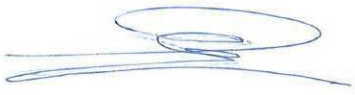
Validation report form for renewal of crediting period for CDM project activities

(Version 01.0)

VALIDATION REPORT FOR RENEWAL OF CREDITING PERIOD (RCP)	
Title of the project activity	URBAM/ARAUNA – Landfill Gas Project (UALGP)
Reference number of the project activity	1247
Number and duration of the next crediting period	2nd 7-year crediting period from 27/10/2015 to 26/10/2022
Version number of the validation report for RCP	Version 3.1
Completion date of the validation report for RCP	09/11/2017
Version number of PDD to which this report applies	Version 16
Project participant(s)	URBAM – Urbanizadora Municipal S.A. Araúna Participacões e Investimentos Ltda First Climate (Switzerland) AG
Host Party	Brazil
Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope: 13 - Waste handling and disposal Selected Methodology: ACM0001 - "Flaring or use of landfill gas" (version 18.0)
Estimated annual average GHG emission reductions or net anthropogenic GHG removals in the next crediting period	147,185 tCO_2e per year
Name of DOE	Applus+ certification LGAI Technological Center, S.A. (Applus+ LGAI)
Name, position and signature of the approver of the validation report for RCP	Juan Sendín Caballero  LGAI Technological Center S.A (Applus+) B.U. Systems Certification Area Manager

SECTION A. Executive summary

LGAI Technological Center, S.A. (hereafter referred to as Applus+ LGAI) was commissioned by URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda (hereinafter referred to as PP) to perform the validation assessment of the renewal of 7-year crediting period for the registered CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)" (hereinafter referred to as the project activity). The project activity is located in Brazil and it was previously registered under the CDM by UNFCCC on 14/10/2007 (UNFCCC reg. no: 1247) under a renewable crediting period of 7 years. The 1st 7-year crediting period of the project activity encompassed the period from 27/10/2008 to 26/10/2015. The host-country project participant and project owners URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda successfully notified the Secretariat of the CDM Executive Board (CDM-EB) on 09/10/2016 of its intention to request a renewal of a crediting period of the registered CDM project activity by submitting a draft version of the updated PDD (version 12, dated 09/10/2016 /40/) and informing of their selection of a DOE for performing related CDM validation services.

Project design:
The design of the project activity encompasses collection and destruction (through combustion in high temperature enclosed flare under efficient and controlled conditions) of landfill gas (LFG) at the URBAM landfill. The project design currently does not encompass any utilization of collected LFG as fuel for electricity generation, heat generation or any other means of utilization. The project activity thus promotes destruction of methane (CH_4) that otherwise would be emitted into the atmosphere in the absence of the project activity (baseline scenario). LFG (which is rich in CH_4) has been historically generated at the URBAM landfill as a result of the anaerobic decomposition of municipal solid waste (MSW) disposed in such landfill through the utilization of appropriate MSW landfilling techniques and procedures.
As per the project design, all electricity demand of the project activity is met through imports of electricity sourced from the National Electricity Grid of Brazil. While no backup captive off-grid electricity generator is used, whenever supply of grid-sourced electricity is interrupted, the project's operation is thus temporarily interrupted.

The URBAM landfill is located in the Municipality of São José dos Campos. São José dos Campos is a part of São Paulo State, which is located in the South-East region of Brazil.

This Validation Report summarizes the findings from the validation assessment performed on the basis of UNFCCC criteria for CDM, as well as criteria given by the latest version of the CDM Validation and Verification Standard for Project Activities (CDM-VVS for PA) (version 01.0) /1/, CDM Project Cycle Procedure for Project Activities (CDM-PCP for PA) (version 01.0) /16/ and CDM Project Standard for Project Activities (CDM-PS for PA) (version 01.0) /15/.

Scope and objective of the validation assessment for renewal of crediting period:
The scope of the validation of the renewal of crediting period is to provide an independent and objective validation assessment of the updated Project Design Document (PDD) for the project activity (PDD version 16 dated 03/11/2017) /2/ (hereinafter referred to as updated PDD) relating to the baseline, estimated emission reductions, design of the monitoring plan and starting date of the 2nd 7-year crediting period by using the most recent version of the applicable CDM baseline and monitoring methodology + methodological tools applicable to the project activity + applicable CDM guidance and rules. The validation opinion provided by Applus+ LGAI is based on the assessment of the updated PDD /2/ through applying standard auditing techniques including, but not limited to, document reviews, follow up actions (e.g. telephone or e-mail interviews) and also the review of the applicable CDM baseline and monitoring methodology + applicable methodological tools and underlying formulae and calculations. The validation assessment was carried out in accordance with the latest version of the CDM VVS for PA (version 01.0) /1/ and the CDM-PS for PA (version 01.0) /15/ including an assessment of the following issues:

a) The impact of eventually new relevant national and/or sectoral policies and circumstances on the baseline scenario for the project activity by taking into account relevant guidance

from the Board with regard to renewal of the crediting period of the registered CDM project activity at the time of requesting renewal of crediting period of the project activity;

b) The correctness of the application of the CDM baseline and monitoring methodology selected for the determination of the continued validity of the baseline (ACM0001 (version 18.0) /5/) + methodological tools applicable to the project activity or its update, and the estimation of emission reductions for the applicable crediting period of the registered CDM project activity.

c) The correctness of the designed monitoring plan valid for the 2nd 7-year crediting period (based on the application of ACM0001 (version 18.0) /5/ + methodological tools applicable to the project activity).

The objective of the validation assessment for renewal of crediting period is to have an independent evaluation being performed by a Designated Operational Entity (DOE) of the updated version of the PDD of a registered project activity for a subsequent 7-year crediting period in terms of its compliance with relevant UNFCCC requirements for the renewal of the crediting period (as per the latest guidance from the CDM Executive Board, as set out in the CDM-PS for PA /15/, CDM-PCP for PA /16/, and other relevant guidance).

The validation assessment aims to confirm whether the previously derived baseline scenario for the registered project activity is still valid or has been appropriately updated by taking into account of new data if applicable. In particular, the project's baseline, monitoring plan and the project's compliance with relevant UNFCCC requirements and host Party criteria are validated in order to confirm the overall correctness of the application of the approved baseline methodology, including estimation of the emission reductions to be achieved by the project activity within the new 7-year crediting period.

In particular, to reassess the validity of the original baseline or its update (through an assessment of the impact of new relevant national and/or sectoral policies and circumstances on the baseline, and the correctness of the application of an approved baseline methodology) for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable new crediting period.

The validation will result in a conclusion as to whether the request for renewal of crediting period should be submitted to the CDM Executive Board. The final decision on whether to renew the crediting period rests with the CDM Executive Board.

The validation is not meant to provide any consulting towards the project participants of the registered project activity. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

The validation assessment for renewal of crediting period was carried out on the basis of the following rules and requirements that are applicable for the CDM project activity:

- Article 12 of the Kyoto Protocol /6/,
- Guidelines for the implementation of Article 12 of the Kyoto Protocol /6/ as presented in the Marrakech Accords under decision 3/CMP.1 /7/ and subsequent decisions made by the Executive Board and COP/MOP,
- Other relevant rules, including applicable and valid host country legislation/regulations,
- The CDM Validation and Verification Standard for Project Activities (CDM-VVS for PA) version 01.0 /1/,
- The monitoring plan of the updated PDD /2/ applicable for the 2nd 7-year renewable crediting period
- The CDM baseline and monitoring methodology ACM0001 "Flaring or use of landfill gas" (version 18.0) /5/,
- Updated version of the PDD valid for the 2nd 7-year crediting period /2/,

- The following methodological tools, which are referred in the PDD:

    - "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 02.0) /11/

    - "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/

    - "Project emissions from flaring" (version 02.0.0) /10/

    - "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/

    - "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /12/

    - "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (version 03.0.1). /12/

    - "Emissions from solid waste disposal sites" (version 08.0). /14/

Validation process:
The validation process is an independent assessment performed by a Designated Operational Entity (DOE) that is based on applicable and valid guidelines described in the latest version of the CDM-VVS for PA /1/. In addition to that, standard auditing techniques have been applied by the validation team appointed by Applus+ LGAI As part of the validation assessment, the validation team initially performed a desk review on all validation related documents, followed by interviews with representative of the project participants URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda.

The performed validation assessment encompassed (i) comprehensive review of the latest version of the registered PDD valid for the currently expired 1st 7-year crediting period (from 27/10/2008 to 26/10/2015) (PDD version 11, dated 03/01/2014) /3/, (ii) review of the updated PDD for the 2nd 7-year renewable crediting period + supporting documents; (iii) conduction of interviews with representatives of the PP; (iv) resolution of all identified outstanding issues (raised Corrective Action Request (CAR) and Clarification Requests (CL)) and, finally, (v) issuance of the Validation Report.

As part of the validation process, the validation findings and observations from the performed document desk review and interviews with the PP. For all identified inconsistencies and lack of clarity, related findings (list of outstanding issues) are raised. The next steps are to close out the findings through direct communication with the project participant(s) and receipt of updated version of the PDD /2/ and/or supporting documents and finally preparing the Validation Report. The draft version of the Validation Report undergoes a technical review by Applus+ LGAI prior to its submission to the CDM-EB.

Validation assessment conclusion and summary of the validation opinion:
As part of the conducted validation assessment, some outstanding issues were identified by the validation team appointed by Applus+ LGAI. Such outstanding issues were sufficiently and appropriately addressed by the project participants URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda through the compilation of a revised version of the updated PDD /2/ for the 2nd 7-year crediting period of the project activity.

In summary, it is the opinion of Applus+ LGAI that the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)", as described in the updated version of the PDD (version 16 dated 03/11/2017) /2/, meets all relevant UNFCCC requirements for the renewal of its 7-year crediting period (including completion requirements for the PDD) and correctly applies the CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools. Applus+ LGAI thus requests the CDM Executive Board (CDM-EB) to renew the 7-year crediting period for the project activity.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader /Technical / Financial Expert	EI	Díaz	Miguel Cortés	Applus + LGAI	Y	Y	Y	Y
2.	Team Leader	OR	Ahirwar	Vivek Kumar	GCEES	Y	N/A	Y	Y

Note: IR: Internal Resources, EI: External Individuals, OR: Outsourced Resource.

Demonstration how the validation team appointed by LGAI Tech. Center S.A. meets the competence required for the performance of the verification assessment is included in Appendix 2.

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	EI	Xue	Denny	Applus+ LGAI
2.	Approver	IR	Sendín	Juan	Applus+ LGAI

Note: IR: Internal Resources, EI: External Individuals, OR: Outsourced Resource.

Demonstration how the appointed verification team meets the competence required for the performance of the verification assessment is included in Appendix 2.

SECTION C. Means of validation

C.1. Desk review

A detailed document reviews on the initial PDD /2/, applied CDM baseline and monitoring methodology /5/ and applicable methodological tools and all other associated documentation and references were performed by the validation team appointed by Applus+ LGAI through application of standard auditing techniques in order to assess the quality of information provided. The performed document review encompassed the following:

- Comprehensive review of data and information to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the updated PDD /2/ and information from other sources (not limited to those provided by the project participants)
- Reference to available information relating to other project based initiatives and/or technologies identical or similar to the one adopted by the project activity
- Review and evaluation, based on the applied CDM baseline and monitoring methodology/5/ and applicable methodological tools, of the appropriateness/correctness of formulae, calculation approaches and monitoring approaches as referred in the updated PDD /2/.

The following documents were assessed:

- PDD applicable to the currently expired 1st 7-year crediting period /3/
- Validation Report for the project activity /8/
- Validation Opinion Report for the latest performed validation assessments for post-registration changes of the project activity /39/.
- Verification Reports and Monitoring Reports for the previously performed periodic verifications within the currently expired 1st 7-year crediting period for the project activity /22/ /27/
- Relevant decisions, clarifications and guidance from the CMP and the CDM-EB
- Relevant regional and national and sectoral policies dealing with solid waste and landfill gas (LFG) management

A list of all documents reviewed or referred to in the course of this validation is included in Appendix 3.

C.2. On-site inspection

Duration of on-site inspection: 04/11/2017				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Opening meeting for the on-site visit. During such initial meeting the validation team was introduced, it was confirmed/outlined the objectives and scope of the on-site visit and it was confirmed the previously planned agenda for such visit. The representative of the project participants URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda also introduced himself and completed/signed the Applus+ LGAI list of participants form for the on-site visit.	Operation control room of the project activity	04/11/2017	Miguel Cortes
2.	Visual inspection of the infrastructure encompassed by the project activity in order to confirm whether the general descriptions of the project design, applied technology and project location details as added in the updated PDD are under conformance with all infrastructure installed and/or in place as part of the project activity (LFG collection wells and pipeline net work, LFG flaring infrastructure, monitoring instruments/equipment, etc.)	Areas within the landfill covered by the project's LFG collection infrastructure + area where the project's LFG destruction infrastructure is installed + operation control room of the project activity	04/11/2017	Miguel Cortes
3.	Visual inspection of the infrastructure encompassed by the project activity in order to confirm whether the identified project boundary and the schematic flow diagram (delineating the project activity (equipment, parameters to be monitored, and GHG included in the project boundary)) as added in the updated PDD is under conformance with all infrastructure installed and/or in place as part of the project activity (LFG collection wells and pipeline net work, LFG flaring infrastructure, monitoring instruments/equipment, etc.)	Areas within the landfill covered by the project's LFG collection infrastructure + area where the project's LFG destruction infrastructure is installed + operation control room of the project activity	04/11/2017	Miguel Cortes
4.	Visual inspection of the project's data collection and recording infrastructure encompassed by the project activity in order to confirm whether electronically recording for continuously measured LFG related parameters as well as measurements related to the exhaust gas of the flares (temperature in the exhaust gas of the flares and other parameters related to flare operational conditions) via appropriate data logger / data acquisition system (located within the site boundary) + all other required additional monitoring as part of the implementation and application of the monitoring plan for the project activity.	Operation control room of the project activity	04/11/2017	Miguel Cortes
5.	Visual inspection and review on available documented working instructions in order	Operation control room of	04/11/2017	Miguel Cortes

	to confirm the existence of procedures for data recording and archiving as part of the application of the monitoring plan for the project activity.	the project activity		
6.	Visual inspection and review on available documented working instructions in order to confirm the existence of procedures for maintenance, testing and calibration of monitoring instruments/equipment as part of the implementation and application of the monitoring plan for the project activity.	Operation control room of the project activity	04/11/2017	Miguel Cortes
6.	Visual inspection and review on available documented working instructions in order to confirm the existence of an operational and management structure relying on trained staff (incl. contractors) with responsibilities clearly defined as part of the implementation and application of the monitoring plan for the project activity.	Operation control room of the project activity	04/11/2017	Miguel Cortes

DOE Remark-Note on site visit: The site visit was not done during previous submission as Applus+ LGAI judged conducting a physical on-site visit (as part of validation assessment) as not necessary/required. This was under full conformity with the paragraphs 71-77 of CDM-VVS (version 09.0), however due to change of Version from VVS (version 09) to VVS, PA (version 01) paragraphs 30a and 405, the requirement of conduction of physical on-site visit become mandatory for this project), Furthermore, based on site inspection, DOE assessment team able to confirmed that there is no difference /changes observed from registered project activity, all information are found same and consistent .

C.3. Interviews

No.	Interviewed			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Barbosa	Nuno	UniCarbo - Energia e Biogás Ltda.	28/06/2017	Implementation and operational status of the project activity + confirmation of non-existence of post-registration changes valid for the project activity in the particular context of its renewal of the 7-year crediting period. Meeting of applicability conditions of the selected CDM baseline and monitoring methodology + applicable methodological tools. Applicable national policies and regulations and their eventual impacts in terms of changing of the previously derived baseline scenario and baseline emissions. Application of updated and/or new values for previously existent or new ex-ante determined (fixed) parameters. Design of the monitoring plan (as per applicable requirements of the selected CDM baseline and monitoring methodology + applicable methodological tools). The performed corrections in the Monitoring Report in order to address Corrective Action Requests (CARs) raised as outcome of the validation assessment.	Vivek Kumar Ahirwar
2.	Fonseca	Ailton	Araúna Participacoes Investimentos Ltda	04/11/2017		Miguel Cortes

C.4. Clarification requests, corrective action requests and forward action requests raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	-	-	-
Application of baseline and monitoring methodology and standardized baseline	-	CAR 01	-
Validity of original baseline or its update	-	-	-
Estimated GHG emission reductions or net anthropogenic GHG removals	-	-	-
Validity of monitoring plan	-	-	-
Crediting period	-	-	-
Project participants	-	CAR 02	-
Others	-	-	-
Total	-	2	-

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	As per paragraphs 406 and 415 (a) (i) and (ii) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI checked if PP used a later valid version of the PDD form for completing the updated PDD /2/. The validation team also determined whether project design information transferred to such latest version of the PDD form was materially the same as that included in the PDD applicable for the 1st 7-year crediting period. The validation team also determined whether PP completed the updated the PDD /2/ by correctly updating applicability section as per the latest version of the applied CDM methodology in accordance with the requirements as per the CDM-PS for PA (version 01.0) /16/.
Findings	No CARs and/or CLs were raised regarding the compliance with utilization and completion of the PDD form.
Conclusion	The updated PDD /2/ was completed by correctly applying the latest version of the CDM-PDD form (version 10.1) with all applicable guidance for its completion being sufficiently and appropriately followed. Applicable guidance and requirements for completing the CDM-PDD form (version 10.1) as established by the attachment to the CDM-PDD form (version 10.1) "Attachment. Instructions for completing this form" /17/ were confirmed by the validation team to be correctly considered. Relevant rules and requirements as per the CDM-PS for PA (version 01.0) /15/ were also confirmed to be sufficiently met/considered in the completion of the updated PDD/2/. While the PDD /3/ valid for the 1st 7-year crediting period of the project activity applies the CDM baseline and monitoring methodology ACM0001 - Consolidated methodology for landfill gas project activities (version 5) + applicable methodological tools; the updated PDD /2/ applies he latest version of such methodology (version 18.0) /2/ + applicable methodological tools. The validation team was able to confirm that some sections of the updated PDD /2/ were appropriately and correctly completed through transferring of significant amount of project design description information elements from the PDD applicable for first crediting period. While as per paragraph 271 of the CDM-PCP for PA (version 01.0) /16/, in the context of the renewal of crediting period for a CDM project activity, it is not required to obtain a new letter of approval (LoA) from involved Parties in the context of the renewal of crediting period for a CDM project activity, the validation team confirmed anyway that indication of the host-country and names of the project participants are correctly included in the updated PDD /2/. In summary, the validation team is able to confirm that information made available in the updated PDD/2/ is sufficiently accurate, complete, and provides clear understanding of the CDM project activity.

D.2. Application of baseline and monitoring methodology and standardized baseline

Means of validation	As per paragraph 403 of the CDM-VVS (version 01.0) /1/, the validation team appointed by Applus+ LGAI checked whether PP had used the valid and latest version of the CDM baseline and monitoring methodology /5/ that was previously applied in the PDD valid for the currently expired 1st 7-year crediting period and had sufficiently demonstrated the project design is in line with the applicability conditions for such selected methodology.
Findings	A CAR was raised regarding application of baseline and monitoring methodology and standardized baseline: **CAR#01:** The specifications of the installed flare (under the ex-ante determined parameter $SPEC_{flare}$) as indicated in the PDD are not in accordance with provided evidences. In response, the validation team confirmed that performed related amendments in the PDD are deemed reasonable, correct and sufficiently address the raised CAR#01. This CAR#01 is thus successfully closed.

Conclusion

The revised PDD applicable to the first crediting period /2/ applies the CDM baseline and monitoring methodology ACM0001 - Consolidated methodology for landfill gas project activities (version 5). The updated PDD/2/ applies ACM0001 - "Flaring or use of landfill gas" (version 18.0) /5/. As confirmed by the validation team, Version 18.0 currently represents the latest version of ACM0001. Thus, the selection of ACM0001 (version 18.0) /5/ for completing the updated PDD/2/ is confirmed as being correct.

The validation team had also checked the current list of valid standardized baselines as outlined in the applicable section of the UNFCCC CDM website /37/, and confirmed that there is no standardized baseline applicable to the project activity.

The validation team confirmed that the selected CDM baseline and monitoring methodology /5/ and all applicable methodological tools /10/ /11/ /12/ /13/ were correctly applied with respect to the following:

- Meeting of applicability conditions/criteria (assessment details included in Appendix 5 below)
- Delineation of project boundary and selection of emission sources and Greenhouse gases (GHGs) (assessment details included below in this Section);
- Baseline identification (assessment details included in Section D.3)
- Algorithms and/or formulae used to determine emission reductions (assessment details included in Appendix 6 below)
- Selection and definition of values for ex-ante determined (fixed) parameters (assessment details included in Appendix 7 below)
- Monitoring plan (including selection and definition of parameters monitored ex-post and monitoring approaches for such parameters (assessment details included in Appendix 8 below)

Assessment of meeting of applicability conditions/criteria for the selected CDM baseline and monitoring methodology + applicable methodological tools:

The updated PDD /2/ has been completed in full conformance with the selected CDM baseline and monitoring methodology /5/ + applicable methodological tools /10/ /11/ /12/ /13/. As outlined in Section B.2 of the updated PDD /2/, all applicability criteria/requirements for this CDM baseline and monitoring methodology and applicable methodological tools are demonstrated to be sufficiently met. Details for the assessment performed by the validation team of how such applicability criteria/requirements are met is summarized in Appendix 5 of this report.

Assessment of the definition of the project boundary as per the PDD:

As established by the applied methodology /5/, the project boundary for the project activity is correctly identified in the updated PDD /2/ as the site where LFG is captured, destroyed and utilized. Since the electricity demand of the project activity is met uniquely by imports of grid-sourced electricity from the National Electricity Grid of Brazil, PP has correctly included National Electricity Grid of Brazil as the spatial boundary for the project activity.

All GHG emission sources and GHG gases included in the project boundary are correctly outlined in Section B.3 of the updated PDD /2/ as summarized below:

GHG emission sources included in the project boundary:

	GHGs included	Description
Baseline scenario	CO_2	Not included. CO_2 emissions from decomposition of organic waste are not accounted since the CO_2 is also released under the project activity.
	CH_4	Methane in LFG is generated as a result of anaerobic decomposition of the organic fraction of the municipal solid waste (MSW) disposed in the URBAM landfill since it started to operate.
	N_2O	Excluded for simplification. This emission source is assumed to be very small.

	Project scenario	CO_2	Grid-sourced electricity consumption by the project activity.
		CH_4	Not included. CH_4 emissions resulted from flaring (residual CH_4 in the exhaust gas of the flare). It is however important to note that as per ACM0001 (version 18.0) /5/, such emissions are to be considered in the context of the calculation of baseline emissions.
		N_2O	Excluded for simplification. This emission source is assumed to be very small.

The selected emission sources and GHGs are correct and are appropriately justified for the project activity.

No leakage emissions are considered as leakage emissions are not required to be accounted as per applied methodology /5/.

In summary, the identified project boundary is confirmed by the validation team as being under compliance with the selected CDM baseline and monitoring methodology /5/ + applicable methodological tools /10/ /11/ /12/ /13/. The definition of the project boundary is sufficiently justified in the updated PDD /2/.

The validation team also confirms that there are no GHG emission sources, which are not addressed by the applied methodology, and which are expected to contribute more than 1% of the overall expected annual average emission reductions.

It was also confirmed by the validation team that all main GHG emission sources, the physical delineation of the CDM project activity, and other relevant project and baseline emission sources covered in the applied methodology are included within the project boundary for the purpose of calculating project and baseline emissions for the project activity.
The identified project boundary and the selected sources and gases are correctly justified in the updated PDD/5/.

D.3. Validity of original baseline or its update

Means of validation	In accordance with paragraph 407 of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI reviewed the validity of the previously identified baseline scenario for the project activity against applicable requirements of methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (version 03.0.1) /32/) (hereinafter referred to as baseline validity tool).
Findings	No CARs and/or CLs were raised regarding the demonstration of the validity of the previously determined baseline scenario for the project activity.
Conclusion	Section B.4 of the updated PDD/2/ includes the complete application of the stepwise approach of the baseline validity tool for demonstrating the validity of the previously derived baseline scenario for the project activity. As confirmed by the validation team, the baseline scenario for the project activity was previously determined and assessed (at the time of the validation of the project activity in year 2008) as most of LFG generated at the URBAM landfill being emitted into the atmosphere (with reduced share of generated LFG being sporadically combusted in a set of 14 pre-project conventional LFG venting/combustion drains). The demonstration of validity of the baseline scenario is performed by presenting in Section B.4 of the updated PDD /2/ the whole determination of the baseline scenario by also following applicable guidance and stepwise procedure of the selected CDM baseline and monitoring methodology. The steps of the baseline validity tool /32/ were applied as follows: *Step 1: Assess the validity of the current baseline for the next crediting period* *Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies:*

	The validation team confirmed that as per the PDD applicable for the first crediting period, the baseline scenario is directly determined as "*atmospheric release of landfill gas*"[3].
	As confirmed by the validation team, the project activity under the configuration valid for the renewal of its crediting period meets the requirements and conditions for the effective continuation of the validity of the baseline scenario previously identified during the validation phase for the project activity in year 2008 (which was made under the provisions of the baseline and monitoring methodology ACM0001 (version 5)).
	While ACM0001 (version 18.0) [5] supersedes ACM0001 (version 5), the updated PDD [2] correctly considered specific provisions and requirements of the applied more recent version of ACM0001 methodology regarding the determination of the baseline scenario. Section B.6.1 of the updated PDD [2] includes the application of the stepwise approach of the applied methodology [5] for the determination of the amount of methane that would have been captured and destroyed in the baseline scenario (absence of the CDM project activity) at the URBAM landfill.
	As confirmed by the validation team, although there is still no regional or national legal requirement in Brazil establishing LFG to be collected and destroyed in landfills, in the particular case of the URBAM landfill, a very small share of generated LFG flare was voluntarily combusted in previously existent pre-project LFG venting/combustion drains located in such landfill.
	Thus, the validation team was able to confirm that the demonstration of continuation of the baseline scenario for the project activity is in full compliance with mandatory national, regional and/or sectorial policies and requirements.
	Step 1.2: Assess the impact of circumstances By assuming the continuation of the validity of the previously identified baseline scenario in the context of the renewal of the crediting period of the project activity, it is thus assumed that there is no need to assess the impact of circumstances (such as availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions) and/or sectoral policies which have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period. This is deemed reasonable and acceptable.
	The updated PDD [2] appropriately emphasizes that the previously identified baseline scenario for the project activity is demonstrated as not changed at the time of requesting renewal of the crediting period. The validation team had confirmed that apart from the Brazilian National Policy on Waste Management (Decree No. 7,404/10), there are indeed no other relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or prior to the submission of the request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period.
	Details about the Brazilian National Policy on Waste Management (Decree No. 7,404/10) and its impacts over the baseline scenario for the project activity are correctly and appropriately included in Section B.4 of the updated PDD [2]. The conditions used to determine the baseline emissions in the previous crediting period are still valid in the context of the renewal of the crediting period of the project activity. In summary, the conditions and circumstances considered or taken into account to determine the baseline emissions in the previous 7-year crediting period are correctly assumed as still being valid for the next 7-year crediting period.
	It is thus correctly assumed that, in the absence of the project activity, major share of LFG generated at the URBAM landfill would still be freely emitted into the atmosphere (with a very reduced share of generated methane being destroyed in conventional passive LFG venting/combustion drains in the year prior to the

implementation of the project activity).
It is also sufficiently demonstrated that there is no change in the market or regulatory characteristics/aspects (including legal requirements) or new market or regulatory circumstances that would demand any type of re-assessment or re-evaluation for the determination of the baseline scenario for the 2nd 7-year renewable crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewable is requested.
While the baseline scenario previously identified at the validation of the project activity was not selected as "*the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology",* application of step 1.3 is thus not applicable.

Step 1.4: Assessment of the validity of the data and parameters
The validation team confirmed that, while the PDD applicable for the currently expired 1st 7-year crediting period /3/ applies a not any longer valid version of the CDM baseline and monitoring methodology ACM0001 (version 5), some methodological requirements, ex-ante selected data and monitoring parameters as per such PDD are no longer valid/applicable for the 2nd 7-year crediting period as the selected methodology is a more recently issued version of such methodology. As outlined in the updated PDD /2/, the selected CDM baseline and monitoring methodology and the related methodological tools contain differentiated applicable methodological approaches (when compared to ACM0001 (version 5). New data and ex-ante determined parameters are applied in the context of the demonstration of the validity of the previously derived baseline scenario and also applied in the ex-post determination of baseline emissions for the 2nd 7-year crediting period.

Further assessment of the application of the methodological approaches for the demonstration of validity of the previously derived baseline scenario is included below under Step 2. The application of the methodological approach to determine baseline emissions for the 2nd 7-year crediting period as per the selected CDM baseline and monitoring methodology /5/ is further assessed under Section D.4.

Step 2: Update the current baseline and the data and parameters

Step 2.1 Update the current baseline
As appropriately outlined in the updated PDD /2/, while the previously determined baseline scenario is still valid for the 2nd 7-year renewable crediting period, this Step is thus not applicable for the renewal of crediting period of the project activity. Nonetheless, while the methodological approaches for the determination of baseline scenario and baseline emissions as per the selected CDM baseline and monitoring methodology /5/) is indeed different than the previously applied methodology ACM0001 (version 5), for completeness reasons, the updated PDD /2/ includes the whole determination of the baseline scenario and baseline emissions as per the applicable guidance and requirements and stepwise approaches of selected CDM baseline and monitoring methodology regardless the fact that the baseline scenario remains being the same.

Assessment of the determination of the baseline scenario (in order to demonstrate the continuation of earlier identified baseline scenario) by following applicable stepwise procedure of the "Combined tool to identify the baseline scenario and demonstrate additionality" /30/ as required by the selected CDM baseline and monitoring methodology.

The continuation of the previously identified baseline scenario for the project activity is correctly presented and demonstrated in the updated PDD /2/ through the application of the stepwise approach for determining baseline scenario as per the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/ as required by selected CDM baseline and monitoring

methodology /5/ as follows:

STEP 0: Demonstration whether the proposed project activity is the First-of-its-kind: As correctly indicated in the updated PDD /2/, this optional step is not applied for the renewal of the crediting period of a registered CDM project activity.

Step 1: Identification of alternative scenarios: As part of application of Step 1, all applicable alternatives which are specified by ACM0001 (version 18.0) /5/ were correctly considered and analysed as follows:

Step 1a: Define alternative scenarios to the proposed CDM project activity

The following alternatives were initially considered:

LFG1: The project activity (i.e. capture of landfill gas and its flaring and/or its use) undertaken without being registered as a CDM project activity. This is a plausible alternative scenario, however involves significant investment and additional costs of landfill operations with no associated revenues.

LFG2: Atmospheric release of the landfill gas or partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns. This scenario corresponds to the continuation of the current situation (the proposed project activity or any other alternatives are not implemented).

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;

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

As correctly outlined in the updated PDD /2/, scenarios LFG3, LFG4 and LFG5 were not taken into account under the application of Step 1a since no changes in the operation of the landfill as a result of the implementation of the project activity have occurred during the currently expired 1st 7-year crediting period and neither are changes expected to occur during the 2nd 7-year crediting period. Therefore it is deemed appropriate to exclude LFG3, LFG4 and LFG5 from the list of alternative scenarios.

While the design of the proposed project activity currently does not encompass any utilization of collected LFG as gaseous fuel for electricity or heat generation, supply of LFG to a natural gas distribution network or distribution of LFG compressed/liquefied using trucks, alternative scenarios for the use of LFG were thus not identified. This is deemed correct as utilization of LFG is not encompassed by the project activity as per the project design configuration valid for its renewal of crediting period. This is in accordance to ACM0001 (version 18.0) /5/.

Outcome of Step 1a:
As the outcome of application of Step 1a of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/ the realistic and credible alternatives remained (as defined by ACM0001 (version 18.0) /5/ are identified as LFG1 and LFG2. The validation team considers the list of realistic and credible alternatives after the application of Step 1a of the methodological tool to be complete, correct and appropriate.

Step 1b: Consistency with mandatory applicable laws and regulations:

As outlined in the updated PDD /2/, the list of alternatives left after application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate

additionality" (version 06.0) [30] is the same as after application of Step 1b of the methodological tool: LFG1 and LFG2.

As correctly indicated in the updated PDD [2] *"(...) So far, there are still no legal restrictions or requirements for LFG collection and destruction in Brazil, neither for passive venting of LFG. Therefore the remaining alternatives LFG1 and LFG2 are both in compliance with all applicable mandatory laws and regulations.*"

The validation team was able to confirm that indeed there is no legislation requiring the collection and destruction of landfill gas in Brazil. Moreover, the validation team was also able to confirm that collection and destruction of landfill gas is not forbidden in Brazil either.

Outcome of Step 1b:

As the outcome of application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) [30], the realistic and credible alternatives left (as defined by the selected CDM baseline and monitoring methodology) [5] are identified as LFG1 and LFG2. The validation team considers the list of realistic and credible alternatives after the application of Step 1b of the methodological tool to be correct, complete and appropriate.

Step 2: Barrier analysis + STEP 3: Investment analysis + STEP 4: Common practice analysis

The following is correctly outlined in the updated PDD [2]:

> *"(…) As per the applicable methodological guidance of both ACM0001 (version 18.0) and the "Combined tool to identify the baseline scenario and demonstrate additionality", determining baseline scenario for a LFG collection and destruction/utilization initiative proposed as a CDM project activity is somehow combined with assessing and demonstrating additionality for such proposed CDM project activity.*
>
> *While in the particular situation of the renewal of the 7-year crediting period of a registered CDM project activity it is not required to assess and demonstrate the validity of the earlier assessed/demonstrated additionality (of which in the particular case of the project activity was previously assessed and demonstrated as presented in the latest version of the PDD valid for the 1st 7-year crediting period (PDD version 11, dated 03/01/2014), the application of STEP 2, STEP 3 and STEP 4 are thus regarded as not applicable/required in the context of the demonstration of the continuation of the previously identified baseline scenario for the project activity during its 2nd 7-year crediting period (as a requirement for the renewal of the crediting period). This is in accordance with the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" and other applicable CDM guidelines and rules."*

The validation team was able to confirm that the proposed project activity is not economically or financially feasible without revenues from sale of CERs to be generated by the project activity registered under the CDM. Thus, alternative scenario LFG1 is also appropriately excluded as an alternative scenario and the only remaining alternative is alternative LFG2 (atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and odors concerns).

Conclusion about the determination of baseline scenario:

As a conclusion, the validation team was able to confirm that alternative LFG2 (atmospheric release of the landfill gas or, eventually, partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns) is correctly identified as the only realistic alternative valid for the 2nd 7-year crediting of the project activity as per the project design configuration valid for its renewal of crediting period.

	As further assessed under assessment details for the determination of $F_{CH4,BL,y}$, it is correctly assumed that in the absence of the project activity LFG would have been released in an uncontrolled manner to the atmosphere with a very small share of methane generated at the URBAM landfill (verified as being equivalent to 3.07% of the methane collected and combusted by the project activity) being destroyed by combustion in conventional passive LFG venting/combustion drains that were previously existent at this particular landfill site. The identified baseline scenario is correctly determined as per applicable guidance of the selected CDM baseline and monitoring methodology /5/ and the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/). The application of guidance of the selected CDM baseline and monitoring methodology /5/ in the context of the determination of the continuation of the previously identified baseline scenario is deemed transparent and correct. The identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity. It is the opinion of the validation team that the application of the stepwise approach of the baseline validity tool /32/ for demonstrating the validity of the previously derived baseline scenario for the project activity" is deemed reasonable and correct. In summary, in accordance with applicable requirements from the CDM-VVS for PA (version 01.0) /1/, the validation team confirmed that the application of the stepwise approach of the baseline validity tool /32/ for demonstrating the validity of the previously derived baseline scenario for the project activity" is deemed reasonable and correct. It is sufficiently demonstrated that the previously determined baseline scenario for the project activity (scenario that represents GHG emissions that would occur in the absence of the project activity) is still valid. While the previously performed identification of the baseline scenario for the project activity (previously reported in the PDD /3/ applicable for the first crediting period) is also reported in the updated PDD /2/, the validation team has verified that the procedure contained in the selected CDM baseline and monitoring methodology to identify the most reasonable baseline scenario was correctly applied in the updated PDD /2/.

D.4. Estimated GHG emission reductions or net anthropogenic GHG removals

Means of validation	In accordance with the Paragraph 415 (a) (iv) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI reviewed whether the calculation of emission reductions is correct against the requirements of the applied methodology.
Findings	No CARs and/or CLs were raised in this section.
Conclusion	As outlined in the updated PDD /2/, calculations of GHG emissions reductions to be achieved by the project activity during the 2nd 7-year crediting period are based on the application of the ACM0001 (version 18.0) /5/ and the applicable methodological tools. In accordance with the ACM0001 /5/, no leakage emissions are required to be accounted. GHG emissions reductions (ER_y) to be achieved by the project activity during the 2nd 7-year crediting period are defined as the difference between baseline emissions (BE_y) and project emissions (PE_y). Assessment details for the determination of BE_y and PE_y are included in Appendix 6. The validation team confirmed that application of algorithms and formulae for the determination of emission reductions achieved during the 2nd 7-year crediting period is correct and deemed reasonable. Assessment details for the application of algorithms and formulae for the determination of emission reductions achieved during the 2nd 7-year crediting period are included below in Appendix 6.

D.5. Validity of monitoring plan

Means of validation	In accordance with Paragraph 415 (a) (iv) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI reviewed whether monitoring plan mentioned in the initial PDD /2/ is valid and correct.

Findings	No CARs and/or CLs were raised regarding the validity and design of the monitoring plan of the project activity.
Conclusion	As established by the ACM0001 (version 18.0) /5/ and applicable methodological tools, in the context of the ex-post determination of baseline emissions for the project activity, the monitoring system for the project activity during its 2nd 7-year crediting period basically consists of measuring the amount of methane actually combusted (destroyed) in the high temperature enclosed flare + assessment of the operational conditions of the URBAM landfill (via measurements/monitoring of the parameters monitored *ex-post* which are summarized in the table below). Project emissions resulting from flaring of collected LFG ($PE_{flare,y}$) will also be calculated as part of the determination of baseline emissions for the project activity by following applicable measurements and calculations requirements as defined in the tool "Project emissions from flaring" (version 02.0.0) /10/. Finally, project emissions due to the consumption by the project activity of grid-sourced electricity will be determined by applying related monitoring requirements as per the applicable methodology. As appropriately indicated in the updated PDD /2/ and in conformance with currently applicable guidance for completing the CDM-PDD form /17/, all the monitoring equipment and instruments will be maintained and managed in accordance with maintenance (service) and calibration requirements and recommendations defined by the equipment/instrument manufacturers. It has also been indicated in the updated PDD /2/, measurement checking and calibration of the monitoring equipment/instruments will be performed on a regular basis as per manufacturer's related requirements in order to ensure the correct measurement of data to be monitored. The LFG flaring equipment will also be maintained as per recommendations of the equipment manufacturer. Monitoring information/data of flare equipment maintenance will be recorded and reported as required by the selected CDM baseline and monitoring methodology /5/ and by the methodological tool "Project emissions from flaring" (version 02.0.0) /10/. It is the opinion of the validation team that the revised monitoring plan will give opportunity for real measurements of achieved emission reductions. All the data pertaining to monitoring parameters will be archived for at least two years after the end of crediting period. General details of the data to be collected, frequency of data recording, and the project management responsibilities are defined and are also clearly defined in the monitoring plan of the updated PDD /2/. It is the opinion of the validation team that the revised monitoring plan, as described in the updated PDD /2/, is feasible for the project participants. As outlined in the updated PDD /2/, maintenance service and routines for project's equipment and instruments include all required preventive and corrective actions in order to ensure appropriate functioning of all project related equipment. Related maintenance activities include visual control of the equipment state and real-time check of displayed parameters; cleaning up the equipment and the sensors; lubrication and greasing; replacement or overhauling of defective parts (including regular welding service in the HDPE pipelines and manifolds). Furthermore, as also outlined in the updated PDD /2/, spare units for some of the monitoring instruments/equipment will eventually be kept on-site. It has been indicated in the updated PDD /2/ that an appropriate and revised project's operational and management structure is considered for the 2nd 7-year crediting period. Such operational and management structure will rely on staff with responsibilities to be clearly defined; where all collaborators and employees involved with operation of project and/or monitoring will receive appropriate training. Training of operational and management staff will encompass general competence development about LFG generation and collection; review of equipment operational principles; maintenance and calibration requirements for project's related equipment; procedures for monitoring data gathering and handling as well as emergency and safety procedures. In summary, it is the opinion of the validation team that the description and design of

	the revised monitoring plan as per the updated PDD /2/ complies with all the monitoring requirements of the ACM0001 (version 18.0) /5/ and applicable methodological tools. Such description is also under conformance with currently applicable guidelines for completing the CDM-PDD form /17/. It is also the opinion of the validation team that the project participants will be able to implement and operate the monitoring plan during the 2nd 7-year crediting period. *Assessment of information added in the PDD regarding parameters to be monitored ex-post:* The updated PDD /2/ correctly includes in Sections B.7.1 and B.7.3 details about the parameters to be monitored *ex-post* during the 2nd 7-year renewable crediting period for which assessment is also included in Appendix 7 of this report. As established by ACM0001 /5/ and the tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ and also appropriately outlined in the updated PDD /2/, the volumetric or mass flow of landfill gas captured ($V_{t,wb/db,j}$ or $M_{t,db,j}$) and the methane fraction in the landfill gas ($v_{CH4,t,db/wb,j}$) will be continuously measured in the same basis (dry or wet). The selection of the parameters monitored *ex-post* and their monitoring procedures as outlined in updated PDD /2/, are deemed complete, transparent and in accordance with requirements of the selected CDM baseline and monitoring methodology and applicable methodological tools. Assessment details for the selection and definition of parameters to monitored ex-post and applied monitoring approaches : *Assessment of information added in the PDD regarding management system and quality assurance for the monitoring process:* The monitoring plan for the project activity, as outlined in the updated PDD /2/, includes inter alia, sufficient details about the following management and quality related aspects: - General description of the staff responsibilities and authorities for project management; - General description about procedures for data gathering and data reconciliation and reporting; - General description about monitoring equipment/instruments; - General information about calibration requirements of monitoring equipment/instruments; - General information about data quality control, training, data management system, reporting and verification of data (data reconciliation). - A general and sufficient description of the monitoring plan is elaborated in the updated PDD /2/ applying the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools. The monitoring plan has been established in order to enable subsequent verification of emission reductions for the project activity during the 2nd 7-year renewable crediting period for which periodic verification(s) are yet to be performed. The application of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools is deemed transparent. By taking into account verified previously issued Monitoring Reports valid for the 1st 7-year crediting period /22/, the validation team considers the PP potentially able and competent enough to monitor the project activity as per the monitoring plan valid for the 2nd 7-year crediting period. The monitoring plan as per the updated PDD /2/ indicates that all monitoring instruments and equipment will remain being calibrated as per manufacturer recommendations and/or as per international standards. Operational data relevant for emission reduction accounting for the project activity will remain being logged continuously by using automated computerized data logger and storage system. For the 2nd 7-year crediting period, data records will remain being stored on an

	appropriate computer software or data recording system where daily log-sheet files will serve for backup and crosscheck purpose and archived at project site. Monthly project performance reports will be made available at both the project site and administrative office in both electronic copy and hard copy to ensure data integrity. All monitoring data will be kept up to 2 years after the end of crediting period. Training of operational staff for the relevant data record keeping, operation and maintenance related procedures are also considered. Moreover, staff will continue to be trained on procedures for applicable corrective actions. It is the opinion of the validation team that the description of the monitoring procedures for the project activity as described in the updated PDD /2/ is deemed complete, reasonable and its implementation is potentially feasible for the PP. Through document check and performed phone interview with representatives of the project participants, it is verified that the monitoring plan as described in the updated PDD /2/ provides sufficient information and it is described in compliance with the selected CDM baseline and monitoring methodology and applicable methodological tools. As a conclusion, the validation team has confirmed that the monitoring plan of the updated PDD /2/ (as well as other sections of the PDD that describes the approaches to be applied for the determination of related baseline and project emissions) is correctly completed in the updated PDD /2/. It is the opinion of the validation team that the descriptions of the monitoring plan (and descriptions in related sections of the updated PDD /2/ describing the approaches for determining baseline and project emissions) do not negatively affect the accuracy and correctness of the determination of baseline emissions. The monitoring plan for the project activity, as outlined in Section B.7.1 and B.7.3 of the updated PDD /2/, meets all requirements and criteria of the selected CDM baseline and monitoring methodology/5/ and applicable methodological tools. Sections B.7.1 and B.7.3 of the updated PDD /2/ were also confirmed by the validation team to be completed in full compliance with applicable guidance for completing the latest version of the CDM-PDD form (version 10.1) /17/. *Assessment of applicability of the selected CDM baseline and monitoring methodology*/5/ *+ applicable methodological tools:* While the PDD /2/ applies the selected methodology ACM0001 (version 18.0) /5/ and applicable methodological tools, the validation assessment has also assessed the compliance of the project activity with the applicability criteria and requirements for such methodology and methodological tools that the PDD /2/ refers to Through the performed document checking and background research, it was confirmed by the validation team that the selected methodology ACM0001 (version 18.0) /5/ + all applicable methodological tools are correctly applied in the context of the completion of the updated PDD /2/. Details about the assessment of meeting of applicability conditions of such methodology and methodological tools are included in Appendix 5. In summary, the validation team confirmed that the description of the monitoring plan valid during the 2nd 7-year renewable crediting period is in accordance with the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools.

D.6. Crediting period

Means of validation	In accordance with Paragraph 415 (a) (v) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI reviewed whether the starting date and length of the 2nd crediting period, as outlined in the final PDD /2/, meets all applicable requirements for renewal of crediting period.
Findings	No CARs and/or CLs were raised regarding the selected starting date for the 2nd 7-year crediting period of the project activity.
Conclusion	The 2nd 7-year crediting period is defined in the updated PDD /2/ as starting on 27/10/2015 and ending on 26/10/2022. As part of its assessment, the validation

	team confirmed that consideration of expected operational lifetime for pre-project equipment installed at the project site for the determination of the length of the crediting period is not relevant/applicable in the particular case of the project activity. The PP has only more recently notified the CDM-EB Secretariat (by submitting via email on 09/10/2016 an initial draft version of the updated PDD and by also informing at that time their selection of a DOE for performing the required validation assessment) of its intention to renew another 7-year crediting period of the project activity. While such action was not taken within nine to six months prior to the date of expiration of the 1st crediting period, PP are aware that it will not be possible to claim emission reductions eventually achieved by the project activity right from the starting of the 2nd 7-year crediting period. The validation team thus confirms that having the indication in the updated PDD /2/ of the 2nd 7-year crediting period starting on 27/10/2015 and ending on 26/10/2022 is deemed correct and in full compliance with all applicable CDM requirements.

D.7. Project participants

Means of validation	In accordance with paragraph 415 (a) (vi) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by Applus+ LGAI checked the names of the project participants included in the updated PDD /2/ against the name included in the previously issued PDD /3/ applicable to the currently expired 1st 7-year crediting period of the project activity as well as in the UNFCCC website.
Findings	A CAR was raised regarding the Project Participants of project activity: **CAR#02:** Details for the project participants, as described in the applicable document Modalities of Communication (MoC) form, are not in accordance with information provided in the initial version of the updated PDD for the renewal of crediting period. In response to the raised CAR, the validation team confirmed that performed related amendments in the PDD are deemed reasonable, correct and sufficiently address the raised CAR#02. This CAR#02 is thus successfully closed.
Conclusion	The validation team has confirmed, upon closure of the raised CAR, the correctness of corporate identity of all project participants as included in the updated PDD /2/ against information included in the latest version of the completed Modalities of Communication (MoC) form /35/ for the project activity.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline	N	N/A	N/A
Corrections	N	N/A	N/A
Inclusion of a monitoring plan to a registered project activity	N	N/A	N/A
Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline	N	N/A	N/A
Changes to the project design of a registered project activity	N	N/A	N/A
Types of changes specific to afforestation and reforestation project activities	N	N/A	N/A

SECTION E. Internal quality control

Applus+ LGAI has established an internal quality control process under which all documentation (including the validation opinion and the validation checklist) undergo an internal quality control process as a final step of the performed validation assessment. A Technical Review Committee is appointed to review the Validation Report prior of its approval The comments made by the Technical Review Committee are taken into consideration and incorporated in the final report by the appointed validation team (i.e. each report has to be finally approved either by the head of the technical review committee or the deputy). In case one of these two persons is part of the assessment team approval can only be given by the other one. The final report (after resolutions of all findings) is then submitted to the CDM Quality Manager for final review and approval. After confirmation of the PP the validation opinion and relevant documents are submitted to the EB through the UNFCCC web-platform.

SECTION F. Validation opinion

LGAI Technological Center, S.A. (Applus+ LGAI) has performed the validation assessment for the updated Project Design Document (PDD) valid for 2nd 7-year crediting period for the registered CDM project activity titled "URBAM/ARAUNA – Landfill Gas Project (UALGP)" in the context of its renewal of the crediting period (2nd 7-year renewable crediting period starting on 27/10/2008 and ending on 26/10/2015). The project activity was previously registered by the UNFCCC on 14/10/2007 as CDM project activity with registration no. 1247.

The validation was performed in accordance with CDM Validation and Verification Standard for Project Activity (CDM-VVS for PA) (version 01.0) /1/ and included the assessment of the following issues:

- Evaluation of impact(s) of new relevant national and/or regional policies, circumstances and regulations on the previously determined baseline for the confirmation of the validity of the previously derived baseline taking into account relevant guidance from the CDM Executive Board (CDM-EB) with regards to renewal of the crediting period at the time of requesting renewal of crediting period;
- Evaluation of the correctness of the application of the CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ and applicable methodological tools in the updated PDD /2/
- Assessment of calculations and reporting of estimates of emission reductions to be achieved by the project activity during the 2nd 7-year crediting period.

The review of the updated PDD and the subsequently performed follow-up interviews with the PP has provided the validation team appointed by Applus+ LGAI with sufficient evidence to determine the validity of the original and previously identified baseline scenario. The validation team confirmed that the updated PDD /2/ correctly applies the selected CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools. The validation team also assessed a spreadsheet /4/ with calculations of *ex-ante* estimations of emission reductions to be achieved by the project activity during its 2nd 7-year renewable crediting period. Such spreadsheet /4/ is enclosed to the updated PDD /2/.

The validation team appointed by Applus+ LGAI is of the opinion that the project activity has the potential to achieve GHG emission reductions during the 2nd 7-year crediting period as per ex-ante estimates of emission reductions indicated in the updated PDD /2/. As verified by the validation team, all explanations and justifications provided by the PP regarding information and assumptions added in the PDD are deemed reasonable and acceptable.

In our opinion, that the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)" meets all the relevant requirements for the renewal of the crediting period. Hence Applus+ LGAI recommends the renewal of the crediting period of this project activity.

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology (CDM baseline and monitoring methodology)
CAR	Corrective Action Request
CDM-EB	CDM Executive Board (the board)
CDM-PCP for PA	CDM Project Cycle Procedure for Project Activities
CDM-PS for PA	CDM Project Standard for Project Activities
CDM-VVS for PA	CDM Validation and Verification Standard for Project Activities
CER	Certified Emission Reduction
CETESB	Companhia Ambiental do Estado de São Paulo (Environmental Agency/Authority for São Paulo State in Brazil)
CH_4	Methane
CL	Clarification Request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DOE	Designated Operational Entity
ER	Emission Reduction
GHG	Greenhouse gas(es)
LFG	Landfill gas
LGAI Tech. Center S.A.	LGAI Technological Center, S.A.
MP	Monitoring Plan
MR	Monitoring Report
PAHO	Pan American Health Organization
PDD	Project Design Document
PP	Project Participants
QA/QC	Quality Assurance / Quality Control
UNFCCC	United Nations Framework Convention on Climate Change

Appendix 2. Competence of team members and technical reviewers

According to the sectoral scopes / technical area and experiences in the sectoral or national business environment, Applus+ LGAI has composed a project validation team in accordance with the appointment rules in Applus+ LGAI. The composition of assessment team has to be approved by the Applus+ LGAI ensuring that the required skills are covered by the team. The four qualification levels for team members that are assigned by formal appointment rules as below:

- Leader Auditor (LA)
- Auditor (A)
- Auditor Trainee (T)
- Technical Experts (E)

It is required that the sectoral scope / technical area related to the methodology has to be covered by the assessment team.

Name	Qualification	Coverage of scope	Coverage of technical area	Financial aspect	Attendance to the on-Site Assessment
Miguel Cortes	LA/E	Yes (1 & 13)	Yes (1.1 & 13.1)	Yes	Yes
Vivek Kumar Ahirwar	LA	Yes (1 & 13)	Yes (1.1 & 13.1)	Yes	No
Denny Xue	TR	Yes (1 & 13)	Yes (1.1 & 13.1)	Yes	N/A

The curricula vitae of the DOE's validation team members are provided below:

Vivek Kumar Ahirwar is a BEE-Certified Energy Auditor by Govt of India with over eight years of relevant experience in energy efficiency, energy audit, thermal and electrical energy generation technology from renewable source and energy conservation in energy intensive industries, designated consumers and commercial buildings, implementation of energy conservation building codes, research, process and green building projects. He is a certified lead auditor for ISO 14001 EMS and 14064. He has experience under various categories of projects stating from renewable to waste to supercritical projects and WCD. He has successfully audited more than 100 GHG (CDM/VCS/GS) projects in different states across the India. He has done Mater in Technology (Energy Management) from a premier institute, School of Energy & Environmental Studies, DAVV, Indore (M.P.), India and Bachelor of Engineering (Mechanical Engineering) from Govt. Engineering college, Rewa, RGPV, India.

Hanshen (Denny) Xue (Master Degree in Environmental Engineering, Bachelor Degree in Thermal Engineering) is an Auditor appointed by Applus+ LGAI for the GHG project assessment. He is based on Shanghai. He has 1.5 years of work experiences in CDM project development. Before he joined Applus+ LGAI, he has been worked for Shanghai Chuanji Investment and Management which is a CDM consultancy company as a project manager for CDM project development.

Miguel Cortes has a Master Degree and Bachelor Degree in Civil Engineering. Mr. Cortes has 11 years of GHG experience, of which 6 years he has acted as a project developer and with other 6 years has acting as a Technical Reviewer and Lead Assessor within different Designated Operational Entities (DOEs). As member of assessment or technical review certification teams, Mr. Cortes has been involved with 26 validations and 22 verifications in Renewable Energies (Scope 1), Manufacturing (Scope 4), Mineral Production (Scope 8) and Metal Production (Scope 9) under the CDM and other schemes/standarts for GHG emission reduction initiatives. Furthermore, he has accumulated more than 9 years of direct technical and management experience within the Cement industry (including cement production and mineral extraction/mining related activities). His CDM experience also includes provision of consultancy and advisory services for GHG emission reduction projects within in the sectoral scopes involving manufacturing, mining, metal production, (including waste heat recovery (WHR) initiatives), biofuels, biomass production and hydropower projects.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	UNFCCC/CDM-EB	Clean Development Mechanism Validation and Verification Standard for Project Activity (CDM-VVS for PA), version 01.0 as per EB 93, Annex 5	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Standards/index.html	Others
/2/	PP	Project Design Document (PDD) for the 2nd 7-year crediting period of the registered CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)". (version 16).	Dated 03/11/2017.	Project Participants
/3/	PP	Latest version of the Project Design Document (PDD) valid for the 1st 7-year crediting period for the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)". Version 11.	Dated 03/01/2014. Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1185017358.24/view	Project Participants
/4/	PP	Emission reduction calculation spreadsheet with *ex-ante* estimations of emission reductions to be achieved by the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)" during the 2nd 7-year renewable crediting period. Version 16.	Dated 03/11/2017.	Project Participants
/5/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas", version 18.0	Dated 13/05/2016. Available online: https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR	Others
/6/	UNFCCC	Kyoto Protocol to the United Nations Framework Convention on Climate Change	Dated 1998. Available online: http://unfccc.int/resource/docs/convkp/kpeng.pdf	Others
/7/	UNFCCC	Decision 3/CMP. 1 (Marrakesh – Accords)	Dated 30/03/2006. Available online: https://cdm.unfccc.int/Reference/COPMOP/08a01.pdf	Others
/8/	Det Norske Veritas AS	Validation Report for the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)". , dated 20/07/2007.	Dated 20/07/2007. Available online: https://cdm.unfccc.int/filestorage/B/I/0/BI0LB5VMX10MPDKTS3G7S4TCL6N7D2/Validation%20report.pdf?t=UXl8b3BlYms0fDDYhQmRtfI02B1vT_46cfDq	Others
/9/	IPCC	1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book; 2006 IPCC Guidelines for National Greenhouse Gas	Available online: http://www.ipcc-nggip.iges.or.jp/public/gl/invs5.html	Others

		Inventories: work book.	http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html	
/10/	UNFCCC/CDM-EB	"Project emissions from flaring", version 02.0.0 as per EB 68.	Dated 20/07/2012. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf/history_view	Others
/11/	UNFCCC/CDM-EB	Methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 02.	Dated 27/12/2015. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v2.0.pdf	Others
/12/	UNFCCC/CDM-EB	Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream¨, version 03.0.	Dated 27/11/2015. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf	Others
/13/	UNFCCC/CDM-EB	"Tool to calculate the emission factor for an electricity system", version 5.0	Dated 27/11/2015. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf	Others
/14/	UNFCCC/CDM-EB	"Emissions from solid waste disposal sites" (version 07.0).	Dated 16/04/2015. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v7.pdf	Others
/15/	UNFCCC/CDM-EB	CDM Project Standard for Project Activity (CDM-PS for PA), version 01.0 as per EB 93, Annex 4	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Standards/index.html	Others
/16/	UNFCCC/CDM-EB	CDM Project Cycle Procedure for Project Activity (CDM-PCP for PA), version 01.0 as per EB 93, Annex 6	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Procedures/index.html#proj_cycle	Others
/17/	UNFCCC	Project design document form for CDM project activities (incl. the Attachment. Instructions for completing this form", version 10.1.	Dated 28/06/2017. Available online: https://cdm.unfccc.int/Reference/PDDs_Forms/index.html	Others
/18/	Federal Government of Brazil	Federal Resolution CONAMA nº 001/86.	Dated 23/01/1986. Available online: http://www.mma.gov.br/port/conama/res/res86/res0186.html	Others
/19/	UNFCCC/CDM-EB	Standard for application of the global warming potentials to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol. Version 01.0 as per EB 69.	Dated 13/09/2012. Available online: https://cdm.unfccc.int/faq/Reference/Standards/meth/reg_stan02.pdf Others	Others
/20/	Huitric, R. L. and	"Measuring landfill gas collection	Available online:	Others

	Kong, D. et al	efficiency using surface methane concentration"	http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf	
/21/	Brasmetano Ind. e Com. Ltda.	Instructions Manual for the high temperature enclosed flare installed at the URBAM landfill as part of the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)".	-	Others
/22/	PP	Monitoring Reports for all previous verifications within the currently expired 1st 7-year crediting period of the registered CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)"	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1185017358.24/view	Project Participants
/23/	DNA of Brazil	Resolução de nº 8, de 26 de maio de 2008, que adota, para fins de atividade de projeto de MDL, um único sistema como definição de sistema elétrico do projeto no Sistema Interligado Nacional. (Resolution no. 8, that adopts a single national electricity grid for CDM Project activities).	Dated 26/05/2008. Available online: http://www.mct.gov.br/upd_blob/0024/24719.pdf	Others
/24/	Federal Republic of Brazil, Ministry of Environment	"Gestão integrada de resíduos sólidos"	Dated 2007.	Others
/25/	Federal Republic of Brazil ,Ministry of Science and Technology	The second Brazilian Greenhouse Gases Emissions Inventory Report."	Dated 2010. Available online: http://www.mct.gov.br/upd_blob/0213/213909.pdf	Others
/26/	ABRELPE	"Panorama dos Resíduos Sólidos no Brasil- 2014".	Available online: http://www.abrelpe.org.br/panorama_apresentacao.cfm	Others
/27/	Germanischer Lloyd Certification GmbH	Verification and Certification Report for the registered CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)". Monitoring Period from 27/10/2008 to 15/11/2009 (1st verification).	Available online: https://cdm.unfccc.int/filestorage/3/N/4/3N4CRIOD7YTQW1JGKZ65HF20PVLXSM/Verification_Report_Version04.pdf?t=UUp8b3BlYm5pfDCF1uPeZFXKn05i74-eMGOR	Others
/28/	PP	Historical measurements of methane in the LFG which was captured and destroyed in the year prior to the implementation of the project activity performed by URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda (related to year 2007).	Dated 15/01/2008.	Project participants
/29/	CETESB	Operational license for the URBAM landfill, valid 10/06/2018.	Dated 10/06/2013. Available online: http://autenticidade.cetesb.sp.gov.br/pdf/02570012100110062013.pdf	Others
/30/	UNFCCC/CDM-EB	"Combined tool to identify the baseline scenario and	Dated 24/07/2015. Available online:	Others

		demonstrate additionality", version 06.0 as per EB 85.	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v4.0.0.pdf/history_view	
/31/	Brazilian Ministry of City Infrastructure	Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2010 (translated into English language as "Outlook/diagnostic for municipal/urban solid waste management – year 2010).	Dated June 2012. Available online: http://www.snis.gov.br/PaginaCarrega.php?EWRErterterTERTer=93	Others
/32/	UNFCCC/CDM-EB	Methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period", version 03.0.1 as per EB 66.	Dated 02/03/2012. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf	Others
/33/	Pan American Health Organization (PAHO)	"Analysis of the municipal solid waste management situation – Report on the regional evaluation of municipal solid waste management services in Latin America and the Caribbean".	Dated year 2005. Available online: http://www.bvsde.ops-oms.org/bvsars/fulltext/informeng/cap3.pdf	Others
/34/	Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke	Fundamentals of Classical Thermodynamics; 3rd Edition, John Wiley & Sons, Inc. Table A-4: Saturated Water-Temperature.	Dated 1996. Available online: http://fireflylabs.com/disted/courses/m275-data(all%20years)/SaturatedWaterTables-T&P.pdf	Others
/35/	PP	Completed Modalities of Communication (MoC) form for the CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)"	Dated 25/04/2017. Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1185017358.24/view	Project Participants
/36/	Brazil's Interministerial Commission on Global Climate Change (DNA of Brazil)	CO_2 emission factors for electricity generation in Brazil National Interconnected System – Base year 2015.	Available online: http://www.mct.gov.br/index.php/content/view/307492.html	Others
/37/	UNFCCC/CDM-EB	List of valid standardized baselines applicable for CDM project activities.	Available online: https://cdm.unfccc.int/methodologies/standard_base/new/sb7_index.html	Others
/38/	UniCarbo/UNFCCC/CDM-EB	Submitted inquire in the context of communications directed to the CDM Executive Board (previously known as 'Letter to the Board') with the title "*320_INQ-01231-G8Q1_Request of clarification about issues related to the renewal of crediting period of CDM project activities*" (dated 23/10/2013), including the response from the CDM-EB.	Available online: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20131025150150715-320_INQ-01231-G8Q1_Unicarbo_FORM.pdf/320_INQ-01231-G8Q1_Unicarbo_FORM.pdf?t=ME58b2U0M2RifDDAttB_nXkp7KWjoxuEQhuK and https://cdm.unfccc.int/filestorage/e/x/t/extfile-20131220113003559-320_INQ-1231-G8Q1_Unicarbo_Response.pdf/320_INQ-1231-	Others

			G8Q1_Unicarbo_Response.pdf?t=STJ8b2U0M3B3fDCpQil5om2ZxoJcBmxhU3Gy	
/39/	Germanischer Lloyd Certification GmbH	Validation Opinion Report for the latest performed validation assessments for post-registration changes of the project activity, Revision No. 05.	Dated 04/04/2014 Available online: https://cdm.unfccc.int/filestorage/2/B/L/2BL15AIZ4S7YT63G0PXV9HRCFEK8MU/044_Post_registration_changes_assessment%20report_version%2005%20FA.pdf?t=aHJ8b3BlY2R2fDADYlgAbG-2naID4-XmOR9s	Others
/40/	PP	Draft version of the revised Project Design Document (PDD) for the registered CDM project activity "URBAM/ARAUNA – Landfill Gas Project (UALGP)" submitted by Araúna Participacões e Investimentos Ltda in order to notify the Secretariat of the CDM Executive Board (CDM-EB) their intention to request a renewal of a crediting period of the registered CDM project activity. Version 12.	Dated 09/10/2016.	Project Participants

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	X	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
No CLs were raised during this assessment.				
Project participant response				**Date:** DD/MM/YYYY
-				
Documentation provided by project participant				
-				
DOE assessment				**Date:** DD/MM/YYYY
-				

Table 2. CAR from this validation

CAR ID	1	**Section no.**	D.2.	**Date:** 21/06/2017
Description of CAR				
The specifications of the installed flare (under the ex-ante determined parameter $SPEC_{flare}$) as indicated in the PDD are not in accordance with provided evidences.				
Project participant response				**Date:** 08/07/2017
As a response to the raised CAR, the specifications of the installed high temperature enclosed flare (under the ex-ante determined parameter $SPEC_{flare}$) were corrected in the revised version of the PDD.				
Documentation provided by project participant				
No additional document was provided.				
DOE assessment				**Date:** 10/07/2017
The validation team confirmed that performed related amendments in the PDD are deemed reasonable, correct and sufficiently address the raised CAR#01. This CAR#01 is thus successfully closed.				

CAR ID	2	**Section no.**	D.7.	**Date:** 21/06/2017
Description of CAR				
Details for the project participants, as described in the applicable document Modalities of Communication (MoC) form, are not in accordance with information provided in the initial version of the updated PDD for the renewal of crediting period.				
Project participant response				**Date:** 08/07/2017
As a response to the raised CAR, the project participant First Climate (Switzerland) AG was correctly added in the revised PDD in accordance to the latest version of the applicable document Modalities of Communication (MoC) form.				
Documentation provided by project participant				
No additional document was provided.				
DOE assessment				**Date:** 10/07/2017
The validation team confirmed that performed related amendments in the PDD are deemed reasonable, correct and sufficiently address the raised CAR#02. This CAR#02 is thus successfully closed.				

Table 3. FAR from this validation

FAR ID	X	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
No FARs were raised during this assessment.				
Project participant response				**Date:** DD/MM/YYYY
-				
Documentation provided by project participant				
-				
DOE assessment				**Date:** DD/MM/YYYY
-				

Appendix 5: Assessment of applicability conditions of the applied methodology

While details and explanations about how the applicability criteria/requirements of ACM0001 (version 18.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /32/ are appropriately and sufficiently included in Section B.2 of the updated PDD (version 16, dated 03/11/2017) /2/, related assessment details are summarized in the table below:

Applicability criteria of ACM0001 (version 18.0)	Assessment by the validation team
"*The methodology is applicable under the following conditions:* *(a) Install a new LFG capture system in a new or existing SWDS[1] where no LFG capture system was installed prior to the implementation of the project activity; or* *(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that:* *(i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and* *(ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available.* *(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:* *(i) Generating electricity;* *(ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or* *(iii) Supplying the LFG to*	As per the CDM Project Standard, in the context of the renewal of crediting period for a previously registered CDM project activity, the PDD valid for the new 2nd 7-year crediting period should be completed by applying the latest version for the CDM baseline and monitoring methodology which was previously applied or, if applicable, the latest version for the CDM baseline and monitoring methodology of which the previously applied CDM methodology was replaced by and/or consolidated into. The project activity was previously registered as a CDM project activity by applying the CDM baseline and monitoring methodology ACM0001 (version 5). While ACM0001 (version 18.0) /5/ is the latest valid version of the ACM0001 baseline and monitoring methodology, it is thus the one to be applied in the context of the renewal of crediting period for the registered CDM project activity. Applicability criteria (b – i) is fulfilled, as the project design considered for the purpose of renewal of the crediting period encompasses the installation of an active (forced) LFG capture system in an existing landfill replacing a previously existent rudimentary passive LFG collection system (using 14 conventional passive LFG venting and combustion drains in which LFG was sporadically combusted). Condition (c) is also fulfilled as the project activity design encompasses only collection and flaring of collected LFG. No utilization of LFG as fuel for electricity generation, heat generation (boiler, air heater or kiln) or glass melting furnace; and/or being supplied to consumers through a natural gas distribution network or by trucks is encompassed by the project design under the configuration valid for the renewal of its crediting period. Condition (d) is also applicable as there have been no expected changes in the operation of the URBAM landfill as a result of the implementation of the project activity and no change is expected to occur in the future either. No change in the current practice of landfilling of MSW at the URBAM landfill occurred after the implementation of the project activity either. With or without the project activity, no recycling of the organic fraction of the waste, neither aerobic treatment, neither incineration has occurred or is expected to occur at the URBAM landfill. In fact, recycling of organic matter, aerobic treatment and incineration has not ever been common practice in Brazil and in the region of influence of the URBAM landfill either. As part of validation assessment, in order to confirm the applicability of the selected CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ +

[1] SWDS = Solid Waste Disposal Site. In the particular case of the project activity, the considered SWDS is the URBAM landfill.

consumers through a natural gas distribution network. *(iv) Supplying compressed/liquefied LFG to consumers using trucks;* *(v) Supplying the LFG to consumers through a dedicated pipeline;* *(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity."*	applicable methodological tools, /5/, interviews were conducted with the PP and it was confirmed that operation of the URBAM landfill site is not expected to be changed under any aspect. By taking into account the content/rationale for the applicability condition (d), and based on assessment of (i) detailed information made available in the updated PDD /2/ regarding how the condition (d) is met + (ii) assessment of credible documented information/evidences, thus sufficiently justifying the plausibility and correctness of information made available in the updated PDD /2/); the validation team is of the opinion that it is sufficiently justified the implementation and operation of the project activity has never represented and it is not expected to represent any driver or incentive to promote any kind of reduction in the amount of organic waste that would be recycled in the absence of the project activity (baseline scenario) at the URBAM landfill and/or at any other existent or potential (hypothetical) waste treatment or utilization facility under the area of influence of this particular landfill. The prevailing waste management practices pertinent to organic solid waste recycling in the region attended by the URBAM landfill were also assessed by the validation team. As verified, detailed information (including aspects, facts and statistics related to recycling of organic fraction of MSW in the region of influence of the URBAM landfill and in other regions of Brazil) are included in the related documented evidences assessed by the validation team /24/ /26/ /31/ /33/ which are appropriately referred in the updated PDD /2/. Such data sources confirm the non-existence of any facility with relevant scale/size to promoting utilization or recycling of organic fraction of solid waste (such as a solid waste composting plant) in the region of the project site. The validation team also assessed the amount of organic waste currently being recycled or utilized in the region and whether such amount has ever been potentially negatively impacted by the previous implementation of the project activity. Available and credible statistical data and information sources were assessed by the validation team (including both related sources indicated in the updated PDD /2/ evidences as well as other credible sources selected by the validation team /24/ /24/ /25/ /31/ /33/). Assessed data and information sufficiently confirm the suitability and plausibility of all related argumentation and explanations which are made available in the updated PDD /2/. Furthermore, based on assessment of related construction and design documentation for the URBAM landfill and also based on interviews performed with the PP, the validation team was also able to confirm that no initiative involving recycling of organic fraction of MSW (or any other type of solid waste) is currently expected to be implemented at the URBAM landfill or in any other site by the PP. Furthermore, by also taking into account the applicable regulatory framework and typical business environment for waste management services (as a public service) in Brazil, it is also the understanding and opinion of the validation team (based on its sectoral expertise and performed assessment of related sectoral literature /24/ /26/ /31/ /33/), that the implementation of the project activity in year 2007 has not represented and it is not expected to represent any potential incentive or driver for any administration of municipalities in the region, for any other public entity or for any other relevant recycling practitioner (if existent in the future) to promote eventual changes in existent regional policies, rules and practices involving recycling of organic waste in the region.

	The publication "Panorama dos Resíduos Sólidos no Brasil – 2014" /26/ (Outlook of Solid Waste Sector in Brazil – 2014 states the following: "*solid waste recycling initiatives in Brazil are quite limited and encompass mostly aluminium, paper, plastic (including PET bottles) and glass material. In case of existing recycling activities, material to be recycled is separated from waste stream prior to being disposed in a landfill or dumpsite. For the specific case of recycling of organic waste material, paper waste sent to disposal in landfills is not even regarded as recyclable material (and thus not even accounted in the available statistics for recyclable material). Only clean (not contaminated) and previously separated paper waste material is considered as recyclable material. No other type of organic material has been recycled in Brazil*". In the particular case of the landfill where the project activity is implemented, no received organic waste stream has ever been directed to recycling. Thus, the project activity has never promoted any volume or practice changes in terms of recycling of organic solid waste. The "Panorama dos Resíduos Sólidos no Brasil – 2014" /26/ is a publication published by the "Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE" (Brazilian Association for Municipal Solid Waste and Special Waste) and represents the most credible outlook and statistics source for the solid waste management sector in Brazil. The validation team judges that this source of information is a reliable and also realistic evidence that the management of the URBAM landfill has never changed after the project activity implementation and no change is expected to occur in the future either. As a conclusion, it is sufficiently demonstrated that under no circumstance the implementation and expected continuous operation of project activity would per se represent a driver or incentive to have any party reducing or preventing the volume of organic waste stream that would be recycled in the baseline scenario (e.g. in order to get such solid waste stream being disposed using landfilling practices at the URBAM landfill (or at any other solid waste disposal site (SWDS))). In summary, it is sufficiently demonstrated in the updated PDD /2/ that condition (d) of the above-quoted applicability criteria is sufficiently met.
"*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) Atmospheric release of LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; 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*	Applicability condition (a) is fulfilled since, as confirmed by the validation team, the baseline scenario is confirmed to be directly identified as the release (free emission) of generated LFG into the atmosphere (with a very small share of LFG being sporadically combusted in conventional LFG venting/combustion drains. As the project design does not encompass the utilization of collected LFG as fuel for electricity generation, condition (b - i) is thus not an applicable alternative. Although, while no on-site heat requirements at the URBAM landfill are identified in the description of the project design, the project design does not encompass generation of heat using LFG as fuel. Supply LFG for heat generation off-site is not considered either. Therefore, applicability condition (b - ii) is not an applicable alternative either. Applicability condition (c) is not applicable either, since the project design does not encompass supply of LFG to the end-user(s) through natural gas distribution network, trucks or the

kiln; *(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and* *(ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary* *(c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas."*	dedicated pipeline.
Non applicability condition: *This methodology is not applicable:* *(a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace;* (b) *If the management of the SWDS in the project activity is deliberately changed during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity.*	Condition (a) is not applicable as LFG captured by the project activity is not expected to displace fossil fuels in a kiln, air heater or glass melting furnace. Moreover no baseline and monitoring methodology other than ACM0001 (version 18.0) /5/ is applied. Condition (b) is not applicable either as no quantitative or qualitative changes in the operation of the URBAM landfill has so far occurred and/or are expected to occur as a direct or indirect result of the implementation and operation of the project activity. As appropriately outlined in the updated PDD /2/, with or without the implementation of the project activity, no recycling of the organic fraction of the waste, aerobic waste treatment or waste incineration are expected to occur. In fact, recycling of waste, waste aerobic treatment and waste incineration are not common practices in Brazil. During the performed validation assessment, interviews were conducted with representatives of the project participants and it was confirmed that the PP does not intend or plan to change the operation or design of the URBAM landfill site under any aspect. Moreover, as claimed by the PP and described in the updated PDD /2/, the operational conditions and the previously conceived design of the URBAM landfill are not expected to change in the future. It is important to note that as per monitoring requirements for the monitoring parameter Management of the SWDS, 2nd 7-year crediting period, the design and operational conditions of the solid waste disposal site (SWDS) will be annually monitored on the basis of different sources, including inter alia: - Original construction and operational design of the URBAM landfill; - Technical specifications and requirements for the management of the URBAM landfill; - Applicable local or national regulations dealing with management and operation of existing landfills. As required by ACM0001 (version 18.0) /5/, any occurred or planned relevant change in terms of management of the landfill is to be reported and justified as part of the monitoring process for the project activity.
"The applicability conditions included in the tools referred to above also apply."	As confirmed by the validation team, demonstration of how applicability conditions for the following methodological tools to which the selected methodology /5/ refers to (and that are

	applied by the project activity) are met is sufficiently demonstrated in Section B.2 of the updated PDD /2/: − "Project emissions from flaring" (version 02.0.0) /10/ − "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 2) /11/ − "Emissions from solid waste disposal sites" (version 07.0) /14/ − "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ − "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/ − "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period for renewal of crediting period" /32/

Appendix 6: Assessment of GHG emission reduction calculations

As a result of the deemed acceptable and reasonable decision of the project participants URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda of applying ACM0001 (version 18.0) /5/ + applied new methodological tools /10/ /11/ /12/ /13/ for compiling the updated version of the PDD /2/, the appointed validation team confirmed, as part of the performed validation assessment, the appropriateness and correctness of the applied algorithms/formulae used for determining emission reduction to be achieved by the project activity along its 2nd 7-year crediting period as per requirements of such CDM methodology and methodological tools.
It is important to note that the applied methodological and monitoring approach for the determination of baseline emissions for the project activity as per the updated PDD /2/ is quite different than the one previously applied as per the PDD valid for the currently expired 1st 7-year crediting period /3/ .

While as per ACM0001 (version 18.0) /5/, no leakage emissions are required to be accounted, GHG emissions reductions (ER_y) to be achieved by the project activity during the 2nd 7-year crediting period are thus correctly defined (in tCO_2e) as the difference between baseline emissions (BE_y) and project emissions (PE_y), where assessment details for the approaches for the determination of BE_y and PE_y are included below:

Assessment of the determination of baseline emissions:
As established by selected CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools /10/ /11/ /12/ /13/ and correctly outlined in Section B.6.1 of the updated PDD /2/, in the particular case of the project activity (under the configuration valid for its renewal of crediting period) baseline emissions are directly and correctly determined as follows:

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

Where:

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

$BE_{CH4,y}$ Baseline emissions of methane from the SWDS in year *y* (in tCO_2e/yr)

The determination of baseline emissions correctly applies the stepwise procedure which is established by ACM0001 (version 18.0) /5/ as follows:

Baseline emissions of methane from the SWDS ($BE_{CH4,y}$):
Baseline emissions of methane from the URBAM landfill ($BE_{CH4,y}$) are correctly determined based on the amount of methane that is captured in the project scenario and the amount of methane that is assumed as being captured and destroyed in the baseline scenario (absence of the project activity). In addition, the effect of methane oxidation in the top layer section of the landfill in the baseline scenario (absent in the project) is also correctly taken into account as required by ACM0001 (version 18.0) /5/. $BE_{CH4,y}$ is thus calculated (in tCO_2e/yr) as follows:

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

Where:

OX_{top_layer} Fraction of methane in the LFG that would be oxidized in the top layer of the considered SWDS in the baseline (dimensionless). As correctly outlined in Section B.6.2 of the updated PDD /2/, OX_{top_layer} is correctly *ex-ante* determined as 10% (default values as per ACM0001 (version 18.0) /5/).

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in tCH_4/yr). $F_{CH4,PJ,y}$ is determined by following the stepwise approach of ACM0001 (version 18.0) /5/ as assessed below under the sub-section *"Ex post determination of $F_{CH4,PJ,y}$"*:

$F_{CH4,BL,y}$ Amount of methane in the LFG that would be flared in the baseline in year *y* (in tCH_4/yr). $F_{CH4,BL,y}$ is also determined by following the stepwise approach of ACM0001 (version 18.0) /5/ as assessed below under the sub-section "*Determination of $F_{CH4,BL,y}$*":

GWP_{CH4} Global Warming Potential of CH_4. GWP_{CH4} is correctly ex-ante determined as 25 tCO_2e/tCH_4.

Ex post determination of $F_{CH4,PJ,y}$:
During the 2nd 7-year renewable crediting period, $F_{CH4,PJ,y}$ will be determined (in tCH_4/year) as the quantity of methane flared as follows:

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

Where:

$F_{CH4,flared,y}$ Amount of methane in the LFG which is destroyed by flaring in year *y* (in tCH_4/yr). $F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare and any methane emissions from the flare, as follows:

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

Where:

$F_{CH4,sent\_flare,y}$ Amount of methane in the LFG which is sent to the flare in year *y* (in tCH_4/yr)

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

Determination of $F_{CH4,sent\_flare,y}$:
As established by ACM0001 (version 18.0) /5/ and as correctly outlined in the updated PDD /2/, $F_{CH4,sent\_flare,y}$ is correctly determined by following applicable guidance of the "Tool to determine the mass flow of greenhouse gas in a gaseous stream" /12/. In the context of the application of such methodological tool for the ex-post determination of $F_{CH4,sent\_flare,y}$ the following set requirements are correctly regarded as applicable:

- The gaseous stream the tool shall be applied to is the LFG stream delivery pipeline to the high temperature enclosed flares. $F_{CH4,sent\_flare,y}$ is thus calculated as the mass flow of methane to the flare.
- CH_4 is the greenhouse gas for which the mass flow should be determined;
- The flow of the gaseous stream should be measured on continuous basis;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (applicable equations in the methodological tool);

The mass flow should be calculated on an hourly basis for each hour *h* in year *y*;
As confirmed by validation team applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ was correctly applied to determine $F_{CH4,sent\_flare,y}$ as assessed below:

Use of applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" for determining $F_{CH4,sent\_flare,y}$:

As confirmed by validation team, applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ is correctly applied for the ex-post determination of $F_{CH4,sent\_flare,y}$ as follows:

Use of Option A, B, C or D:
The following potential measurement options of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ are considered for the determination of $F_{CH4,sent\_flare,y}$:

Considered methodological approaches for the determination of $F_{CH4,sent\_flare,y}$ as per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/

Option	Flow of gaseous stream	Volumetric fraction
A	Volume flow – dry basis	Dry or wet basis
B	Volume flow – wet basis	Dry basis
C	Volume flow – wet basis	Wet basis
D	Mass flow – dry basis	Dry or wet basis

As correctly outlined in the updated PDD /2/, depending on project conditions and installed instruments/equipment along the 2nd 7-year crediting period, Option A, B, C or D will be selected *ex-post*. The decision of PP to select the calculation option *ex-post* (as reflected in the updated PDD /2/) is deemed reasonable and acceptable (by taking into account that the selection of Option A, B, C or D clearly depends on project's operational aspects/conditions and specifications of monitoring equipment operating along the 2nd crediting period).

Thus, along the 2nd crediting period, depending on project's operational aspects/conditions and specifications of operative monitoring equipment, either Option A, B, C or D will be applied ex-post as assessed below:

<u>*Option A*</u>

$$F_{CH4,t} = V_{t,db,j} * v_{CH4,t,db} * \rho_{CH4,t}$$

Where:

$F_{CH4,t}$ Mass flow of greenhouse gas *i* (*i* = CH_4) in the gaseous stream (LFG) in time interval *t* (in kg gas/h)

$V_{t,db,j}$ Volumetric flow of LFG stream in time interval *t* on a dry basis for *j*

$v_{CH4,t,db}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 gas *i*/m^3 dry gas)

$\rho_{CH4,t}$ Density of methane in the gaseous stream in time interval *t* (kg gas *i*/m^3 gas *i*). $\rho_{CH4,t}$ will be determined as follows:

$$\rho_{CH4,t} = P_t * MM_{CH4} / R_u * T_t$$

Where:

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

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

MM_{CH4} Molecular mass of greenhouse gas *i* (*i = CH4)* (in kg/kmol)

R_u Universal ideal gases constant (in $Pa.m^3/kmol.K$)

Option B

$F_{CH4,t}$ is determined by using the equations listed above under *Option A* by converting the measured volumetric flow from wet basis to dry basis as follows:

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

Where:

$V_{t,db}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 dry gas/h)

$V_{t,wb}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis (in m^3 wet gas/h)

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 H_2O/m^3 dry gas). The volumetric fraction of H_2O in time interval *t* on a dry basis ($v_{H2O,t,db}$) is estimated as follows:

$$v_{H2O,t,db} = (m_{H2O,t,db} * MM_{t,db}) / (MM_{H2O})$$

Where:

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis (in m^3 H_2O/m^3 dry gas)

$m_{H2O,t,db}$ Absolute humidity in the gaseous stream in time interval *t* on a dry basis (in kg H_2O/kg dry gas)

$MM_{t,db}$ Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)

MM_{H2O} Molecular mass of H_2O (in kg H_2O/kmol H_2O)

As also defined in the updated PDD [/2/], in case *Option B* is selected, the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) will be determined using Option 2 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" [/12/] for the "*Determination of the absolute humidity of the gaseous stream"* as follows:

Option 2: Simplified calculation without measurement of the moisture content

While this considered calculation option provides a simple and conservative approach to determine the absolute humidity (by assuming the gaseous stream is dry or saturated depending on which is the conservative situation), if it is conservative to assume that the gaseous stream is dry, then $m_{H2O,t,db}$ is appropriately assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is appropriately assumed to equal the saturation absolute humidity ($m_{H2O,t,db,sat}$) and calculated as follows:

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

Where:

$m_{H2O,t,db,sat}$ Saturation absolute humidity in time interval *t* on a dry basis (in kg H_2O/kg dry gas)

$p_{H20,t,Sat}$ Saturation pressure of H_2O at temperature T_t in time interval *t* (in Pa)

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

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

MM_{H2O} Molecular mass of H_2O (in kg H_2O/kmol H_2O)

$MM_{t,db}$ Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas) $MM_{t,db}$ is estimated using the following equation:

$MM_{t,db} = \Sigma_i (v_{i,t,db} * MM_k)$

Where:

$v_{k,t,db}$ Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis (m^3 gas k/m^3 dry gas)

MM_k Molecular mass of gas *k* (kg/kmol)

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

In accordance with the simplification given in the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" [12] it is appropriately indicated in the updated PDD [2] that only the volumetric fraction of CH_4 ($v_{CH4,t,db}$) will be monitored and the difference to 100% will be considered as pure nitrogen.

Option C

$F_{CH4,t} = V_{t,wb,n} * v_{CH4,t,wb} * \rho_{CH4,n}$

Where:

$F_{CH4,t}$ Mass flow of greenhouse gas methane in the gaseous stream in time interval *t* (in kg gas/h)

$V_{t,wb,n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions (in m^3 wet gas/h)

$v_{CH4,t,wb}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a wet basis (in m^3 gas /m^3 wet gas)

$\rho_{CH4,n}$ Density of methane in the gaseous stream at normal conditions (in kg gas *i* /m^3 wet gas *i*). Parameter $\rho_{CH4,n}$ will be determined as follows:

$\rho_{CH4,n} = P_n * MM_{CH4} / R_u * T_n$

Where:

P_n Absolute pressure at normal conditions (in Pa)

T_n Temperature at normal conditions (in K)

MM_{CH4} Molecular mass of methane (in kg/kmol)

R_u Universal ideal gases constant (in $Pa.m^3/kmol.K$)

The following equation should be used to convert the volumetric flow of the gaseous stream from actual conditions to normal conditions of temperature and pressure:

$V_{t,wb,n} = V_{t,wb,j} *(T_n / T_t) * (P_t / P_n)$

Where:

$V_{t,wb,n}$ Volumetric flow of the considered gaseous stream (LFG) in a time interval *t* on a wet basis at normal conditions (in m^3 wet gas/h)

$V_{t,wb,j}$ Volumetric flow of LFG stream in time interval *t* on a wet basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in m^3 wet gas/h)

P_t Pressure of the gaseous stream in time interval *t* (in Pa)

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

P_n Absolute pressure at normal conditions (in Pa)

T_n Temperature at normal conditions (in K)

Option D

The mass flow of methane $F_{i,t}$ (i = CH_4) is determined using equations 12 and 13 as outlined in the updated PDD [2]. The volumetric flow of the LFG in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare ($V_{t,db,j}$) is determined by converting the mass flow of the gaseous stream to a volumetric flow as follows:

$V_{t,db,j} = M_{t,db,j} / \rho_{t,db}$

Where:

$V_{t,db,j}$ Volumetric flow of LFG stream in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in m^3 dry gas/h)

$M_{t,db,j}$ Mass flow of the LFG stream in time interval *t* on dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in kg/h)

$\rho_{t,db}$ Density of gaseous stream (LFG) in time interval *t* on a dry basis (in kg dry gas/m³ dry gas). $\rho_{t,db}$ shall be determined as follows:

$\rho_{t,db} = P_t * MM_{t,db} / R_u * T_t$

Where:

$MM_{t,db}$ Molecular mass of the gaseous stream (LFG) in a time interval t on a dry basis (in kg dry gas/kmol dry gas)

P_t Pressure of the gaseous stream (LFG) in time interval *t* (in Pa)

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

Determination of $PE_{flare,y}$ (in the context of the determination of $F_{CH4,flared,y}$):
As correctly outlined in the updated PDD [/2/], $PE_{flare,y}$ is determined using the methodological approaches of the latest version of the "Project emissions from flaring" (version 02.0.0) [/10/]. Project emissions from flaring the residual gas ($PE_{flare,y}$) are determined based the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$). As correctly described in the updated PDD [/2/], the 3-step approach for determining project emissions from flaring through continuous monitoring of following parameters will be used as per the applicable guidance of the tool "Project emissions from flaring" [/10/]. The application of this methodological tool encompasses the following steps:

STEP 1: Determination of the methane mass flow of the residual gas
This first step indicates that the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" [/12/] is used to determine the mass flow of methane in the residual gaseous stream in minute *m* ($F_{CH4,m}$). Furthermore, $F_{CH4,m}$ shall be used to determine the mass of methane in kilograms fed to the flare in minute *m* ($F_{CH4,RG,m}$).

1. The following requirements are correctly considered:
2. The gaseous stream tool shall be applied to the residual gas;
3. The flow of the gaseous stream shall be measured continuously;
4. CH_4 is the greenhouse gas *i* for which the mass flow should be determined;
5. The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the tool); and
6. The time interval *t* for which mass flow should be calculated is every minute *m*.

STEP 2: Determination of the flare efficiency

Option A: Application of default value:
The flare efficiency for each minute *m* ($\eta_{flare,m}$) is 90% when the following two operational conditions/requirements are simultaneously met (in order to demonstrate that the flare is operating as per the recommendations and requirements set by the equipment manufacturer for the minute *m* in question):

(1) The temperature of the exhaust gases of the flare (monitoring parameter $T_{EG.m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification/requirements for the flare (monitoring parameter $SPEC_{flare}$) in minute *m*;
(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

If for the minute *m*, conditions (1) and/or (2) are not met, $\eta_{flare,m}$ is set as 0% for the minute in question

Option B: Measured flare efficiency:
The flare efficiency in the minute *m* is determined as a value which is calculated based on performed related measurements ($\eta_{flare,m} = \eta_{flare,calc,m}$) when the following conditions are simultaneously met (in order to demonstrate that the flare is operating):

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

(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

Otherwise $\eta_{flare,m}$ is set as 0%.

Option B.1: Measured flare efficiency:
The efficiency of combustion in the flare in minute *m* is determined as the average of two measurements of the flare efficiency made in year *y* ($\eta_{flare,calc,y}$), based on monitored data as per Option B.1: Biannual measurement of the flare efficiency, as follows:

$$\eta_{flare,calc,y} = 1 - \frac{1}{2} \sum (F_{CH4,EG,t} / F_{CH4,RG,t})$$

Where:

$\eta_{flare,calc,y}$ Flare efficiency in the year *y*

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

t The two time periods in year *y* when the flare efficiency is measured (minimum of one hour and separated by at least six months)

$F_{CH4,EG,t}$ Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in time period *t* (in kg). $F_{CH4,EG,t}$ is to be measured according to an appropriate national or international standard. $F_{CH4,RG,t}$ is calculated according to Step 1 and consists of the sum of methane flow in the minutes m that make up the time period *t.*

As an alternative to this approach, default values may be applied (in case determining of the methane destruction efficiency of the flare (flare efficiency - $\eta_{flare,m}$) is not available) as per Option A: Default value.

STEP 3: Calculation of project emissions from flaring
According to the applicable guidance of the tool "Project emissions from flaring" /10/, Project emissions from flaring ($PE_{flare,y}$) are calculated as the sum of emissions for each minute *m* in year *y* as follows:

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

Where:

$PE_{flare,y}$ Project emissions from flaring of the residual gas in year *y* (in tCO_{2e})

GWP_{CH4} Global warming potential of methane valid for the commitment period (in tCO_{2e}/tCH_4). GWP_{CH4} is correctly ex-ante determined as 25 tCO_2e/tCH_4.

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

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

As assessed by the validation team, the application of the 3-step approach is correctly outlined in the updated PDD [/2/].

Ex ante determination of $F_{CH4,PJ,y}$:

As established by ACM0001 (version 18.0) [/5/], the *ex-ante* estimation of emission reductions for the whole 2nd 7-year renewable crediting period are correctly calculated and correctly reported in the updated PDD [/2/] based on the application of the multi-phased first order decay (FOD) model as per applicable guidance of the "Emissions from solid waste disposal sites" [/14/]. In accordance to ACM0001 (version 18.0) [/5/], in the particular context of the *ex-ante* estimations of emission reductions to be achieved by the project activity, $F_{CH4,PJ,y}$ is determined (in tCO_2e) as follows:

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

Where:

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in 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* (in tCO_2e/yr). $BE_{CH4,SWDS,y}$ was determined using the methodological tool "Emissions from solid waste disposal sites" (version 07.0) [/14/]. Application A "The CDM project activity mitigates methane emissions from a specific existing SWDS" is selected. The calculation of values for $BE_{CH4,SWDS,y}$ correctly takes into account the different types of waste *j* with respectively different decay rates k_j and different fractions of degradable organic carbon (DOC_j). By correctly applying the multi-phased FOD model, in the context of the *ex-ante* estimation of emission reduction, baseline emissions of methane are calculated based on the actual and projected waste streams $W_{j,x}$ disposed in each year *x.*

η_{PJ} Efficiency of the LFG capture system that will be installed in the project activity. η_{PJ} is correctly *ex-ante* determined as 0.9280 (92.80%).

Determination of $F_{CH4,BL,y}$:

As required by the selected methodology [/5/], the amount of methane assumed as being captured and destroyed in the baseline scenario ($F_{CH4,BL,y}$) (absence of the project activity) due to eventually applicable regulatory or contractual requirements, or to address eventually existent applicable safety and other concerns (which are collectively referred to as "*requirement"* under this step) is correctly determined by following the applicable approach through selection of one of the four cases of the applied CDM baseline and monitoring methodology as outlined in the table below:

Cases for the determination of $F_{CH4,BL,y}$ as per ACM0001 (version 18.0):

Situation at the start of the project activity	Requirement to destroy methane?	Existing LFG capture and destruction system?
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

Source: ACM0001 (version 18.0) [/5/]

Assessment of the existence of regulatory or contractual and non-regulatory or non-contractual requirements to destroy methane (as per the applicable definition of "requirement" of ACM0001 (version 18.0):

Existence of contractual requirements related to LFG management for the particular case of the project activity:
As confirmed by the validation team, from the time the URBAM landfill was built until nowadays there has been no legal municipal, state or national legally binding requirement or regulation that would establish any management requirement for LFG at such particular landfill site. The following disclaimer is thus confirmed to be appropriately added in the updated PDD /2/:

"Requirement to destroy methane: NO".

By taking this assumption into account, Case 2 and Case 4 (*Requirement to destroy methane? = Yes*) from the cases above-summarized are thus automatically regarded as not applicable cases for the determination of $F_{CH4,BL,y}$. This is deemed reasonable and correct.

Thus, in the context of the assessment of the valid cases, the remaining possibly valid alternatives (cases) (after the confirmation of existence of non-regulatory and non-contractual requirements to destroy methane due to safety and odor concerns) are thus Case 1 and Case 3 (*Requirement to destroy methane? = No*).

Assessment of existence of "LFG capture and destruction system" at the URBAM landfill (as per the applicable definition of "existing LFG capture and destruction" of ACM0001 (version 18.0)):

The validation team verified that, as appropriately outlined in Section A.3, until May 2008 (prior of the project activity starting of operation), despite of the non-existence of requirements to destroy methane at the URBAM landfill, this landfill was under regular operation with LFG being sporadically combusted in permanently available reduced number of 14 conventional passive LFG venting/combustion drains available at that time. As also assessed by the validation team, while historical data on the amount of LFG collected and combusted by such pre-project 14 previously existent conventional passive LFG venting/combustion drains are available for year 2007, despite of the non-existence of requirements, such drains were installed for reasons related to better understanding the role of LFG generation within the geotechniques (physical stability) of the URBAM landfill. As also explained to the validation team by the representative of the PP, related measurements were performed and recorded as a result of an attempt of URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda.

The validation team thus confirms that, there was an existing LFG capture system at the URBAM landfill prior to the implementation of the project activity. Therefore, Case 3 is correctly regarded as applicable, with Case 1 being also regarded as not applicable.

In summary, the only option/case applicable for the URBAM landfill (in the absence of the project activity) is correctly selected as Case 3.

Application of methodological guidance valid for Case 3:

As per applicable guidance of ACM0001 (version 18.0) /5/, $F_{CH4,Bl,y}$ is correctly calculated as:

$$F_{CH4,BL,y} = F_{CH4,BL,sys,y}$$

As also confirmed by the validation team, the amount of methane captured through the use of the pre-project LFG management infrastructure cannot be monitored ex-post since such previously existent infrastructure (under the configuration during the period from year 2007 to the start of operation of the project activity) is not any longer available. As informed to the validation team,

such pre-project LFG management infrastructure was decommissioned and disassembled as a result of the beginning of operations of the project activity in 2008.

Thus, in the particular case of URBAM landfill, $F_{CH4,BL,y}$ is thus correctly determined as follows:

$F_{CH4,BL,y} = F_{CH4,BL,x-1} / F_{CH4,x-1} * F_{CH4,PJ,y}$

Where:

$F_{CH4,BL,x-1}$ Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity. As per previously available measurement records valid for year 2007, $F_{CH4,BL,x-1}$ is calculated as 177.71 tCH_4. While $F_{CH4,BL,x-1}$ represents a ex-ante selected (fixed) parameter, details for this parameter are also correctly summarized in Section B.6.2 of the updated PDD /2/.

$F_{CH4,x-1}$ Amount of methane in the LFG generated in the SWDS in the year prior to the implementation of the project activity. $F_{CH4,x-1}$ is calculated as 6,156.30 tCH_4 (value valid for year 2007). As confirmed by the validation team, details about the correct determination of $F_{CH4,x-1}$ are made available in the emission reduction calculation spreadsheet /4/ valid for the 2nd 7-year crediting period (that is enclosed to the updated PDD /2/).

In summary, by taking into account the assumed/determined values for $F_{CH4,BL,x-1}$ and $F_{CH4,x-1,}$ the validation team was able to confirm that, as outlined in the updated PDD /2/, $F_{CH4,BL,y}$ is correctly determined as follows:

$F_{CH4,BL,y} = (177.71 / 6,156.30) * F_{CH4,PJ,y} = 0.0289 * F_{CH4,PJ,y}$

Determination of Project Emissions:

The only emission sources to be accounted as project emissions in year *y* (PE_y) are summarized as follows:

$PE_y = PE_{EC,y}$

Where:

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

Assessment of the determination of project emissions due to the consumption of electricity by the project activity ($PE_{EC,y}$):

In the particular case of the project activity, $PE_{EC,y}$ is determined as follows:

$PE_{EC,y} = PE_{EC,grid,y}$

Where:

$PE_{EC,grid,y}$ Project emissions from consumption of grid electricity due to the project activity in year *y.* $PE_{EC,grid,y}$ is correctly outlined in the updated PDD /2/ as being determined (in tCO_2/yr) based on monitoring ex-post of records of amount of grid-sourced electricity that is consumed by the project activity (by following applicable guidance and monitoring requirements of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity

generation" [11]). *Ex-post* determined annual values for CO_2 emission factor for consumed grid electricity (by following applicable guidance and monitoring requirements of the "Tool to calculate the emission factor for an electricity system" [13]) will also be considered. *Ex-ante* determined value of the Average technical transmission and distribution losses in the National Grid of Brazil in year *y* ($TDL_{grid,y}$) (by also following the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" [11]) is also considered as per the following calculation formulae:

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

Where:

$EC_{PJ,grid,y}$ Quantity of grid-sourced electricity consumed by the project activity in year *y* (in MWh/yr). $EC_{PJ,grid,y}$ will be monitored (based on measurements) during the remaining share of the 1st 7-year renewable crediting period.

$TDL_{grid,y}$ Average technical transmission and distribution losses in the National Grid of Brazil in year *y.* $TDL_{grid,y}$ is correctly *ex-ante* determined as 20% in accordance with Scenario A (Option A1) of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" [11].

$EF_{EL,grid,y}$ Emission factor for grid electricity generation in year *y* (in tCO_2/MWh). The CO_2 emission factor $EF_{EL,grid,y}$ is ex-ante calculated by applying the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" [11] and Option A.1 was correctly chosen. Due to the definition of related parameters as per the applied CDM baseline and monitoring methodology ACM0001 (version 18.0) [5], scenario A applies as the electricity end users would be supplied with electricity sourced by the same power grid (i.e. the National Electricity Grid of Brazil) which will be the same electricity grid connected to the project activity's new electricity generation facility (using LFG as gaseous fuel). The validation team thus confirms that Option A.1 is correctly selected. In accordance applicable guidance of ACM0001 (version 18.0) [5], the parameter $EF_{EL,k,y}$ is correctly defined as "Combined margin CO_2 emission factor" ($EF_{grid,CM,y}$).

Ex-ante determination of $EF_{grid,CM,y}$:
As outlined in the updated PDD [2], the parameter $EF_{grid,CM,y}$ is determined *ex-ante* in accordance with applicable guidance of the "Tool to calculate the emission factor for an electricity system" [13]. The *simple-adjusted OM* method is appropriately selected as the calculation method. The selection of this approach is in accordance with related guidance and definitions set by the Brazilian Ministry of Science, Technology and Innovation (MCTI) [31], which holds the Comissão Interministerial da Mudança Global do Clima (CIMGC) (the DNA of Brazil).

As correctly outlined in the updated PDD [2], for the 2nd 7-year renewable crediting period, $EF_{grid,CM,y}$ is determined *ex-ante* (in tCO_2/MWh) by following the applicable stepwise procedure as per the latest version of the "Tool to calculate the emission factor for an electricity system" [13], where the following formulae is applied:

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

Where:

$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year *y* (in tCO_2/MWh)
$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (in tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The weighting factors for build and operating margin (w_{BM} and w_{OM}) were also correctly *ex-ante* selected as per applicable guidance of the "Tool to calculate the emission factor for an electricity system" /13/. $EF_{grid,OM,y}$ is calculated *ex-ante* by applying calculation guidance of the methodological tool applicable for *simple-adjusted OM* and determined value will remain fixed during the entire 2nd 7-year crediting period of the project activity. As appropriately outlined in the upated PDD /2/, this calculation method represents a variation of the simple OM method, where the power plants/units (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*m*). The simple adjusted OM is calculated based on the net electricity generation of each power unit and an emission factor for each power unit as follows:

$$EF_{grid,OM-adj,y} = (1-\lambda_y) \times \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y \times \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where:

$EF_{grid,OM-adj,y}$	Simple adjusted operating margin CO_2 emission factor in year *y* (in tCO_2/MWh)
λ_y	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y* (in MWh)
$EG_{k,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (in MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (in tCO_2/MWh)
$EF_{EL,k,y}$	CO_2 emission factor of power unit *k* in year *y* (in tCO_2/MWh)
m	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	All low-cost/must-run grid power units serving the grid in year *y*
y	The relevant year as per the data vintage (2014, 2015 and 2016 in the particular case of the project activity).

For the determination of annual values for the Build margin CO_2 emission factor ($EF_{grid,BM,y}$) for the 2nd 7-year crediting period, the choice of the project participants is Option 1. The build margin emissions factor is the generation-weighted average emission factor (in tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (in MWh)

$EF_{EL,m,y}$ CO_2 emission factor of power unit *m* in year *y* (in tCO_2/MWh)

m Power units included in the build margin

y Most recent historical year for which power generation data is available

Determination of Leakage emissions:

In accordance with ACM0001 (version 18.0) /5/, leakage emissions are not considered for the determination of emission reductions to be achieved by the project activity. As part of its assessment, the validation team confirms that, as highlighted in the updated PDD /2/, it was not identified project emission or leakage which would contribute to more than 1% of the emission reductions to be achieved by the project activity other than the ones covered by the selected CDM baseline and monitoring methodology (ACM0001 (version 18.0)) /5/.

Ex-ante estimation of emission reductions to be achieved by the project activity during the 2nd 7-year crediting period:

The *ex-ante* estimation of emission reductions to be achieved by the project activity (as calculated in the emission reductions calculation spreadsheet /4/ and summarized in the updated PDD /2/) was assessed by the validation team. The performed assessment included checking of input parameters and formulas contained in the spreadsheet cells for estimating baseline and project emissions along the 2nd 7-year renewable crediting period. The validation team was also able to confirm that all assumptions and data used for estimating GHG emission reductions to be achieved by the project activity are listed in the updated PDD /2/. Furthermore, formulas, parameters and values are complete, accurate and transparent.

For the project activity baseline emissions generated from waste disposal at the SWDS ($BE_{CH4,y}$) are estimated to be on the average 147.252 tCO_2e per year, over the 2nd 7-year crediting period. The *ex-ante* estimated project emissions (PE_y) are determined as 88 tCO_2e per year. Emission reductions (ER_y) to be achieved by the project activity were *ex-ante* estimated as the difference of ex-ante estimation of baseline emissions and ex-ante estimation of project emissions. ER_y are estimated to be (on the average) 147,164 tCO_2e per year over the 2nd 7-year renewable crediting period. Detailed calculation of *ex-ante* estimation of both baseline and project emissions, as provided in the emission reduction calculation spreadsheet /4/ which is enclosed to the updated PDD/ 2/, can be reproduced using data and parameter values provided in the updated PDD /2/ and supporting files submitted to the validation team. The selection and determination of all used factors and parameters are deemed reasonable and acceptable (as further assessed in Appendix 7 and 8). In summary, the GHG calculations are complete and transparent.

The validation team however highlights that forecasted/estimated emission reductions over the 2nd 7-year renewable crediting period are deemed accurate and correct within reasonable limits. Based on assessment of other similar registered CDM project activities (also involving LFG collection and destruction/utilization), the validation team highlights that methane generation and collection efficiency of LFG in landfills (as typically forecasted through the application of the FOD model in the context of the selected methodology and the methodological tool "Emissions from solid waste disposal sites" /14/) has an inherent high uncertainty level (of almost 50% in some cases) and hence the amount of emission reductions, which will be determined on the basis of *ex-post* monitoring, might significantly vary from the forecasted amount.

Summary of ex-ante determination of emission reductions:
As correctly reported in the updated PDD /2/, ex-ante annual estimates of emission reduction to be achieved by the project activity during the 2nd 7-year crediting period are summarized as follows:

Year	Emission reductions (tCO_2e)
2015	24,418
2016	140,046
2017	142,818
2018	145,455
2019	147,973
2020	150,385
2021	152,703
2022	126,497
Total	**1,030,295**
Annual average	147,185

In summary, the validation team confirmed that calculations for *ex-ante* estimates of emission reductions to be achieved by the project activity during the 2nd 7-year renewable crediting period, as reported in the updated PDD /2/, are deemed complete and transparent.

Appendix 7: Assessment of ex-ante selected (fixed) parameters

As outlined in Section B.6.2 of the updated PDD /2/, the following *ex-ante* determined parameters are correctly defined and used for the *ex-ante* estimation of emission reduction to be achieved by the project activity within the 2nd 7-year crediting period and/or for the determination of baseline and/or project emissions for the project activity along such crediting period:

Table 4-3: Parameters determined *ex-ante*[2]

Parameter / data	Unit	Value applied	Source of used data/ GLC assessment opinion
Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline (OX_{top_layer})	-	0.1	Default value as per ACM0001 (version 18.0) /5/ is correctly selected and indicated in the updated PDD /2/. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

[2] The table includes all *ex-ante* determined parameters which are presented in Section B.6.2 of the updated PDD. In accordance with applicable CDM guidance for completing the CDM-PDD form, data that are calculated with equations provided in the applied CDM baseline and monitoring methodology and default values specified in the applied methodology and applicable methodological tools are not included in the table and in Section B.6.2 of the PDD. This is deemed correct.

Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity (2007) ($F_{CH4,BL,x-1}$)	tCH_4/yr	177.71	As confirmed by the validation team, value as per available records of historical measurements performed by URBAM - Urbanizadora Municipal S.A. and Araúna Participacoes e Investimentos Ltda. (related to year 2007) /28/ is correctly selected. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s). DOE Remark on correction of value FCH4,BL,x-1 : There was one typo error in reporting of value FCH4,BL,x-1 in previous PDD, which is now correct in latest PDD version 16 dated 03/11/2017, similar the value of FCH4,BL,x-1 is corrected in this section accordingly.
Global Warming Potential of CH_4 (GWP_{CH4})	tCO_2e/tCH_4	25	Value 25 (as per IPCC's: Global Warming Potential for Given Time Horizon) is correctly selected. This is in accordance with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol /19/. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Efficiency of the LFG capture system that will be installed in the project activity (η_{PJ})	-	0.9280	As confirmed by the validation team, selected value is as per available literature. Information available in the technical paper "*Measuring landfill gas collection efficiency using surface methane concentration*" /20/ estimates that the typical LFG collection efficiency in LFG collection and

			destruction initiatives in Brazil is about 92.80%. This paper is publicly available at the website of the California Environmental Protection Agency. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Universal ideal gases constant (R_u)	Pa.m³/kmol.K	8,314	Default values as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ are correctly applied in the updated PDD /2/. In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Molecular mass of gas *k* (MM_k)	kg/kmol	28.01 (N_2)	
Molecular mass of greenhouse gas *i* (MM_i)	kg/kmol	16.04 (CH_4)	
Total pressure at normal conditions (P_n)	Pa	101,325	
Temperature at normal conditions (T_n)	K	273.15	
Molecular mass of water (MM_{H2O})	kg/kmol	18.0152	

Average technical transmission and distribution losses for providing electricity to the grid and for grid sourced electricity consumed by the project activity ($TDL_{grid,y}$)	%	20	Applicable conservative default value is correctly selected as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" /11/ (default values as established by option A.1). In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Weighting of build margin emissions factor (w_{BM})	%	0.75 (75%)	Values are correctly selected as per the methodological tool "Tool to calculate the emission factor for an electricity system" /13/ (default value applicable for 2nd 7-year crediting period of a CDM project activity). In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Weighting of operating margin emissions factor (w_{OM})	%	0.25 (25%)	
Build margin CO_2 emission factor in year *y* ($EF_{grid,BM,y}$)	tCO_2/MWh	0.1581	Values are correctly selected as per the methodological tool "Tool to calculate the emission factor for an electricity system" /13/. In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Operating margin CO_2 emission factor in year *y* ($EF_{grid,OM-adj,y} = EF_{grid,OM,y}$)	tCO_2/MWh	0.4979	
Model correction factor to account for model uncertainties ($\varphi_{default}$) (as appropriately outlined in the updated PDD /2/, $\varphi_{default}$ is equivalent to φ_y)	-	0.75	Values are correctly selected according to the methodological tool "Emissions from solid waste disposal sites" /14/ (default value for Application A) (based on the climate conditions valid for the location of the project activity and/or technical design aspects of the URBAM
Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste) (OX)	-	0.1	
Fraction of methane in the SWDS gas (volume fraction) (F)	-	0.5	

Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS. ($DOC_{f,default}$)		Weight fraction	0.5		landfill). In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Methane correction factor ($MCF_{default}$)		-	1.0		Assessment details are presented below
Fraction of degradable organic carbon (by weight) in the waste type *j* (weight fraction) (DOC_j)		-	Assessment details are presented below.		
Decay rate for the waste type j (k_j)		1/yr			
Weight fraction of the waste type (W_j)		-			
Manufacturer's flare specifications for temperature, flow rate / heat flux and maintenance schedule ($SPEC_{flare}$)	Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):	°C	500 (min)	1,000 (max)	Values are correctly indicated as per the information assessed in the clarification letter provided by the flare manufacturer Brasmetano Ind. e Com. Ltda. In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
	Operational LFG flow (for continuous operation):	Nm^3/h	200 (min)	3,000 (max)	
	Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material):	Days	365 days		
	Required/ recommended minimum frequency for replacement of the flare isolation ceramics revetment material:	-	After 10 years of regular and appropriate operation		

Additional assessment details for the ex-ante determined parameter $MCF_{default}$, DOC_j , k_j and w_j:

Assessment of the suitability of ex-ante determined value for parameter $MCF_{default}$:
By taking into account the current and forecasted MSW disposal and management practice at the URBAM landfill and also by assessing the valid operational license for such landfill

[29], the validation team was able to confirm that MSW has been disposed in this particular landfill with depths greater than 5 meters and appropriate MSW landfilling measures have been undertaken and are expected continue being performed throughout the whole landfill operational lifetime (such as effective mechanical compacting, leveling and covering of disposed MSW). The validation team was thus able to conclude that the selected value for the *ex-ante* determined parameter $MCF_{default}$ (equal to 1.0) is deemed acceptable, reasonable and in accordance with applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 07.0) [14]. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s). In summary, the parameter and its selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Assessment of the suitability of ex-ante determined values for parameters DOC_j , k_j and w_j:
As established by the methodological tool "Emissions from solid waste disposal sites" [14], default IPCC 2006 values [9] were correctly selected for the parameters Fraction of degradable organic carbon in the waste type *j* (weight fraction) (DOC_j), Decay rate for the waste type *j* (k_j) and Weight fraction of the waste type (W_j) by taking into account the available statistics and meteorological data valid for the region where the URBAM landfill is located. The selected values for DOC_j, k_j and w_j for the different fractions of solid waste types are presented in the table below. Furthermore, the values were confirmed by the validation team to be deemed appropriate and correct. Values of mean temperatures and precipitation data for the city of São José dos Campos were also correctly taken into account for the determination of values of k_j as required by the methodological tool "Emissions from solid waste disposal sites" [14].

Table 4-4: Composition of disposed MSW (w_j) and *ex-ante* selected values for the parameter DOC_j and k_j

Waste type *j*	Fraction of degradable organic carbon (by weight) in the waste type *j* (DOC_j)	Decay rate for the waste type *j* (k_j) (in 1/yr)	Weight fraction of the waste type *j* (w_j)
Wood and wood products	43%	0.03	4.7%
Pulp, paper and cardboard (other than sludge)	40%	0.06	17.1%
Food, food waste, beverages and tobacco (other than sludge)	15%	0.185	44.9%
Textiles	24%	0	2.6%
Garden, yard and park waste	20%	0.10	0.0%
Glass, plastic, metal, other inert waste	0%	0	30.7%

In summary, the parameters and their selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Conclusion about the assessment of the selection of ex-ante determined (fixed) parameters as per the updated version of the PDD:
In summary, the selection and report of the all *ex-ante* determined (fixed) parameters in the updated the PDD (version 16, dated 03/11/2017) /2/ is deemed reasonable, complete and transparent.

The rationale/justification for selected values for all *ex-ante* determined (fixed) parameters is sufficiently provided in the updated PDD /2/. Supporting evidences for the selected values were made available to the validation team. Referred data sources were also verified by the validation team. In summary, the description of all ex-ante selected (fixed) parameters and their selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Appendix 8: Assessment of parameters monitored ex-post

The parameters to be monitored *ex-post* are correctly indicated in the updated PDD (version 16, dated 03/11/2017) /2/ as required by ACM0001 (version 18.0) /5/ + the following applicable methodological tools:

- Emissions from solid waste disposal sites (version 07.0, EB83) /14/
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 02.0, EB 87) /11/
- Project emissions from flaring (version 02.0.0, EB 68) /10/
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0, EB 87) /12/
- Tool to calculate the emission factor for an electricity system (version 05.0, EB 87) /13/
- Combined tool to identify the baseline scenario and demonstrate additionality (version 06.0, EB 85) /30/
- Assessment of validity of the original/current baseline and to update the baseline at the renewal of a crediting period (version 03.0.1, EB66) /32/

The updated PDD /2/ correctly includes in Sections B.7.1 and B.7.3 details about all parameters to be monitored *ex-post* along the 2nd 7-year renewable crediting period for which related assessment is included in the table below:

Parameter	Assessment details
Management of SWDS	The design and operational conditions of the URBAM landfill will be annually monitored on the basis of different sources such as: - Original design of the landfill vis-a-vis eventual changes; - Technical specifications for the management of the URBAM landfill vis-a-vis eventual related eventual changes; - Applicable local or national regulations As required by ACM0001 (version 18.0) /5/, the design and operational conditions of the URBAM landfill should be demonstrated not to be modified in order to ensure that no practice to increase methane generation have occurred prior or after the implementation of the project activity. As established by ACM0001 (version 18.0) /5/, any change in the management of the landfill after the implementation of the project activity will be justified by referring to technical or regulatory specifications. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency

	with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric flow of LFG stream in time interval *t* on a dry basis ($V_{t,db}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db}$)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric fraction of CH_4 in time interval *t* on a wet basis ($v_{CH4,t,wb}$)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Mass flow of the LFG stream in time interval *t* on dry basis ($M_{t,db}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Temperature of the LFG stream in time interval *t* (T_t)	Measurements for T_t will be recorded and reported in ^{o}C. Recorded/ reported data will be converted to Kelvin (K) (in order to also being recorded/ reported in K). Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored

	continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Pressure of the LFG stream in time interval *t* (P_t)	Depending on installed measurement instrument, measurements for P_t will be recorded and reported in mbar. Recorded/reported data will be converted into Pascal (in order to be also recorded and reported in Pa). Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Amount of grid electricity consumed by the project activity during the year *y* ($EC_{PJ,grid,y}$)	Continuous measurements will be aggregated manually or automatically. Accumulated measurement records will be recorded and reported at least with an every-month frequency. Measurement records will be cross-checked against available electricity consumption receipts/invoices issued by the local electricity distribution company. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)	Measured in accordance to an appropriate national or international standard e.g. UKs Technical Guidance LFTGN05. The time period *t* over which the mass flow is measured must be at least one hour. The average flow rate to the flare during the time period *t* must be greater than the average flow rate observed for the previous six months. Monitoring of this parameter is required in the case of enclosed flares and if the project participants select Option B.1 to determine flare efficiency. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,Sat}$)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)	Measured by appropriate temperature measurement equipment with an every-minute frequency. Measurements outside the operational temperature specified by the manufacturer may indicate that the flare is not functioning correctly and may require maintenance. Flare manufacturers must provide suitable monitoring ports for the monitoring of the temperature of the flare. These would normally be expected to be in the middle third of the flare. Where more than one temperature port is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer specifications for temperature. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Flame detection of flare in the minute *m* ($Flame_m$)	Detection of flame in the flare recorded with an every-minute frequency as a minute that the flame was on, otherwise recorded as a minute that the flame was off. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Maintenance events completed in year *y* as monitored by the project participants ($Maintenance_y$)	Record the date that maintenance events were completed in year *y*. Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificates. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Operational status of biogas destruction devices (Status of biogas destruction device)	Continuous measurements. As there is no electricity generation in this project activity, is applicable to consider the same procedure as adopted for parameter $Flame_m$. Monitoring and documenting may be undertaken through monitoring of by recording the energy production from methane captured or the operation of the flare (by means of a flame detector) in order to demonstrate the actual destruction of methane in such uniquely installed biogas destruction device. , unless a different method is specified in the underlying methodology/tool. Emission reductions will not accrue for periods in which the underlying destruction device (high temperature enclosed flare) is not operational.

Appendix 9: Photographs of On-site Assessment by DOE on 04/11/2017.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