reliability of the estimated input values and the likely range? c. Is the sensitivity analysis possible to reproduce?	DR	**CAR 11. The sensitive analysis shall be performed according to the requirements of the tool for demonstration of additionality and considering the guidelines on investment analysis.** A complete sensitivity analysis has been provided in the PDD which also includes appropriate explanations regarding the possibility to reach the benchmark for main parameters. AENOR has reproduced the calculations to reach same results. CAR is closed.	CAR 11	OK
B.5.28 Are input values used in all the investment analysis valid and applicable at the time of the	DR	**CAR 12- Evidence about the appropriateness of the input values and assumptions used in the investment analysis shall be also provided. In addition, input values used in the investment analysis should be valid**	CAR 12	OK

investment decision taken by the project participant? Is the time of investment decision appropriately justified by evidences?		**and applicable at the time of the investment decision.** Input values used in the financial model are detailed in the PDD and spreadsheet. Sources have been also detailed and provided to AENOR. All of them are valid and applicable at the investment decision date. CAR is closed.		
B5.29 Does the PDD present the investment analysis in a transparent manner and provide all the relevant assumptions *(*preferably in the CDM-PDD form, or in separate annexes to the CDM-PDD*)*	DR	The PDD presents the investment analysis in a transparent manner and provide all the relevant assumptions.	CAR 9,10,11	OK
B.5.30 Have the listed input values been consistently applied in all calculations?	DR	The listed input values has been consistently applied in all calculations.	CAR 9,10,11	OK
B.5.31 Are all references made in the investment analysis correctly referenced/ sourced? Have these sources been verified?	DR	All references used in the financial model have been detailed in the PDD and evidence were provided to AENOR.	CAR 9,10,11	OK
B.5.32 Have financial calculations been verified by: assessing all parameters and assumptions against the available evidence and expertise; crosschecking the parameters against 3rd party or publicly available sources; reviewing feasibility reports, public announcements and annual financial	DR	Financial calculations have been verified by assessing all parameters and assumptions against the available evidence and our sectoral expertise; and crosschecking the parameters against 3rd party or publicly available sources.	CAR 9,10,11	OK

reports; assessing the correctness of computations and the sensitivity analysis?				
B.5.33 Have values from a feasibility study report (FSR) approved by national authorities been used? If so: a. Has the FSR been the basis of the decision to proceed with the investment in the project? How has this been verified? b. Are the values used in the PDD and associated annexes valid and consistent with the FSR? c. At the time of the investment decision, are the input values from the FSR valid and applicable (based on specific local and sectoral expertise and knowledge)?	DR	Not applicable. The project activity does not use a FSR as a basis of the decision.	OK	OK
B.5.34. In case of applying step 3 (barrier analysis) of the additionality tool: Is a complete list of barriers developed that prevent the different alternatives to occur?	DR	The final PDD does not consider barrier analysis to demonstrate the additionality of the project.	OK	OK
B.5.35. Do any such identified barriers have a clear and direct impact on the financial returns of the	DR	**CAR 13 . PP shall apply the tool for demonstration of additionally and guidelines on barriers for correctly demonstrate the applicability of barriers with direct impact on the financial returns. Moreover, evidence**	CAR 13	OK

project activity? (these are not barriers and should be assessed in the investment analysis)		**shall be provided for justifying the appropriateness of identified barriers.** The final PDD does not consider barrier analysis to demonstrate the additionality of the project. Combined tool is used to demonstrate additionality. CAR is closed		
B.5.36 Are the identified barriers real and substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics?	DR	The final PDD does not consider barrier analysis to demonstrate the additionality of the project.	CAR 14	OK
B.5.37. Is it clearly explained how approval of the project in the CDM would enable the proposed project activity to surmount the barrier? Is the rationale reasonable and justified with evidence?	DR	**CAR 14** **The PDD shall describe how the CDM alleviates the identified barriers from occurring.** The final PDD does not consider barrier analysis to demonstrate the additionality of the project. CAR is closed	CAR 14	OK
B.5.38. Does the review of relevant background information on the nature of the company(ies) and entitiy(ies) involved in the financing and implementation of the project sufficiently justify that the barriers related to the lack of access to capital, technologies and skilled labour are real?	DR	The final PDD does not consider barrier analysis to demonstrate the additionality of the project.	CAR 13	OK

B.5.39 Has common practice analysis been undertaken?	DR	Common practice has been carried according to the steps quoted in the applicable version of the Combined tool.	OK	OK
B.5.40 Is the geographical and temporal scope of the common practice analysis appropriate for the assessment related to the project activity's technology or industry type?	DR	Yes, the geographical and temporal scope of the analysis is appropriate.	OK	OK
B.5.41 Have all comparable projects been included in the common practice analysis If some projects have been excluded as non comparable, is the exclusion reasonable and justified?	DR	The project is the first of its kind in the country according to evidence provided by DNA and checked by AENOR. However, the common practice analysis has been carried out following all steps of the combined tool.	OK	OK
B.5.42 Have similar and operational projects other than CDM project activities been undertaken in the region?	DR	No other similar and operational projects have been undertaken in the host country.	OK	OK
B.5.43 Are these widely observed and commonly carried out? If so: a. How have the essential distinctions with the proposed CDM project activity been assessed? b. Are such distinctions justified with	DR	No other similar and operational projects have been undertaken in the host country.	OK	OK

sufficient evidence? c. If inaccessibility of data is the reason why some projects have not been included in the analysis, is justification of this claim provided?				
B.5.44 Overall, is the proposed CDM project activity considered common practice?	DR	The proposed project is not common practice in then host country.	OK	OK
B.5.45. Is it demonstrated/justified that the project activity is not a likely baseline scenario?	DR	It is demonstrated that the project activity is not a likely baseline scenario.	OK	OK
B.6. Emissions reductions				
*B.*6.1. *Explanation of methodological choices*				
B.6.1.1. Is it explained how the procedures provided in the methodology are applied by the proposed project activity?	DR	**CAR 4: In section B.6.1 (Explanation of methodological choices) It shall be explained how the procedures, in the approved methodology to calculate project emissions, baseline emissions, leakage emissions and emission reductions are applied to the proposed project activity.** **It shall be clearly stated which equations will be used in calculating emission reductions. It shall be explained and justified all relevant methodological choices** The final version of the PDD explains correctly the procedures provided in the methodology. This CAR is closed	**CAR 4**	OK
B.6.1.2. Is every selection of options offered by the methodology correctly	DR	Every selection of options offered by the methodology is correctly	OK	OK

justified and is this justification in line with the situation verified on-site?		justified and is in line with the situation verified on-site		
B.6.1.3. Are the formulae required for the determination of emissions reductions correctly presented and used? *(Open excel, trazability of data, etc)*	DR	Yes, the formulae required for the determination of emissions reductions are correctly presented and used in the PDD and the spreadsheet	OK	OK
B.6.1.4 Are all the data and assumptions listed in the PDD and are appropriate and calculations result in a conservative estimate of emission reductions?	DR	All sources of data have been given in the emission reduction calculation sheet and evidence has been provided to the validation team.	OK	OK
B.6.2. Data and parameters that are available at validation				
B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology? Is all the information required for each parameter included?	DR	**CAR 5: Parameters included in section B.6.2. (Data and parameters that are available at validation) do not correspond to which are included in the approved baseline and monitoring methodology and methodological tools applied to the project activity** The list of parameters presented in the latest version of the PDD is considered to be complete with regard to the requirements of the applied methodology and tools. This CAR is closed	OK	OK

B.6.2.2. Are all the data derived from official data sources or replicable records and have been correctly quoted?	DR	All data used in calculations are from official data sources and they are correctly quoted.	OK	OK
B.6.2.3. For parameter: OXtop_layer a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.4. For parameter: $F_{CH4,BL,x-1}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.5. For parameter: GWP_{CH4} a. Title in line with Methodology? b. Data unit correctly expressed?	DR	a) to h) are OK.	OK	OK

c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2.6. For parameter: NCV_{CH4} a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.7. For parameter: η_{PJ} a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.8. For parameter: $W_{j,x}$	DR	a) to h) are OK.	OK	OK

a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2.9. For parameter: ϕ_y a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.10. For parameter: OX a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly	DR	a) to h) are OK.	OK	OK

described?				
B.6.2.11. For parameter: F a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.12. For parameter: $DOC_{f,default}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.13. For parameter: $MCF_{,default}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified?	DR	a) to h) are OK.	OK	OK

g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2.14. For parameter: DOCj a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.15. For parameter: k_j a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.16. For parameter: f_y a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?)	DR	a) to h) are OK.	OK	OK

e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2.17. For parameter: $EF_{grid,CM,y}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.18. For parameter: $TDL_{k,y}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.19. For parameter: $SPEC_{flare}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description?	DR	a) to h) are OK.	OK	OK

d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2..20. For parameter: Ru a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.21. For parameter: MM,i a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.22. For parameter: $MM_{,k}$ a. Title in line with Methodology?	DR	a) to h) are OK.	OK	OK

b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.6.2.23. For parameter: Pn a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.6.2.24. For parameter: Tn a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK

B.6.2.25. Will the data and parameters result in a conservative estimate of emissions reductions?	DR	Yes, the data and parameters result in a conservative estimate of emission reductions.	OK	OK
B.6.3 Calculation of GHG Emission Reductions – Baseline Emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*				
B.6.3.1 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	DR	Yes, the calculations are documented in a complete and transparent manner.	OK	OK
B.6.3.2. Have conservative assumptions been used when calculating the baseline emissions?	DR	Conservative assumptions have been used in calculations.	OK	OK
B.6.3.3 Are uncertainties in the baseline emission estimates properly addressed?	DR	Yes, they have been properly addressed.	OK	OK
B.6.3.4. Is additional background information on baseline data provided in Annex 3 of the PDD? Is	DR	Yes, additional background information on baseline data is provided in Annex 3 of the PDD, and is consistent with data presented by other	OK	OK

this information consistent with data presented by other sections of the PDD?		sections of the PDD.		
B.6.4 Calculation of GHG Emission Reductions – Project Emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*				
B.6.4.1 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	DR	**CL 1 It shall be clarified whether the calculation of the emission factor of the electricity grid was done with the most recently data available at the moment of the publication of the PDD for the Global Stakeholder Consultation.** Evidence of the correct selection of data has been provided , the calculations are documented in a complete and transparent manner. This CL is closed	**CL 1**	OK
B.6.4.2. Have conservative assumptions been used when calculating the project emissions?	DR	Conservative assumptions have been used in calculations.	OK	OK
B.6.4.3 Are uncertainties in the project emission estimates properly addressed?	DR	Yes, they have been properly addressed.	OK	OK
B.6.5. Calculation of GHG Emission Reductions – Leakage				

It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.				
B.6.5.1 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	DR	Not applicable. No leakage is applicable according to the methodology applied.	N/A	N/A
B.6.5.2. Have conservative assumptions been used when calculating the leakage emissions?	DR	Not applicable. No leakage is applicable according to the methodology applied.	N/A	N/A
B.6.5.3. Are uncertainties in the leakage emission estimates properly addressed?	DR	Not applicable. No leakage is applicable according to the methodology applied.	N/A	N/A
B.6.6. Ex-ante calculation of emission reductions				
B.6.6.1. Are the GHG calculations documented in a complete and transparent manner? Are all the calculations correct?	DR	Yes, the calculations are documented in a complete and transparent manner.	OK	OK
B.6.6.2. Is the data provided in this section consistent with data as presented in other chapters of the	DR	**CAR 6 The table with the summary of the ex ante estimation of emission reductions included in PDD does not correspond to the model included in the approved PDD Form.**	**CAR 6**	OK

PDD?		Last version of PDD has been updated accordingly. Data and tables are consistent along the PDD. This CAR is closed		
B.6.7. Summary of the ex-ante estimation of emission reductions				
B.6.7.1. Will the project results in fewer GHG emissions than the baseline scenario?	DR	Yes, the project will result in a fewer GHG emissions than the baseline.	OK	OK
B.6.7.2. Are the emissions reductions projected in line with the envisioned time schedule for the project' implementation and the indicated crediting period?	DR	Yes, the emissions reductions projected are in line with the time schedule for the project' implementation and the indicated crediting period.	OK	OK
B.7. Application of the monitoring methodology and description of the monitoring plan				
B.7.1. Description of the monitoring plan				
B.7.1.1 Is the monitoring plan documented according to the approved methodology and relevant tools and in a complete and transparent manner?	DR	Yes. Monitoring Plan has been completed according to the monitoring methodology. Roles and responsibilities, data collection and processing, accuracy and calibration of equipment as well as QA/QC procedures have been addressed in the PDD in a complete and transparent manner	OK	OK
B.7.1.2. Does the monitoring methodology provide a consistent approach in the context of all	DR	Yes, a consistent approach is provided in the PDD.	OK	OK

parameters to be monitored and further information provided in the PDD?				
B.7.1.3. Does the monitoring plan provide a clear description of the organization structure involved in monitoring activities and their responsibilities?	DR	Yes, the structure is clear and responsibilities are well defined.	OK	OK
B.7.1.4. If applicable: Does annex 4 provide useful information enabling a better understanding of the envisioned monitoring provisions?	DR	Yes, the PDD provides a schematic diagram with the location of the monitoring equipment and related monitoring parameters.	OK	OK
B.7.1.5. Is the registration, monitoring, measurement and reporting procedure defined?	DR	Yes, the registration, monitoring, measurement and reporting procedure is defined appropriately.	OK	OK
B.7.2 Compliance of the monitoring plan with the approved methodology				
B.7.2.1 Is the list of parameters considered to be complete with regard to the requirements of the applied methodology? Are all of them clearly described in the monitoring plan and in accordance with the methodology and tools?	DR	Yes, the list of parameters is considered to be complete with regard to the requirements of the applied methodology and tools. They are clearly described.	OK	OK

B.7.2.2. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary during the crediting period?	DR	The monitoring plan provides for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary during the crediting period.	OK	OK
B.7.2.3. For parameter: Operation hours of the power plant a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.4. For parameter: $EG_{PJ,y}$ a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.5. For parameter: EGEC,y a. Title in line with Methodology? b. Data unit correctly expressed?	DR	a) to h) are OK.	OK	OK

c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.7.2.6. For parameter: Vt,db (before flare & engine) a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.7. For parameter: Vi,t,db (before flare & engine) a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.8. For parameter: Tt(before flare & engine) a. Title in line with Methodology?	DR	a) to h) are OK.	OK	OK

b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.7.2.9. For parameter: Pt (before flare & engine) a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.10. For parameter: VRG,m a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.11. For parameter: vi,RG,m a. Title in line with Methodology? b. Data unit correctly expressed?	DR	a) to h) are OK.	OK	OK

c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.7.2.12. For parameter: TEG,m a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.13. For parameter: vO2,EG,m a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.14. For parameter: fcCH4,EG,m a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and	DR	a) to h) are OK.	OK	OK

appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.7.2.15. For parameter: Flamem a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.16. For parameter: Maintenancey a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.2.17. For parameter: Managment of SWDS a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and	DR	a) to h) are OK.	OK	OK

appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?				
B.7.2.18. For parameter: TDL a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?	DR	a) to h) are OK.	OK	OK
B.7.3 Implementation of the Monitoring Plan				
B.7.3.1 Do the means of monitoring of each of the parameters included in the plan complies with the requirements of the methodology?	DR	Yes, all the parameters included in the plan comply with the requirements of the methodology.	OK	OK
B.7.3.2. Is the measurement equipment described and deemed appropriate?	DR	Yes, the measurement equipment is described appropriately.	OK	OK
B.7.3.3. Are procedures identified for	DR	Procedures for maintenance and installation of equipment, as well as for calibration, are included in the monitoring plan and deemed to be	OK	OK

maintenance of monitoring equipment and installations? Are provisions regarding the calibration intervals included in the monitoring plan?		correct.		
B.7.3.4. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements or lack of data?	DR	The accuracy class of the meters employed by the project is considered appropriate	OK	OK
B.7.3.5. Is the monitoring Plan sufficient to ensure the verification of a proper implementation of the monitoring plan?	DR	Yes, the monitoring plan is considered to be sufficient.	OK	OK
B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)				
B.8.1. Is there any indication of a date when the baseline and monitoring was determined?	DR	Date of completion of the application of the baseline study has been addressed in the PDD.	OK	OK
B.8.2. Is this consistent with the time	DR	Yes, this is consistent with the time line of the project's history.	OK	OK

line of the PDD history?				
B.8.3. Is the information on the person(s)/entity(ies) responsible for the application of the baseline and monitoring methodology provided consistent with the actual situation?	DR I	Yes, it is.	OK	OK
B.8.4. Is information provided whether this person / entity is also considered a project participant? *(Guidelines for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodologies (CDM-NM)*	DR	Yes, the PDD identifies clearly that the person/entity responsible for the application of the baseline and monitoring methodology is not a project participant listed in Annex 1.	OK	OK
C. DURATION OF THE PROJECT ACTIVITY / CREDITING PERIOD				
C.1. Duration of the project activity				
C.1.1. Are the project's starting date and operational lifetime clearly	DR	Last version of PDD has been corrected. The starting date of the project activity is 01 June 2011 and the expected operation lifetime of the project activity is 14 years at minimum. This is considered correct. This	CAR 7	OK

defined and reasonable?		CAR is closed		
C.2. Choice of the crediting period and related information				
C.2.1. Is the assumed crediting period clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max. 10 years)? And, is the starting date of the crediting period corrected considered?	DR	**CAR 8: The expected operational lifetime of the project activity is not coherent neither with the starting date of the project activity nor with the starting date and the length of the crediting period** The last version of the PDD has been corrected. The assumed crediting period is a renewable crediting period of 7 years. The starting date of the crediting period is reasonable. This CAR is closed.	**CAR 8**	OK
D. ENVIRONMENTAL IMPACTS				
D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts				
D.1.1. Has the analysis of the environmental impacts of the project activity been sufficiently described in the PDD?	DR	Yes, an analysis of environmental impacts has been described in the PDD.	OK	OK
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes,	DR	A full Environmental Impact Assessment was not required. An Environmental Management Plan (EMP) was required and has been submitted and approved. The EMP has been approved and reliable	OK	OK

has an EIA been approved?		evidence have been provided to the validation team		
D.1.3. Will the project create any adverse environmental effects? Has any environmental impact identified as significant?	DR	The project has adverse environmental effects, but there are none that have been considered significant.	OK	OK
D.1.4. Are transboundary environmental impacts identified in the analysis?	DR	No transboundary impacts have been identified.	OK	OK
D.1.5. Does the project comply with any other environmental legislation in the host country?	DR	The project activity complies with the environmental legislation in Guatemala.	OK	OK
D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party.				
D.2.1. Have the identified environmental impacts been addressed in the PDD sufficiently?	DR	None of the potential environmental impacts of the project has been assessed as significant.	OK	OK
E. STAKEHOLDERS' COMMENTS				
E.1. Brief description how comments by local stakeholders have been invited and compiled				

E.1.1. Have relevant local stakeholders been consulted prior to the publication of the PDD? Is the exact date of the consultation process included in the PDD?	DR	The local stakeholders' consultation process has been performed prior to the GSC and the date is clearly stated in the PDD. Relevant stakeholders have been consulted.	OK	OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	DR	Different appropriate media have been used to invite local stakeholders	OK	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	DR	The stakeholder consultation process has been carried out in accordance with the Guatemala DNA procedures	OK	OK
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	DR	Yes, the final PDD includes the correct information about the stakeholders consultation carried out prior the publication of the PDD, including the minutes of the meeting, a summary of the comments received and list of participants.	OK	OK
E.2. Summary of the comments received				

E.2.1. Is a summary of the stakeholder comments received provided?	DR	Yes, a summary of the stakeholders' comments has been included in of the PDD	OK	OK
E.3. Report on how due account was taken of any comments received				
E.3.1. Has due account been taken of any stakeholder comments received?	DR	No concerns with regard to the project activity were raised	OK	OK

*MoV/Ref: Means of Validation and references of background documents.

ANNEX 2: CERTIFICATES OF QUALIFICATION VALIDATION AND TECHNICAL REVIEW TEAM

AENOR Asociación Española de Normalización y Certificación

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Zone 3 Landfill Gas Project"

Madrid, 26th November 2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039.07, and in relation with the validation process of the above mentioned project activity:

Name: **José Luis Fuentes Pérez**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA13.1: Waste handling and disposal

José Luis TEJERA OLIVER
CDM Operational Director

AENOR Asociación Española de Normalización y Certificación

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Zone 3 Landfill Gas Project"

Madrid, 26th November 2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039.07, and in relation with the validation process of the above mentioned project activity:

Name: **Luis Robles Olmos**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)
TA13.1: Waste handling and disposal

José Luis TEJERA OLIVER
CDM Operational Director

AENOR Asociación Española de Normalización y Certificación

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Zone 3 Landfill Gas Project"

Madrid, 26th November 2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039.07, and in relation with the validation process of the above mentioned project activity:

Name: **Pablo Taboada Utrera**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA13.1: Waste handling and disposal

José Luis TEJERA OLIVER
CDM Operational Director

AENOR Asociación Española de Normalización y Certificación

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Zone 3 Landfill Gas Project"

Madrid, 26th November 2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039.07, and in relation with the validation process of the above mentioned project activity:

Name: **Mª Carmen González Galán**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)
TA13.1: Waste handling and disposal

José Luis TEJERA OLIVER
CDM Operational Director

AENOR Asociación Española de Normalización y Certificación

CERTIFICATE OF QUALIFICATION

Subject: Validation and Technical Review Team for "Zone 3 Landfill Gas Project"

Madrid, 26th November 2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039.07, and in relation with the validation process of the above mentioned project activity:

Name: **José Antonio Gesto Vilacoba**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA13.1: Waste handling and disposal

José Luis TEJERA OLIVER
CDM Operational Director