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

(Version 03.0)

Title and UNFCCC reference number of the project activity	ESTRE's Paulínia Landfill Gas Project (EPLGP) (UNFCCC ref. no. 0165)
Number and duration of the next crediting period	3rd 7-year crediting period from 14/09/2020 to 13/09/2027
Version number of the validation report	1.0
Completion date of the validation report	15/01/2021
Version number of PDD to which this report applies	05.0
Project participants	ESTRE Ambiental S/A Nordic Environment Finance Corporation
Host Party	Brazil
Applied methodologies and standardized baselines	ACM0001 - "Flaring or use of landfill gas" (version 19.0)
Mandatory sectoral scopes	Sectoral Scope 13 - Waste handling and disposal
Conditional sectoral scopes, if applicable	Not applicable
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	691,290 tCO_2e per year
Name and UNFCCC reference number of the DOE	LGAI Technological Center, S.A. (Applus+ Certification) UNFCCC Ref. No.: E-0032
Name, position and signature of the approver of the validation report	Mr. Agustín Calle de Miguel *Applus+ Certification CDM Technical Manager* Signature:

SECTION A. Executive summary

LGAI Technological Center, S.A., accredited DOE E-0032 (hereinafter referred to as *Applus+ Certification*) was commissioned by ESTRE Ambiental S/A to perform the validation assessment of the renewal of 7-year crediting period for the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)" (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 03/03/2006 (UNFCCC ref. no: 0165) under a renewable crediting period of 7 years. The expired 1st 7-year crediting period of the project activity encompassed the period from 14/09/2006 to 13/09/2013. The currently expired 2nd 7-year crediting period of the project activity encompassed the period from 14/09/2013 to 13/09/2020. The 3rd and last 7-year crediting period of the project activity will encompass the period from 14/09/2020 to 13/09/2027.

The host-country project participant and project owner ESTRE Ambiental S/A has not previously notified the Secretariat of the CDM Executive Board (CDM-EB) of their intention to once again renewal of the crediting period of the registered CDM project activity (by submitting a draft version of the updated PDD and informing of their selection of a DOE for performing related CDM validation services). It relevant to note that, as confirmed by the appointed Applus+ Certification's validation team, such notifying is any longer required as per the currently valid rules and procedures for renewing the 7-year crediting period of registered CDM project activities.

Project design:
The design of the project activity encompasses promotion of methane destruction through collection and combustion of landfill gas (LFG) at the CGR Paulínia landfill with combustion of collected LFG occurring in a set of high temperature enclosed flares (project's methane destruction devices).

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 CGR Paulínia landfill as a result of the anaerobic decomposition of municipal solid waste (MSW) disposed in such landfill site through the utilization of appropriate MSW landfilling techniques and procedures. The only type of GHG abatement/mitigation action encompassed by the project activity under its design configuration is destruction of methane. No emission reductions due to displacement of a more-GHG-intensive service (due to generation of electricity using collected LFG as fuel and/or any other type of LFG utilization) are thus eligible or claimable for the project activity.

All electricity demand for the project activity is to be normally met by consumption of grid-sourced electricity (imports of electricity sourced from the National Electricity Grid of Brazil). Two backup captive off-grid electricity generators (fuelled by diesel) are installed as part of the project activity and are expected to be individually or jointly used only whenever the project's electricity demand cannot be met by imports of grid-sourced electricity.

The CGR Paulínia landfill is located in Paulínia, in State of São Paulo in the Southeastern 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-PA) (version 02.0) /1/, CDM Project Cycle Procedure for Project Activities (CDM-PCP-PA) (version 02.0) /16/ and CDM Project Standard for Project Activities (CDM-PS-PA) (version 02.0) /15/.

Scope and objective of the validation assessment for renewal of crediting period:
The scope of the validation of renewal of crediting period is to provide an independent and objective validation assessment of the Project Design Document (PDD) for the project activity which was updated for a subsequent 7-year crediting period (hereinafter referred to as updated PDD). The validation assessment for renewal of crediting period includes assessment of the baseline scenario, estimated emission reductions, design of the monitoring plan and starting date of the 3rd and last 7-year crediting period of the project activity 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+ certification is based on the assessment of the updated PDD /2/ and by applying standard auditing techniques including, but not limited to, document reviews, follow-up actions (e.g. telephone and/or e-mail interview) and also the conduct of 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-PA (version 02.0) /1/ and the CDM-PS-PA (version 02.0) /15/. It is also relevant to note that for this particular validation assessment, other standard auditing techniques for validation, as referred to in sections 7.1.3 of the CDM-VVS-PA /1/ were applied in light of the decision agreed by the CDM Executive Board (CDM-EB) (in March/2020) to relax mandatory site visits by DOEs for a 3-month period (period from 23/03/2020 to 23/06/2020) because of COVID-19 pandemic (+ decision also agreed by the CDM-EB to extend the relaxation of mandatory site visits until 30/06/2021) /38/. The validation assessment was performed by also considering/assessing the following issues:

a) The impact of eventually new relevant national and/or sectoral policies and circumstances over the previously derived baseline scenario for the project activity by taking into account relevant guidance from the CDM-EB applicable to renewal of the crediting period of the registered CDM 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 19.0) /5/) + methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/ 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 3rd and last 7-year crediting period of the project activity (based on the application of ACM0001 (version 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/).

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-EB, as set out in the CDM-PS-PA /15/, CDM-PCP-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 and/or has been appropriately updated by, if applicable, taking into account of new data and/or circumstance. In particular, the project's baseline scenario, 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 scenario and/or its update (through an assessment of the impact of new relevant national and/or sectoral policies and circumstances over the previously derived baseline scenario, and the correctness of the application of an approved baseline methodology) for the determination of the continued validity of such previously derived

baseline scenario and/or its update, as well as the estimation of emission reductions for the new crediting period.

A validation assessment for renewal of 7-year crediting period of a CDM project activity will result in a conclusion as to whether the request for renewal of crediting period should be submitted to the CDM-EB with a positive validation opinion or not. The final decision on whether to renew the 7-year crediting period (or not) is of full responsibility by the CDM-EB.

The validation assessment for renewal of 7-year crediting period is not meant to provide any type of technical consulting and/or advisory towards the project participant(s) of the registered CDM project activity. However, stated requests for clarifications and/or corrective actions may provide input(s) for improvement of the project design description outlined in the updated PDD.

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-PA) (version 02.0) /1/,
- The monitoring plan of the updated PDD /2/ applicable for the 3rd and last 7-year crediting period of the project activity,
- The CDM baseline and monitoring methodology ACM0001 “Flaring or use of landfill gas” (version 19.0) /5/,
- Updated version of the PDD valid for the 3rd and 7-year crediting period of the project activity /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 03.0) /11/
    - "Project emissions from flaring" (version 03.0) /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 07.0) /13/
    - “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) /24/
    - “Emissions from solid waste disposal sites” (version 08.0) /14/
    - “Tool to calculate the emission factor for an electricity system” (version 07.0) /27/

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-PA (version 02.0) /1/. In addition to that, standard auditing techniques have been applied by the validation team appointed by Applus+ Certification As part of the validation assessment, the Applus+ Certification's validation team initially performed a desk review on all validation related documents, followed by interview conducted with representatives of the project participant ESTRE Ambiental S/A.

The performed validation assessment encompassed (i) comprehensive review of the latest version of the registered PDDs valid for the currently expired 1st and 2nd 7-year crediting periods (PDD version 3.1, dated 18/01/2012 and PDD version 4.5, dated 29/02/2016 respectively) /3/, (ii) review of the updated PDD for the 3rd and last 7-year crediting period + supporting documents; (ii) conduction of interview with representatives of the project participants; (iii) resolution of all eventually identified outstanding issues (raised Corrective Action Request(s) (CAR) and/or Clarification Request(s) (CL) and/or Forward Action Request(s) (FAR)) (if applicable) and, finally, (iv) issuance of the Validation Report.

As part of the validation process, the validation findings and observations from the performed document desk review and interview with representative of the project participants. For all identified inconsistencies and lack of clarity, related findings (list of outstanding issues) are raised. The next steps are, if applicable, to close out the raised 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+ Certification prior to its submission to the CDM-EB.

Validation assessment conclusion and summary of the validation opinion:
As part of the conducted validation assessment, no outstanding issues (findings) were identified by the Applus+ Certification's validation team. Due to lack of outstanding issues, there was no need to have the project participant ESTRE Ambiental S/A appropriately addressing such findings through the compilation of a revised version of the updated PDD /2/ for the 3rd and last 7-year crediting period of the project activity.

In summary, it is the opinion of Applus+ Certification that the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)", as described in the updated version of the PDD (version 5.0, dated 20/11/2020) /2/, meets all relevant UNFCCC requirements for the renewal of its 7-year crediting period (including requirements for completing the PDD) and correctly applies the CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/. Applus+ Certification 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.	Lead Auditor / Technical Expert	EI	Tavares	Luis Filipe	Applus+ Certification	Y	n/a	Y	Y

Note: IR: Internal Resources, EI: External Individuals, OE: Outsourced Entity.

Demonstration how the Applus+ Certification's validation team meets the competence required for the performance of the validation assessment of renewal of crediting period 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 / Technical Expert (13.1)	EI	Xue	Denny	Applus+ Certification
2.	Report Approver	IR	Calle	Agustín	Applus+ Certification

Note: IR: Internal Resources, EI: External Individuals, OE: Outsourced Entity.

Demonstration how the appointed Technical Review team meets the competence required for the performance of the validation assessment of renewal of crediting period is included in Appendix 2.

SECTION C. Means of validation

C.1. Desk/document review

A detailed document reviews on the initial version of the updated PDD /2/, applied CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/ and all other associated documentation and references were performed by the Applus+ Certification's validation team 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 participant)
- 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 /10/ /11/ /14/ /12/ /13/ /24/ /27/, of the appropriateness/correctness of formulae, calculation approaches and monitoring approaches as referred in the updated PDD /2/.

The following documents were assessed:

- PDDs applicable to the currently expired 1st and 2nd 7-year crediting periods of the project activity (PDD version 3.1, dated 18/01/2012 and PDD version 4.5, dated 29/02/2016 respectively) /3/
- Validation Report for the project activity /8/ and Validation Report for the previously occurred 1st renewal of the 7-year crediting period of the project activity /37/ and Validation Opinion Report for previously occurred post-registration changes in the project activity /43/.
- Verification Reports /20/ /26/ /31/ /33/ /35/ and Monitoring Reports /22/ /25/ /34/ /32/ for the previously performed (concluded) periodic verifications within the currently expired 1st and 2nd 7-year crediting periods of the project activity.
- 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: N/A				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	N/A			

No physical on-site inspection (with presence of the Applus+ Certification's validation team) was conducted as part of the performed validation assessment for renewal of crediting period of the project activity.

While performing an on-site inspection to the project activity as part its validation assessment for renewal of crediting period was indeed previously considered to occur as part of the validation assessment for its renewal of crediting period, as a result of recently raised travelling restrictions related to the COVID-19 pandemic, the Applus+ Certification's validation team have proposed to the project participant ESTRE Ambiental S/A to, as an alternative, consider postponing such on-site visit. Such proposal of postponing the on-site inspection was made by taking into account not only travelling restriction related to official decisions and recommendations from local authorities

(i.e. restrictions and recommendations from the Government of São Paulo State and Federal Government of Brazil), but also related corporate travelling restriction policy announced by Applus+ for its operations worldwide.

As an answer to such proposal from Applus+ Certification, the representatives of ESTRE Ambiental S/A highlighted to the Applus+ Certification's validation team that they could not agree with and/or accept such postponing recommendation since this company has a previously contractually agreed CER delivery/forwarding schedule valid for the project activity (which has been so far met and has to be met until the end of its validity as defined in its terms and conditions). The veracity of such contractually agreed CER delivery/forwarding schedule and related obligations to deliver/forward CERs as per such valid schedule was confirmed by the Applus+ Certification's validation team through assessment of the documented CER delivery/forwarding schedule for the project activity /50/ which is based on a previously established Emission Reduction Purchase Agreement (ERPA) that was indeed contractually agreed between ESTRE Ambiental S/A and the Annex I project participant Nordic Environment Finance Corporation (contractual agreement dated 17/06/2015).

While the issuance of CER streams by the project activity for the period beyond the expiration date of its 2nd 7-year crediting period (13/09/2020) (which was confirmed as being a period also encompassed by the valid CER delivery/forwarding schedule based on a previously established ERPA/50/) is indeed completely dependent on effective and successful additional renewal of the 7-year crediting period for the project activity, it is the opinion of the Applus+ Certification's validation team that, as alleged by ESTRE Ambiental S/A, any representative or relevant delay on performing and processing the validation assessment for renewal of crediting period of the project activity would definitely result on delayed emission of such CER stream which would make related CER forwarding potentially not meeting and potentially not being under conformance such previously mutually agreed CER delivery/forwarding schedule /50/.

Due to that, for the particular case of the validation assessment of renewal of the 7-year crediting period of the project activity, by taking into account the contractual obligations that the project participant ESTRE Ambiental S/A has to meet in terms of delivery/forwarding of CERs generated uniquely by project activity (as established in the assessed project's CER delivery/forwarding schedule as per a valid ERPA /50/), Applus+ Certification assumed as deemed reasonable to regard the required on-site inspection to the project site (as part of the validation assessment of renewal of crediting period of the project activity) as a task that could not be postponed due to commercial/contractual related reasons.

By thus (i) acknowledging that the required on-site inspection could not be performed as part of the validation assessment due to the COVID-19 pandemic, (ii) by also assuming that such on-site inspection could not be postponed either (due to the above-summarized reasons) and (iii) by also taking into consideration all guidance and requirements of the CDM-EB recently agreed relaxing of the rule requiring mandatory on-site inspection by DOEs (valid for the period from 23/03/2020 to 23/06/2020 and because of COVID-19 pandemic (+ decision also agreed by the CDM-EB to extend the relaxation of mandatory site visits until 30/06/2021)) /38/; the Applus+ Certification's validation team performed, as part of the validation assessment, the tasks of document review and interviews with representatives of the project participant ESTRE Ambiental S/A (steps further detailed in Sections C.1 and C.3 respectively) by incorporating (adding) of the following additional checking's/assessments (as complementary auditing measures):

- Assessment of a set of recently produced pictures (dated 20/12/2020) /49/ with relevant details of different areas/sections of both the CGR Paulínia landfill and the project activity (e.g. landfill's Municipal Solid Waste (MSW) disposal area, project's infrastructure promoting collection and combustion of LFG in currently installed methane destruction devices (i.e. 6 high temperature enclosed flares), monitoring instruments/equipment, etc). This set of pictures was produced on 20/12/2020 as a direct response to a request from the Applus+ Certification's validation team made during the conduction of interviews with

representatives of the project participant ESTRE Ambiental S/A occurred on the same date[1].

- Assessment of the content of the latest versions of the recently issued Monitoring Report /32/ /34/ and Verification Report /33/ /35/ valid for the latest completed periodic verification assessments for the project activity (monitoring periods from 01/10/2019 to 31/12/2019 and from 01/01/2020 to 30/06/2020). These recently issued documents (dated 08/04/2020, 15/04/2020, 13/11/2020 and 20/11/2020 respectively) were recently submitted to UNFCCC by the DOE in charge of these particular verification assessments as part of a CER issuance requests valid for such monitoring periods[2].

Besides of the above-summarized complementary auditing measures, as part of its assessment, the Applus+ Certification's validation team also took into consideration that, in the particular case of the project activity (a typical project-based initiative encompassing collection of LFG (rich in methane) in a well-managed landfill site with combustion of LFG occurring in a set of 6 high temperature enclosed flares (methane destruction devices) as its unique GHG abatement measure), there is no relevant information required for the validation assessment of renewal of 7-year crediting period that would only be assessable and/or confirmable upon the performance of a physical on-site inspection by the Applus+ Certification's validation team.

In this particular context, it is also relevant to note that, as further assessed in other Sections of this Validation Report, all information provided in the updated PDD /2/ was verified (during the performed desk-review and interview phases of the validation assessment) against deemed credible sources. Sufficient documented evidences related to the design and function of the project activity (incl. specification details for main equipment (e.g. currently installed 6 high temperature enclosed flares) + operational aspects of the project activity) were made available to the Applus+ Certification's validation team. It is also relevant to note that identical project design information is included in the updated PDD for the 3rd and last crediting period of the project activity and in the previously validated and registered PDD /3/ for the currently expired 2nd crediting period of the project activity[3] and in the more recently issued Monitoring Reports for the latest performed periodic verification assessments for the project activity (monitoring periods from 01/10/2019 to 31/12/2019 and from 01/01/2020 to 30/06/2020) (with correctness of related information being confirmed in the corresponding Verification Reports for these particular monitoring periods /33/ /35/). Details about project design, construction and implementation phases included in the updated PDD /2/ were confirmed as not being changed when compared to the related descriptions in the PDD for the currently expired 2nd 7-year crediting period of the project activity.

[1] As outlined in Section C.3, as part of conducted interviews with representatives of the project participant ESTRE Ambiental S/A, the Applus+ Certification's validation team has explicitly requested this project participant to produce and make available a set of pictures that could allow clear, transparent and complete visualization of both current operation the CGR Paulínia landfill and the current implementation status of the project activity. As agreed while being interviewed by the Applus+ Certification's team on 20/12/2020, the interviewed representatives produced the set of pictures right after being interviewed by the Applus+ Certification's validation team and submitted all pictures to the team in the same day.

[2] The Monitoring Report and Verification Report for the monitoring period from 01/10/2019 to 31/12/2019 are dated 08/04/2020 and 15/04/2020 respectively. These documents are publicly available online at project activities webpage for its 2nd 7-year crediting period at UNFCCC CDM website.
The Monitoring Report and Verification Report for the monitoring period from 01/01/2020 to 30/06/2020 are dated 13/11/2020 and 20/11/2020 respectively. While these documents were not yet publicly available online at the time of the performance of the validation assessment by Applus+ Certification, copies of the documents were made available to the Applus Certification's validation team by the project participant ESTRE Ambiental S/A.

[3] As outlined in Section D.1, all related project design description information included in the updated PDD /2/ was confirmed by the Applus+ Certification's validation team as being materially the same as that of the PDD applicable to the currently expired 2nd crediting period.

Moreover, based on assessment of documented evidences /82/, while no changes in operational aspects of the CGR Paulínia landfill has occurred and no changes in applicable related regulatory/legal framework for LFG management at this landfill site has occurred either, as further assessed in Section D.3, the baseline scenario information/description valid for the project activity was sufficiently demonstrated not to be changed.

In summary, by taking all the above-presented performed additional auditing measures and aspects into account vis-à-vis applicable requirements established in CDM-VVS-PA (version 02.0) /1/ and by also taking into account the CDM-EB recently agreed relaxing of the rule requiring mandatory on-site inspection by DOEs (valid for the period from 23/03/2020 to 23/06/2020 and because of COVID-19 pandemic (+ decision also agreed by the CDM-EB to extend the relaxation of mandatory site visits until 30/06/2021)) /38/, the Applus+ Certification judged that not performing the previously expected conduction of a physical on-site inspection to the project site and performing additional/complementary assessment tasks instead (as above-summarized) as a deemed acceptable, reasonable and sufficiently complete assessment (with such the consideration of the above-presented performed complementary auditing measures being regarded as deemed sufficient to have the required overall quality and completeness of the performed validation assessment not being negatively affected by the non-performance of physical on-site inspection to the project site).

C.3. Interviews

No.	Interviewed			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Silva	Lucas, (Mr.)	ESTRE Ambiental S/A	20/12/2020	Telephone conference interview encompassing the following topics: - Implementation and operational status of the project activity + confirmation of non-existence of any post-registration change valid for the project activity in the particular context of its renewal of the 7-year crediting period. - Meeting of applicability conditions/requirements of the selected CDM baseline and monitoring methodology + applicable methodological tools /10/ /11/ /12/ /13/ /14/ /24/ /27/ for the renewal of the 7-year crediting period. - 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 eventual new values for ex-ante determined (fixed) parameters in the updated PDD /2/ (when compared to the PDD valid for the currently expired 2nd 7-year crediting period). - Design of the monitoring plan (as per applicable requirements of the selected CDM baseline and monitoring methodology + applicable methodological tools /10/ /11/ /12/ /13/ /14/ /24/ /27/).	Luis Filipe A. Tavares
2.	Braga	Robson, (Mr.)	ESTRE Ambiental S/A	20/12/2020		
3.	Afonso	Rafael, (Mr.)	ESTRE Ambiental S/A	20/12/2020		
4.	Barbosa	Nuno, (Mr.)	UniCarbo - Energia e Biogás Ltda. [4]	20/12/2020		

[4] As confirmed by the Applus+ Certification's Validation Team, UniCarbo Energia e Biogás Ltda. is a CDM consulting and advisory service company that has supported the host-country project participant Estre Ambiental S/A with CDM related issues (inter alia completion of the Monitoring Report). This CDM consulting and advisory service company is confirmed as not being a project participant.

					- Additional checkings/assessments (as complementary assessment tasks) by acknowledging that the required on-site inspection could not be performed as part of the validation assessment due to the COVID-19 pandemic (and by taking into consideration all guidance and requirements of the CDM-EB recently agreed relaxing of the rule requiring mandatory on-site inspection by DOEs (valid for the period from 23/03/2020 to 23/06/2020 and because of COVID-19 pandemic + decision also agreed by the CDM-EB to extend the relaxation of mandatory site visits until 30/06/2021) [/38/]).	

C.4. Sampling approach

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Not applicable.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) 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	-	-	-
Validity of original baseline or its update	-	-	-
Estimated GHG emission reductions or net anthropogenic GHG removals	-	-	-
Validity of monitoring plan	-	-	-
Crediting period	-	-	-
Project participants	-	-	-
Others	-	-	-
Total	00	00	00

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	As per paragraphs 403 and 412 (a) (i) and (ii) of the CDM-VVS-PA (version 02.0) /1/, the validation team appointed by Applus+ Certification checked if project participants used the latest valid version of the PDD form for completing the updated PDD /2/. The Applus+ Certification's 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 currently expired 2nd 7-year crediting period. The validation team also determined whether the project participants completed the updated the PDD /2/ by correctly and sufficiently updating applicability section as per the latest version of the applied CDM methodology in accordance with the requirements as per the CDM-PS-PA (version 02.0) /15/.
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) were raised regarding the compliance with completion guidance and requirements of the PDD form.
Conclusion	The Applus+ Certification's validation team was able to confirm that the updated PDD /2/ was completed by correctly applying the latest version of the CDM-PDD form (version 11.0) /17/ with all applicable guidance and requirements for its completion being sufficiently and appropriately followed. Applicable guidance and requirements for completing the CDM-PDD form (version 11.0) /17/ (as established by the attachment to the CDM-PDD form (version 11.0) "Attachment. Instructions for completing this form" /17/) were confirmed by the Applus+ Certification's validation team to be correctly met/considered. Relevant rules and requirements as per the CDM-PS-PA (version 02.0) /15/ were also confirmed to be sufficiently met/considered in the completion of the updated PDD /2/. All previously issued versions of the PDD valid for the currently expired 1st 7-year crediting period of the project activity apply the CDM baseline and monitoring methodology AM0003 – Simplified financial analysis for landfill gas capture projects (version 3) /28/. All previously issued versions of the PDD valid for the also currently expired 2nd 7-year crediting period of the project activity apply the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) /30/ + applicable methodological tools[5]. The updated PDD /2/ applies the latest version of the CDM baseline and monitoring methodology the CDM baseline and monitoring methodology ACM0001 – Flaring or use of landfill gas (version 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/ [6].

[5] As confirmed by the Applus+ Certification validation team, the latest version of the PDD valid for the currently expired 2nd 7-year crediting period (PDD version 4.5, dated 29/02/2016) /3/ refers to the following methodological tools:

- Emissions from solid waste disposal sites (version 06.0.1)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 01)
- Project emissions from flaring (version 02.0.0)
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 02.0.0)
- Tool to calculate the emission factor for an electricity system (version 03.0.0)
- 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)
- Combined tool to identify the baseline scenario and demonstrate additionality (version 05.0.0)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 02)
- Tool to determine the remaining lifetime of equipment (Version 01)
- Tool to determine the baseline efficiency of thermal or electric energy generation systems (Version 01)

[6] As confirmed by the Applus+ Certification validation team, the updated PDD /2/ refers to the following methodological tools:

- Emissions from solid waste disposal sites (version 08.0)

	The Applus+ Certification's validation team was able to confirm that some sections of the updated PDD /2/ were appropriately and correctly completed through direct transfer of significant amount of project design description information from the latest versions of both the PDD applicable for the currently expired 1st 7-year crediting period of the project activity /3/ and/or from the PDD applicable for the also currently expired 2nd 7-year crediting period of the project activity. While as per paragraph 277 of the CDM-PCP-PA (version 02.0) /16/, 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 Applus+ Certification's validation team confirmed anyway that indication of the host-country and names of the project participant are correctly included in the updated PDD /2/. In summary, the Applus+ Certification's 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.

- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)
- Project emissions from flaring (version 03.0)
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0.0)
- 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)
- Combined tool to identify the baseline scenario and demonstrate additionality (version 07.0)
- Tool to calculate the emission factor for an electricity system (version 07.0)

D.2. Application and selection of methodologies and standardized baselines

Means of validation	As per paragraph 400 of the CDM-VVS (version 02.0) /1/, the validation team appointed by Applus+ Certification checked whether the project participants 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	No findings (CAR(s), CL(s) and/or FAR(s)) were raised regarding the selection and application of CDM baseline and monitoring methodology + applicable methodological tools.
Conclusion	All previously issued versions of the PDD /3/ valid for the currently expired 1st 7-year crediting period of the project activity apply the CDM baseline and monitoring methodology AM0003 – Simplified financial analysis for landfill gas capture projects (version 3) /28/. All previously issued versions of the PDD valid for the also currently expired 2nd 7-year crediting period of the project activity apply the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) /30//. The updated PDD /2/ applies the latest version of the CDM baseline and monitoring methodology the CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/. As confirmed by the Applus+ Certification's validation team, version 19.0 currently represents the latest version of ACM0001. Thus, the selection of ACM0001 (version 19.0) /5/ for completing the updated PDD /2/ is confirmed as being correct. The Applus+ Certification's validation team had also checked the current list of valid standardized baselines as outlined in the applicable section of the UNFCCC CDM website /18/, and confirmed that there is no standardized baseline applicable to the project activity. The Applus+ Certification's validation team also confirmed that the selected CDM baseline and monitoring methodology /5/ and all applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/ 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/ /14/ /12/ /24/ /27/. 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 /10/ /11/ /14/ /12/ /24/ /27/ are demonstrated to be sufficiently met. Details for the assessment performed by the Applus+ Certification's validation team of how such applicability criteria/requirements are met is summarized in Appendix 5 of this Validation Report. As confirmed by the Applus+ Certification's validation team, the applied CDM

baseline and monitoring methodology and applicable methodological tools represent the current latest version of such methodological sources and/or the latest version at the time of starting of the validation assessment.

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 and combusted. Since the electricity demand of the project activity is met by imports of grid-sourced electricity from the National Electricity Grid of Brazil, the project participants have 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	Included. Methane in LFG is generated as a result of anaerobic decomposition of the organic fraction of the municipal solid waste (MSW) disposed in the CGR Paulínia landfill since it started to operate.
	N_2O	Excluded for simplification. This emission source is assumed to be very small.
Project scenario	CO_2	Included. Electricity consumption by the project activity represents emissions from consumption of electricity due to the operation of the project activity for which, as established by ACM0001 (version 19.0) /5/, CO_2 emissions represents important emission source in the particular case of the project activity. While flaring of LFG rich in CH_4 promotes CO_2 emissions, such emissions are not accounted since combusted LFG is regarded as originated from biogenic (natural) source.
	CH_4	Not included. Minor fugitive CH_4 emissions are expected to occur from flaring (residual CH_4 in the exhaust gas of the flare) as part of the normal operation of the project activity. It is however important to note that as per ACM0001 (version 19.0) /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 CDM baseline and monitoring methodology /5/.

In summary, the identified project boundary is confirmed by the Applus+ Certification's validation team as being under compliance with the selected CDM baseline and monitoring methodology /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. The definition of the project boundary is sufficiently justified in the updated PDD /2/.

The Applus+ Certification's 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 Applus+ Certification's 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 404 of the CDM-VVS-PA (version 02.0) /1/, the validation team appointed by Applus+ Certification reviewed the validity of the previously identified baseline scenario for the project activity as per 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) **¡Error! No se encuentra el origen de la referencia.**) (hereinafter referred to as "baseline validity tool" as also referred in Section B.4 of the updated PDD /2/).
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) 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 Applus+ Certification's validation team, the baseline scenario for the project activity was previously initially determined and assessed (both at the time of the validation of the project activity (initiated in year 2004) and later at the time of the previously occurred renewal of the crediting period (in year 2013) as the largest share of LFG generated at the CGR Paulínia landfill being directly emitted into the atmosphere (with small share of generated LFG being combusted in a set of previously existent pre-project conventional passive LFG venting/combustion drains that would otherwise remain being installed and under unmanaged operation across the CGR Paulínia landfill in the absence of the project activity (baseline scenario)). 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 following applicable guidance and stepwise procedure of the selected CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/ + applicable related methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/. The steps of the baseline validity tool /24/ were appropriately applied as per the following assessment details: <u>*Step 1: Assess the validity of the current baseline for the next crediting period:*</u> The following sub-steps are appropriately applied in the updated PDD /2/: *Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies:* The Applus+ Certification's validation team confirmed that as per the PDD applicable for the currently expired 2nd crediting period of the project activity, the baseline scenario (in terms of emissions of methane) is determined as ("*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".

As confirmed by the Applus+ Certification's validation team, the project activity meets the requirements and conditions for the effective continuation of the validity of the previously identified baseline scenario (previously identified as part of the previously occurred 1st renewal of 7-year crediting period of the project activity in year 2013 (performed as per provisions of the baseline and monitoring methodology ACM0001 (version 13.0.0) /30//).
While ACM0001 (version 19.0) /5/ supersedes ACM0001 (version 13.0.0) /30//, the updated PDD /2/ was completed by correctly and sufficiently considering specific provisions and requirements of the applied more recent version of ACM0001 (version 19.0) /5/ methodology regarding the determination of the baseline scenario.
As confirmed by the Applus+ Certification's validation team, 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 CGR Paulínia landfill. As confirmed by the Applus+ Certification's 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 CGR Paulínia landfill, a minor share of generated LFG was previously combusted in such landfill. Thus, the Applus+ Certification's validation team was able to confirm that the demonstration of continuation of the baseline scenario for the project activity is under 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 Applus+ Certification's validation team had confirmed that there are indeed no 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 that would be applicable at the time of requesting renewal of the crediting period.

The conditions used to determine the baseline emissions in the previous crediting period are confirmed as also still being valid/applicable 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 for the previous 7-year crediting period are correctly assumed as still being valid/applicable for the next 7-year crediting period.

It is thus correctly assumed that, in the absence of the project activity, LFG generated at the CGR Paulínia landfill would still be freely emitted into the atmosphere (with very small share of generated methane being destroyed in conventional passive LFG venting/combustion drains). 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 3rd and last 7-year crediting period of the project activity.

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 correctly regarded as not applicable.

Step 1.4: Assessment of the validity of the data and parameters
The Applus+ Certification's validation team confirmed that, while the PDDs valid for the currently expired 1st and 2nd 7-year crediting periods 3/ apply not any longer valid versions of the CDM baseline and monitoring methodologies AM0003 (version 3) and ACM0001 (version 13.0.0) respectively, some methodological requirements, ex-ante selected data and monitoring parameters as per these previous PDD versions are no longer valid/applicable for the 3rd and last 7-year crediting period since the selected CDM baseline and monitoring methodology is a more recently issued version of ACM0001 (version 19.0) /5/. As outlined in the updated PDD /2/, the selected CDM baseline and monitoring methodology and the related methodological tools /10/ /11/ /14/ /12/ /24/ contain differentiated applicable methodological approaches (when compared to the previously applied versions of ACM0001 (version 13.0.0). New data and ex-ante determined parameters are confirmed as being 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 3rd and last 7-year crediting period.

Further assessment of the application of the methodological approach for the demonstration of validity of the previously derived baseline scenario is included below under Step 2 of the stepwise approach of the baseline validity tool /24/. The application of the methodological approach to determine baseline emissions for the 3rd and last 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:

The following sub-step is appropriately applied in the updated PDD /2/:

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 3rd and last 7-year 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 version of methodology ACM0001 (version 13.0.0), 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 previously identified baseline scenario) by following applicable stepwise procedure of the "Combined tool to identify the baseline scenario and demonstrate additionality"

The continuation of the previously identified baseline scenario for the project activity is confirmed by the Applus+ Certification's validation team as being 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 07.0) /13/ as required by selected CDM baseline and monitoring methodology (ACM0001 (version 19.0) /5/) as per the following assessment details:

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 correctly regarded as not applicable/valid 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 19.0) /5/ were correctly and sufficiently considered and analysed as assessed follows:

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

The following alternatives for LFG management at the CGR Paulínia landfill are correctly initially considered in the updated PDD /2/:

LFG1: The project activity (i.e. capture of landfill gas and its flaring and/or its use) being 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 is correctly identified as corresponding to the continuation of the current situation (the proposed project activity or any other alternatives are not implemented).

LFG3: Atmospheric release of the LFG or capture of LFG in an unmanaged SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons. While the CGR Paulínia landfill is a well-managed SWDS, this alternative is correctly regarded as not applicable

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 treated aerobically and not disposed in the SWDS

LFG6: LFG generation is partially avoided 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, LFG5 and LFG6 were not taken into account under the application of Step 1a since no changes in the operation of the CGR Paulínia landfill have occurred as a result of the implementation of the project activity during its currently expired 1st and 2nd 7-year crediting periods and neither are changes expected to occur during its 3rd and last 7-year crediting period. Therefore, it is deemed appropriate to

exclude LFG3, LFG4, LFG5 and LFG6 from the list of alternative scenarios.
As further assessed in Appendix 5, the implementation and operation of the project activity has never represented (and it is not expected to represent) any driver or incentive for the promotion of any kind of reduction in the amount of organic waste that would be recycled at the CGR Paulínia landfill and/or at any other existent or potential (hypothetical) waste treatment or utilization facility under the area of influence of this particular landfill in the absence of the project activity (baseline scenario). The prevailing waste management practices pertinent to organic solid waste recycling in the region attended by the CGR Paulínia landfill were also assessed by the Applus+ Certification's 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 CGR Paulínia landfill and in other regions of Brazil) are included in the related documented evidences assessed by the Applus+ Certification's validation team 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 Applus+ Certification's 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 Applus+ Certification's validation team (including both related sources indicated in the updated PDD /2/ evidences as well as other credible sources selected by the validation team) /41/ /42/.

The following disclaimer (justifying non-promotion of any qualitative or quantitative change in Municipal Solid Waste (MSW) disposal and/or waste recycling and/or waste incineration related activities in the region of influence of the CGR Paulínia landfill) is confirmed by the Applus+ Certification's validation team as being appropriately added in the updated PDD /2/:

> *"The project activity was developed and it is currently implemented at the CGR Paulínia landfill site, which is a well-managed landfill site. This particular SWDS has been under continuous operation since year 2002. The purpose of the CGR Paulínia landfill site is promoting final disposal of municipal solid waste through adopting of appropriate landfilling practices and techniques. The design, construction and operation of the CGR Paulínia landfill do not encompass any recycling of the organic fraction of waste and its design is not expected to change in the future. Furthermore, as further explained in Section B.2, the project activity has not previously promoted and is not expected to promote any change in waste recycling activities in the region where the CGR Paulínia landfill site is located. In this context, it is crucial to note that with or without the project activity being implemented, no recycling of the organic fraction of waste disposed at the CGR Paulínia landfill site, neither aerobic treatment, neither incineration of disposed waste streams have occurred or have prevented (or would have occurred or would have prevented) at this particular landfill and/or in any other landfill, or recycling station located in the region where the landfill is located.*
>
> *Thus, alternative scenarios LFG3, LFG4, LFG5 and LFG6 are hereby automatically excluded from the determination of baseline alternatives. Such exclusions is in accordance with applicable guidance of ACM0001 (version 19.0).*
> *In fact, recycling of organic matter, aerobic treatment and incineration of Municipal Solid Waste (MSW) has not been common practice in Brazil. The implementation and operation of project activity has never promoted and is not expected to promote any quantitative change (including reduction) in the amount of organic solid waste that could or would be eventually recycled."*

Regarding the identification of alternatives for the utilization of LFG for electricity and/or heat generation, while the project activity does not encompass any

utilization of collected LFG as gaseous fuel for electricity and/or heat generation, alternative scenarios for generation of heat and electricity are correctly not identified. This is deemed correct and in accordance to ACM0001 (version 19.0) /5/. Therefore, scenarios E1, E2 and E3 are not considered. Scenarios H1 trough H7 are not considered either. This is also in accordance with ACM0001 (version 19.0) /5/.
Regarding identification of alternatives for the supply of LFG to natural gas distribution network and/or dedicated pipeline and/or distribution of compressed/liquefied LFG using trucks, while this potential alternatives are not considered as part of the project activity either, no related alternative is thus considered. This is also in accordance to ACM0001 (version 19.0) /5/.

Outcome of Step 1a:
As outcome of application of Step 1a of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) /13/ the realistic and credible alternatives remained (as defined by ACM0001 (version 19.0) /5/) are identified as LFG1 and LFG2. The Applus+ Certification's validation team confirmed the list of realistic and credible alternatives after the application of Step 1a of the methodological tool as being complete, correct and appropriate.

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

As correctly 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 07.0) /13/ is the same as after application of Step 1b of the methodological tool: LFG1 and LFG2.

The following related statement is correctly indicated in the updated PDD /2/:

> *"(...) So far, there are still no legal restrictions or requirements/obligations for LFG collection and destruction in Brazil. Moreover, there are still no legal restrictions or requirements/obligations for utilizing collected LFG for generation of electricity (or any other type of LFG utilization) in Brazil either. Therefore, alternative LFG1 and LFG2 are thus under compliance with applicable mandatory laws and regulations.*

The Applus+ Certification's validation team was able to confirm that indeed there is no regional or national 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 outcome of application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) /13/, 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 confirmed the list of realistic and credible alternatives after the application of Step 1b of the methodological tool as being correct, complete and appropriate.

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

The following is correctly and appropriately outlined in the updated PDD /2/:

> *"It is relevant to note that as per the applicable methodological guidance of both ACM0001 (versions 13.0.0 and 19.0) and the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0), determining baseline scenario for a LFG collection and destruction/utilization under the CDM is a task which is*

somehow combined with the assessment and demonstration of additionality for such project activity.

While in the particular case of the renewal of the 7-year crediting period of the project activity, it is not required/necessary to re-assess and re-demonstrate the additionality neither demonstrating the validity of the previously assessed/demonstrated additionality, the application of STEP 2, STEP 3 and STEP 4 of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) are thus automatically regarded as not applicable / not required in the particular context of the demonstration of the continuation of the previously identified baseline scenario for emissions of methane at the CGR Paulínia landfill for the project activity during its 3rd and last 7-year 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 Applus+ Certification's validation team was able to confirm that, like previously demonstrated and assessed as part of the CDM validation of the project activity (assessment initiated in year 2004 and concluded in year 2005), the proposed project activity remains not being economically or financially feasible without revenues from sale of CERs to be generated by the project activity registered under the CDM. Thus, as outlined in the updated PDD /2/, alternative scenario LFG1 is also correctly 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).

<u>*Conclusion about the determination of baseline scenario:*</u>

As a conclusion, the Applus+ Certification's 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 3rd and last 7-year crediting of the project activity as per the project design configuration valid for its renewal of crediting period. In the particular context of the project activity, this alternative represents the following:

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/emitted into the atmosphere with minor share of generated LFG being partially collected and destroyed in conventional passive LFG venting/combustion drains that would otherwise be under operation in the absence of the project activity in order to address still existent requirement of methane to be destroyed at the CGR Paulínia landfill.

The identified baseline scenario valid for the 3rd and last 7-year crediting period of the project activity 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 07.0) /13/. The application of guidance of the selected CDM baseline and monitoring methodology (ACM0001 (version 19.0) /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 in the opinion of the Applus+ Certification's validation team. It is also the opinion of the Applus+ Certification's validation team that the application of the stepwise approach of the baseline validity tool /24/ for demonstrating the validity of the previously derived baseline scenario for the project activity" is deemed reasonable and correct.

In summary, under conformance with applicable requirements from the CDM-VVS-PA (version 02.0) /1/, the Applus+ Certification's validation team confirmed that the application of the stepwise approach of the baseline validity tool /24/ (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 (as reported in the PDDs /3/ applicable for the currently expired 1st and 2nd crediting periods) is also correctly identified and 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 thus correctly and reasonably applied in the updated PDD /2/.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	In accordance with the Paragraph 412 (a) (iv) of the CDM-VVS-PA (version 02.0) /1/, the Applus+ Certification's validation team appointed by Applus+ Certification reviewed whether the calculation of emission reductions (incl. ex-ante estimates of emission reductions to be achieved by the project activity during its 3rd and last 7-year crediting period) is correct against the requirements of the applied methodology.
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) were raised regarding the calculation of emission reductions (incl. ex-ante estimates of emission reductions to be achieved by the project activity during its 3rd and last 7-year crediting period).
Conclusion	The Applus+ Certification's validation team was able to confirm that, as outlined in the updated PDD /2/, calculations of GHG emissions reductions to be achieved by the project activity during its 3rd and last 7-year crediting period are based on the application of the ACM0001 (version 19.0) /5/ and the applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. In accordance with the ACM0001 (version 19.0) /5/, while no leakage emissions are required to be accounted, GHG emissions reductions (ER_y) to be achieved by the project activity during its 3rd and last 7-year crediting period are correctly defined in the updated PDD /2/ 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 Applus+ Certification's validation team confirmed that application of algorithms and formulae for the determination of emission reductions achieved during the 3rd and last 7-year crediting period for the project activity is correct and deemed reasonable. Assessment details for the application of algorithms and formulae for the determination of emission reductions achieved during for the 3rd and last 7-year crediting period of the project activity are included below in Appendix 6.

D.5. Validity of monitoring plan

Means of validation	In accordance with Paragraph 412 (a) (iv) of the CDM-VVS-PA (version 02.0) /1/, the validation team appointed by Applus+ Certification reviewed whether monitoring plan mentioned in the updated PDD /2/ is valid and correct.
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) were raised regarding the validity and design of the monitoring plan of the project activity.
Conclusion	As established by the ACM0001 (version 19.0) /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/, in the context of the ex-post determination of baseline emissions for the project activity during its 3rd and last 7-year crediting period, the monitoring system for the project activity basically consists of measuring the amount of methane actually combusted (destroyed) in the high temperature enclosed flares + monitoring of the status of such methane destruction devices and determining related combustion efficiency + assessment of the operational conditions of the CGR Paulínia landfill (via measurements/monitoring of the parameters monitored *ex-post* which are summarized in a table included in Appendix 8). 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 03.0) /10/. Finally, project emissions due to the consumption by the project activity of 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), calibration requirements and as per recommendations defined by the equipment/instrument manufacturers and/or relevant regulatory requirement(s) (when applicable). It has also been appropriately indicated in the updated PDD /2/ that measurement checking and calibration of the monitoring equipment/instruments will be performed on a regular basis as per manufacturer's related requirements and/or relevant regulatory requirement(s), if applicable, in order to ensure the correct measurement of data to be monitored. The high temperature enclosed flares will be maintained as per recommendations of the equipment manufacturer. Monitoring information/data of such methane destruction devices 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 03.0) /10/. It is the opinion of the Applus+ Certification's validation team that monitoring plan, as described in the updated PDD /2/, will give opportunity for real measurements of achieved emission reductions. All data pertaining to monitoring parameters will be archived for at least two years after the end of crediting period. General details of data to be collected, frequency of data recording, and the project management responsibilities are also clearly defined in the monitoring plan of the updated PDD /2/. It is the opinion of the Applus+ Certification's validation team that the monitoring plan, as described in the updated PDD /2/, is feasible for the project participant. 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 status 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 may be kept on-site.

As also appropriately outlined in the updated PDD /2/, an appropriate project's operational and management structure is considered for the 3rd and last 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 Applus+ Certification's validation team that the description and design of the monitoring plan, as described in the updated PDD /2/, fully complies with all the monitoring requirements of the ACM0001 (version 19.0) /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. Such description is also under conformance with currently applicable guidelines for completing the CDM-PDD form /17/. It is also the opinion of the Applus+ Certification's validation team that the project participant will be able to implement and operate the monitoring plan for the project activity during its 3rd and last 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 all parameters to be monitored *ex-post* during the 3rd and last 7-year renewable crediting period of the project activity. Related assessment is also included in Appendix 7 of this report.

As established by ACM0001 (version 19.0) /5/ and the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ and also appropriately outlined in the updated PDD /2/, the volumetric or mass flow of landfill gas captured which is sent to the flares ($V_{t,wb,j}$ or $V_{t,db,j}$ or $M_{t,db,j}$) and the methane fraction in collected LFG ($v_{CH4,t,wb,j}$ or $v_{CH4,t,db,j}$) will be continuously measured in the same basis (dry or wet).

The selection of parameters monitored *ex-post* and their monitoring procedures, as outlined in updated PDD /2/, are deemed complete, transparent and under full conformance with requirements established by the selected CDM baseline and monitoring methodology and related applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/.
Assessment details for the selection and definition of parameters to monitored ex-post and applied monitoring approaches are included in Appendix 8 of this report.

Assessment of information added in the updated PDD regarding management system and quality assurance for the monitoring process:
The description of 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 process is elaborated in

	the updated PDD /2/ under conformance with related requirements of selected CDM baseline and monitoring methodology/5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. The monitoring plan has been established in order to enable subsequent verification of emission reductions for the project activity during its 3rd and last 7-year crediting period for which periodic verification assessments are yet to be performed. The application of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/ is deemed transparent. By taking into account verified previously issued Monitoring Reports /22/ /25/ /32/ /34/ valid for the both the currently expired 1st and 2nd 7-year crediting period of the project activity, the Applus+ Certification's validation team considers the project participant ESTRE Ambiental S/A potentially able and competent enough to monitor the project activity as per the monitoring plan valid for its 3rd and last 7-year crediting period. The description of 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 3rd and last 7-year crediting period of the project activity, 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, being archived at project site. Monthly project performance reports will be made available at both the project site and administrative office in both electronic and hard copy formats in order to ensure required 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, project's staff will continue to be trained on procedures for applicable corrective actions. It is the opinion of the Applus+ Certification's validation team that the description of the monitoring procedures for the project activity, as outlined in the updated PDD /2/, is deemed complete, reasonable and its implementation is potentially feasible for the host-country project participant ESTRE Ambiental S/A Through document check and interview conducted with representative of the project participants, it is verified that the monitoring plan description, as outlined in the updated PDD /2/, provides sufficient information and it is described in compliance with the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. As a conclusion, the Applus+ Certification's validation team has confirmed that the description of the monitoring plan included in 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. It is the opinion of the Applus+ Certification's 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 description of the monitoring plan for the project activity, as outlined in Section B.7.1 and B.7.3 of the updated PDD /2/, sufficiently meets all requirements and criteria of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/. Sections B.7.1 and B.7.3 of the updated PDD /2/ were also confirmed by the Applus+ Certification's validation team to be completed under full compliance with applicable guidance and guidelines for completing the latest version of the CDM-PDD form (version 11) /17/. *Assessment of applicability of the selected CDM baseline and monitoring*

	methodology + applicable methodological tools: While the PDD /2/ applies the selected methodology ACM0001 (version 19.0) /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/, 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 Applus+ Certification's validation team that the selected methodology ACM0001 (version 19.0) /5/ + all applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/ 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 Applus+ Certification's validation team confirmed that the description of the description of the monitoring plan valid for the 3rd and last 7-year crediting period of the project activity is under conformance with the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /14/ /12/ /24/ /27/.

D.6. Crediting period

Means of validation	In accordance with Paragraph 412 (a) (v) of the CDM-VVS-PA (version 02.0) /1/, the validation team appointed by Applus+ Certification reviewed whether the starting date and length of the 3rd and last 7-year crediting period of the project activity, as outlined in the final version of the updated PDD /2/, meets all applicable requirements for renewal of crediting period.
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) were raised regarding the selected starting date for the 3rd and last 7-year crediting period of the project activity.
Conclusion	The 3rd and last 7-year crediting period of the project activity is correctly defined in the updated PDD /2/ as starting on 14/09/2020 and ending on 13/09/2027. As part of its assessment, the Applus+ Certification's validation team confirmed the consideration of expected operational lifetime for pre-project equipment installed at the project site is not relevant/applicable in the particular context of the determination of the length of the 3rd and last crediting period of the project activity. The Applus+ Certification's validation team thus confirms that having the indication in the updated PDD /2/ of the 3rd and last 7-year crediting period starting on 14/09/2020 and ending on 13/09/2027 is deemed correct and under full compliance with all applicable CDM requirements.

D.7. Project participants

Means of validation	In accordance with paragraph 412 (a) (vi) of the CDM-VVS-PA (version 02.0) /1/, the validation team appointed by Applus+ Certification checked the names of the project participants included in the updated PDD /2/ against the names included in the latest version of the completed Modalities of Communication (MoC) form for the project activity as available in the UNFCCC website.
Findings	No findings (CAR(s), CL(s) and/or FAR(s)) were raised raised regarding the correctness of corporate identity of all project participants included in the updated PDD /2/ against information included in the latest version of the completed Modalities of Communication (MoC) form /21/ for the project activity.
Conclusion	The Applus+ Certification's validation team has confirmed the correctness of reporting corporate identity of both project participants included in the updated PDD /2/ ("ESTRE Ambiental S/A" and "Nordic Environment Finance Corporation") against information included in the latest version of the completed Modalities of Communication (MoC) form /21/ 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

As confirmed by the Applus+ Certification's validation team, there are no identified actual or planned post-registration changes (PRCs) to be encompassed by the validation assessment for renewal of crediting period of the project activity or to be addressed as part of an independent validation opinion assessment.

SECTION E. Internal quality control

As a final step for validation assessment for renewal of 7-year crediting period, the final documentation, including the Validation Report, has to undergo an internal quality control by the Technical Reviewer(s) to be approved.

Details of the Technical Reviewer(s) are provided within the Validation Report in Section B.2. and Appendix 2 for further references of knowledge and capability to conduct the quality checking.

After the Technical Review process, the final documentation has to undergo a final quality checking process called Administrative Review, done by the Applus+ Certification's Project Manager and/or Technical Support.

For final approval, the final set of documents are prepared by the DOE's Technical Manager or its deputy and signed by the authorized signatory of the DOE.

In case any of the persons performing this final internal quality control approval process has acted as a part of the Assessment Team or Technical Review team, the approval can only be given by DOE's personnel who are not part of those teams.

If the final set of documents has been satisfactorily approved, a request of renewal of crediting is submitted to the UNFCCC CDM EB along with the relevant documents.

SECTION F. Validation opinion

LGAI Technological Center, S.A. (Applus+ Certification) has performed the validation assessment for the updated Project Design Document (PDD) valid for the 3rd and last 7-year crediting period for the registered CDM project activity titled "ESTRE's Paulínia Landfill Gas Project (EPLGP)" in the context of its renewal of the crediting period (3rd and last crediting period for the project activity starting on 14/09/2020 and ending on 13/09/2027). The project activity was previously registered by UNFCCC on 09/03/2006 as CDM project activity with UNFCCC ref. no. 0165 and previously had its 7-year renewable crediting period renewed once.

The validation assessment was performed in accordance with applicable requirements of the CDM Validation and Verification Standard for Project Activity (CDM-VVS-PA) (version 02.0) and included performance of assessment of the following issues:

- Evaluation of impact(s) of related new relevant national and/or regional policies, circumstances and regulations (if applicable and valid at the time of requesting renewal of crediting period) on the previously identified baseline scenario for the project activity, thus confirming of the validity of the previously derived baseline scenario by taking into account relevant guidance from the CDM Executive Board (CDM-EB) with regards to renewal of the crediting period;
- Evaluation of the correctness of the application of the selected CDM baseline and monitoring methodology ACM0001 (version 19.0) and applicable methodological tools for the completion of the updated PDD;
- Assessment of calculations and reporting of estimates of emission reductions to be achieved by the project activity during its 3rd and last 7-year crediting period as outlined in the updated PDD.

The performed desk-review of the updated PDD (version 5.0, dated 20/11/2020) and the subsequently performed follow-up interview with representative of the project participants have provided the validation team appointed by Applus+ Certification sufficient information and evidences to determine/confirm the continuation of the validity of the original and previously identified baseline scenario for the project activity.

The Applus+ Certification's validation team also confirmed that the updated PDD correctly applies the selected CDM baseline and monitoring methodology ACM0001 (version 19.0) + applicable methodological tools. The Applus+ Certification's validation team also assessed a spreadsheet with calculations of *ex-ante* estimations of emission reductions to be achieved by the project activity during its 3rd and last 7-year crediting period. Such spreadsheet is enclosed to the updated PDD and was confirmed to be correctly elaborated.

The validation team appointed by Applus+ Certification is of the opinion that the project activity has the potential to achieve GHG emission reductions during its 3rd and last 7-year crediting period as per ex-ante estimates of emission reductions reported in the updated PDD (version 5.0, dated 20/11/2020). As verified by the Applus+ Certification's validation team, all explanations and justifications provided by the project participants regarding information and assumptions included in the updated PDD are deemed reasonable and acceptable.

It is thus the opinion of Applus+ Certification that the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)" meets all the relevant requirements for the renewal of its 7-year crediting period. Hence Applus+ Certification 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-PA	CDM Project Cycle Procedure for Project Activities
CDM-PS-PA	CDM Project Standard for Project Activities
CDM-VVS-PA	CDM Validation and Verification Standard for Project Activities
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification Request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COVID-19	Coronavirus disease (infectious disease caused by a new virus that caused a worldwide pandemic in year 2020).
DOE	Designated Operational Entity
ER	Emission Reduction
GHG	Greenhouse gas(es)
LFG	Landfill gas
LGAI Tech. Center S.A.	LGAI Technological Center, S.A. (Applus+ Certification)
MP	Monitoring Plan
MR	Monitoring Report
PAHO	Pan American Health Organization
PDD	Project Design Document
PP	Project Participants
PRC	Post-registration change
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 applicable sectoral scope / technical area and experience in the sectoral or national business environment, Applus+ Certification has composed an assessment team in compliance with the Contract Review and Assessment Team appointment rules in the internal Quality Management System of Applus+ Certification as well as in compliance with the applicable requirements in the Accreditation Standard.

The composition of the Assessment Team (Applus+ Certification's validation team) has been approved by Applus+ Certification during the Contract Review process ensuring that the required skills and capabilities are covered.

The qualification levels for Assessment Team members that are assigned by aforementioned appointment rules are as presented below:

- Lead Auditor (LA).
- Auditor (A).
- Technical Expert (TE).
- Technical Reviewer (TR).
- Any of the above mentioned roles in training (iT, e.g. AiT for auditor in training).

The Sectoral Scope / Technical Area required knowledge linked to the applied methodology(ies) is covered by the Assessment Team as shown below:

Name	Role	SS/TA Knowledge	Financial Expertise	Attendance to on-site visit
Mr. Luis Filipe Aboim Tavares	LA/ TE	YES (13.1)	*n/a*	*n/a*
Mr. Denny Xue	TR /TE	YES (13.1)	*n/a*	*n/a*

A brief Curriculum Vitae (CV) of the Assessment Team members is provided below:

Mr. Luis Filipe Aboim Tavares:

Luis Filipe Aboim Tavares holds a Bachelor's Degree in Metallurgical Engineering and has twenty tree years' experience in steel production industry covering utilities (water, steam, and wastewater treatment) and environment control (air emissions, wastewater and solid waste management).
He has acted as a GHG auditor since year 2002. He holds vast experience with 3rd-party independent assessments of GHG emission reduction project activities within the area of renewable energy, solid waste management and wastewater treatment implemented in Latin America and other regions. He has experience in validation and verification of numerous CDM projects in Latin America.
His technical qualification and experience under the CDM includes sectors/industries such as iron and steel; metal production; oil and gas industry, electricity and steam generation from renewable energy sources; solid waste handling and disposal as well as animal waste management.
He has undergone extensive training for the performance of GHG validation and verification assessments and he is currently qualified expert for Sectoral Scope 13 under Technical Area "Waste management" and Sectoral Scope 1, among others in accordance with procedures of Applus+ Certification. He also has years-long previous experience on conducting ISO 9001/14001 assessments. Mr. Luis Filipe Aboim Tavares is based in Rio de Janeiro, Brazil.

Mr. Denny Xue:

Mr. Denny Xue (Master's Degree in Environmental Engineering, Bachelor's Degree in Thermal Engineering) is an Auditor appointed by Applus+ LGAI for the GHG project assessment, auditing and technical review.
He has more than 6 years of work experience in CDM/GS4GG/VCS project assessment and technical review with Applus+.
Before he joined Applus+ LGAI, he has been working for Shanghai Chuanji Investment and Management which is a CDM consultancy company as a project manager for CDM project development.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	UNFCCC/CDM-EB	CDM Validation and Verification Standard for Project Activities (CDM-VVS-PA), version 02.0	Dated 29/11/2018. Available online: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20181221092105822-Reg_stan06v02.pdf/Reg_stan06v02.pdf?t=TnR8cG44b3kwfDCm8p9SwJyEr_48BQKbktlE	Others
/2/	ESTRE Ambiental S/A	Project Design Document (PDD) for the 3rd and last 7-year crediting period of the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)" (version 05.0).	Dated 20/11/2020.	Project Participant[7]
/3/	ESTRE Ambiental S/A	Latest versions of the Project Design Documents (PDDs) valid for the 1st and 2nd 7-year crediting periods for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". (PDD version 3.1, dated 18/01/2012 and PDD version 4.5, dated 29/02/2016 respectively)	Dated 18/01/2012 (PDD version 3.1) and 29/02/2016 (PDD version 4.5). Available online: PDD version 3.1: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=1 PDD version 4.5: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=2	Project Participant
/4/	ESTRE Ambiental S/A	Emission reduction calculation spreadsheet with *ex-ante* estimations of emission reductions to be achieved by the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)" during the 3rd and last 7-year crediting period. (version 5.0).	Dated 20/11/2020.	Project Participant
/5/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas" (version 19.0)	Dated 14/06/2019. Available online: https://cdm.unfccc.int/methodologies/DB/JPYB4DYQUXQPZLBDVPHA87479EMY9M	Others

[7] All document with provider indicated as "Project Participant" were sourced by the host-country project participant and project owner ESTRE Ambiental S/A

/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 Certification Ltd.	Validation Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". Report No. 2005-0105. Revision No. 05	Dated 05/01/2005. Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=1	Others
/9/	IPCC	1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book; 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book.	Available online: http://www.ipcc-nggip.iges.or.jp/public/gl/invs5.html http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html	Others
/10/	UNFCCC/CDM-EB	Methodological tool "Project emissions from flaring" (version 03.0).	Dated 28/03/2019. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v3.0.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 03.0).	Dated 22/09/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.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	"Combined tool to identify the baseline scenario and demonstrate additionality", (version 07.0)	Dated 22/09/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf/history_view	Others
/14/	UNFCCC/CDM-EB	Methodological tool "Emissions from solid waste disposal sites" (version 08.0).	Dated 04/05/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf	Others
/15/	UNFCCC/CDM-EB	CDM Project Standard for Project Activity (CDM-PS-PA) (version 02.0).	Dated 29/11/2018. Available online: http://cdm.unfccc.int/Reference/Standards/index.html	Others
/16/	UNFCCC/CDM-EB	CDM Project Cycle Procedure for Project Activity (CDM-PCP-PA) (version 02.0).	Dated 29/11/2018. Available online: http://cdm.unfccc.int/Referen	Others

			ce/Procedures/index.html#proj_cycle	
/17/	UNFCCC	Project design document form for CDM project activities (incl. the Attachment. Instructions for completing this form" (version 11).	Dated 03/05/2019. Available online: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20190531085438892-PDD_form05v11.pdf/PDD_form05v11.pdf?t=OVd8cTRrZTJ5fDBC1_wV2EAiu_PeTD-WX3y3	Others
/18/	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
/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).	Dated 13/09/2012. Available online: https://cdm.unfccc.int/faq/Reference/Standards/meth/reg_stan02.pdf Others	Others
/20/	TUV SUD Industrie Service GmbH	CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 1st periodic verification (monitoring period from 14/09/2006 to 31/01/2007). Report No. 961151, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 2nd periodic verification (monitoring period from 01/02/2007 to 31/07/2007). Report No. 1038926, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 3rd periodic verification (monitoring period from 01/08/2007 to 29/02/2008). Report No. 1151610, Rev 0. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 4th verification (monitoring period from 01/03/2008 to 31/08/2008), Report No.: 1230928, version 1.	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=1	Others

		CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 5st verification (verification period from 01/09/2008 to 31/01/2009). Report No.: 600500207, version 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 7th periodic verification (monitoring period from 01/07/2009 to 25/02/2010). Report No. 600500465, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 8th periodic verification (monitoring period from 26/02/2010 to 31/07/2010). Report No. 600500492, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 9th periodic verification (monitoring period from 01/08/2010 to 31/10/2010). Report No. 600500524, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 10th periodic verification (monitoring period from 01/11/2010 to 31/01/2011). Report No. 600500563, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 11th periodic verification (monitoring period from 01/02/2011 to 30/04/2011). Report No. 600500727, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 12th periodic verification (monitoring period from 01/05/2011 to 30/11/2011).		

		Report No. 600500902, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 13th periodic verification (monitoring period from 01/12/2011 to 31/05/2012). Report No. 600501064, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 14th periodic verification (monitoring period from 01/06/2012 to 30/09/2012). Report No. 600501127, Rev 1.		
/21/	ESTRE Ambiental S/A	Completed Modalities of Communication (MoC) form for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)"	Latest version dated 25/11/2016. Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134509951.62/view?cp=1	Project Participants
/22/	ESTRE Ambiental S/A	Monitoring Report for previous verification performed within the currently expired 1st 7-year crediting period of the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)".	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=1	Project Participant
/23/	Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke	Fundamentals of Classical Thermodynamics; 4th 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
/24/	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)	Dated 02/03/2012. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf	Others
/25/	ESTRE Ambiental S/A	Monitoring Report for previous verification performed within the currently expired 2nd 7-year crediting period of the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)".	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=2	Project Participant
/26/	RINA Services S.p.A.	CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp	Others

		(EPLGP)". 15th periodic verification (monitoring period from 01/10/2012 to 13/09/2013). Report No. 2014-BQ-05-MD, Rev 1.1Aa. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 17th verification (verification period from 01/10/2014 to 31/07/2015). Report version 1.1 Aa.	=1	
/27/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate the emission factor for an electricity system" (versions 4 and 0.7.0)	Version 4: Dated: 04/10/2013 Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf Version 07.0: Dated: 31/08/2018 Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf	Others
/28/	UNFCCC/CDM-EB	CDM baseline and monitoring methodology AM0003 – Simplified financial analysis for landfill gas capture projects (version 3)	Dated 30/09/2005 Available online: https://cdm.unfccc.int/methodologies/DB/UA6E403CCC53CLPKTE82HC58HOT95P	Others
/29/	Companhia Ambiental do Estado de São Paulo - CETESB	Operational License for the CGR Paulínia landfill. Operational License No. 37002790, valid until 04/03/2021.	Document dated 04/03/2016. Available online: http://www.mbengenharia.com/userfiles/file/Licenca-de-operacao-ESTRE.pdf.	Others
/30/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas" (version 13.0.0)	Dated 11/05/2012. Available online: https://cdm.unfccc.int/filestorage/E/Y/F/EYFHCV3K4J5P06DTQSG9WLMOBNUX2I/EB67_repan12_ACM0001_ver13.0.0.pdf?t=cEt8cThodjdnfDBv9uhLUtCN8nT-3ISsWGUL	Others
/31/	EPIC Sustainability Services Pvt. Ltd.	CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 18th verification (verification period from 01/08/2015 to 30/06/2016). Report version 1.0. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 20th periodic	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/view?cp=2	Others

		verification (monitoring period from 01/01/2017 to 30/06/2017). Report No. 600500524, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 21st periodic verification (monitoring period from 01/07/2017 to 30/09/2017). Report No. ESSPL/CDM/2017/170, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 22nd periodic verification (monitoring period from 01/10/2017 to 31/12/2017). Report No. ESSPL/CDM/2017/174, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 23rd periodic verification (monitoring period from 01/01/2018 to 30/06/2018). Report No. ESSPL/CDM/2018/221, Rev 1. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 24th periodic verification (monitoring period from 01/07/2018 to 30/09/2018). Report No. ESSPL/CDM/2018/222, Rev 2. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 25th verification (verification period from 01/10/2018 to 31/12/2018). Report version 1.0. CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 26th periodic verification (monitoring period from 01/01/2019 to 30/06/2019), Version 2.0. CDM Verification and		

		Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 27th periodic verification (monitoring period from 01/07/2019 to 30/09/2019), Version 1.0.		
/32/	ESTRE Ambiental S/A	Monitoring Report for previous verification performed within the currently expired 2nd 7-year crediting period of the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". Monitoring period from 01/10/2019 to 31/12/2019 (version 2.0).	Dated 08/04/2020 Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/CP/LNLLT775VPPZY1HM0CAQBJKP7WDJZ3/iProcess/EPIC_Sust1580467071.11/view	Project Participant
/33/	EPIC Sustainability Services Pvt. Ltd.	CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 28th periodic verification (monitoring period from 01/10/2019 to 31/12/2019, Report version 1.0	Dated 15/04/2020 Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1134989999.25/CP/LNLLT775VPPZY1HM0CAQBJKP7WDJZ3/iProcess/EPIC_Sust1580467071.11/view	Others
/34/	ESTRE Ambiental S/A	Monitoring Report for previous verification performed within the currently expired 2nd 7-year crediting period of the registered CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". Monitoring period from 01/01/2020 to 30/06/2020 (version 2).	Dated 13/11/2020.	Project Participant
/35/	EPIC Sustainability Services Pvt. Ltd.	CDM Verification and Certification Report for the CDM project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)". 29th periodic verification (monitoring period from 01/01/2020 to 30/06/2020, Report version 01.0 (draft version).	Dated 20/11/2020	Others
/36/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 1).	Dated 22/09/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf	Others
/37/	Raymond L. Huitric and Dung Kong	Measuring landfill gas collection efficiency using surface methane concentration. Technical paper issued by members of the Solid Waste Management Department of the Los Angeles County Sanitation Districts.	Dated: Available online: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.498.2784&rep=rep1&type=pdf	Others
/38/	CDM-EB	Agreed relaxing of the rule	Dated March/2020	Others

		requiring mandatory on-site inspection by DOEs (valid for the period from 23/03/2020 to 23/06/2020 and because of COVID-19 pandemic (+ decision also agreed by the CDM-EB to extend the relaxation of mandatory site visits until 30/06/2021))	Available online: https://cdm.unfccc.int/newsroom/latestnews/releases/2020/01041_index.html	
/39/	Federal Republic of Brazil, Ministry of Environment	"Gestão integrada de resíduos sólidos" / Mecanismo de Desenvolvimento Limpo	Dated 2007. Available online: http://livroaberto.ibict.br/bitstream/1/796/1/Gest%C3%A3o%20Integrada%20de%20Res%C3%ADduos%20S%C3%B3lidos%3B%20mecanismo%20de%20desenvolvimento%20limpo%20aplicado%20a%20res%C3%ADduos%20s%C3%B3lidos.pdf	Others
/40/	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
/41/	ABRELPE	"Panorama dos Resíduos Sólidos no Brasil- 2018/2019".	Available online: http://abrelpe.org.br/panorama/	Others
/42/	Brazilian Ministry of Regional Development	Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2017" (tittle translated into English language as "Diagnostics of Urban Solid Waste Management - 2017"	Dated year 2017 Available online: http://www.snis.gov.br/diagnostico-residuos-solidos/diagnostico-rs-2017	Others
/43/	EPIC Sustainability Services Pvt. Ltd.	Validation Opinion Report on Post-registration changes for the CDM project activity: "ESTRE's Paulínia Landfill Gas Project (EPLGP)", version 04.0	Dated 25/07/2018. Available online: https://cdm.unfccc.int/filestorage/3/2/L/32LFJCTD9SEYPHXMIURA8NGW5Q6470/27%20July%202018_%20FVR%20Caeiras%20LFG%20Project%20-%20version%204-%2025.07.2018.pdf?t=SGl8cGVwcGowfDBSwaNBU3hEkCVJEVvJpUpE	Others
/44/	Solid Waste Association of North America (SWANA)	Landfill Gas Collection System Efficiencies (2007).	Report dated 2007.	Others
/45/	California Environmental Protection Agency	Evaluation of Landfill Gas Collection Efficiency. Appendix D.	Dated year 2009. Available online: http://www.arb.ca.gov/regact/2009/landfills09/appd.pdf	Others
/46/	Brazil's Interministerial	CO_2 emission factors for electricity generation in Brazil	Available online: http://www.mctic.gov.br/mctic	Others

	Commission on Global Climate Change (DNA of Brazil)	National Interconnected System – Base years: from 2012 to 2019.	/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html	
/47/	Empresa Brasileira de Pesquisa Energética (EPE)	Balanço Energético Nacional 2019. Brazilian Energetic Balance Report year 2019.	Available online: http://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-2019	Others
/48/	Mayer-Brown / Tauil & Chequer	Legal update / interpretation: Regulation of Brazil's National Policy on Waste Management	Available online: http://www.tauilchequer.com.br/publications/article.asp?id=10261&nid=13012	Others
/49/	ESTRE Ambiental S/A	set of recently produced pictures with relevant details of different areas/sections of both the CGR Paulínia landfill and the project activity.	Dated 17/11/2020.	Project Participant
/50/	ESTRE Ambiental S/A	CER delivery/forwarding schedule valid for the project activity "ESTRE's Paulínia Landfill Gas Project (EPLGP)" for the period from year 2015 to year 2020 as per related contractually established agreement (Emission Reduction Purchase Agreement (ERPA)) set between ESTRE Ambiental S/A and Nordic Environment Finance Corporation.	Dated: June/2015	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 as part of the performed validation 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.**		**Date:** DD/MM/YYYY
Description of CAR				
No CARs were raised as part of the performed validation assessment.				
Project participant response				**Date:** DD/MM/YYYY
Documentation provided by project participant				
-				
DOE assessment				**Date:** DD/MM/YYYY

Table 3. FAR from this validation

FAR ID	X	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
No FARs were raised as part of the performed validation 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 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/ are appropriately and sufficiently included in Section B.2 of the updated PDD (version 5.0, dated 20/11/2020) /2/, related assessment details are summarized in the table below:

Applicability criteria of ACM0001 (version 19.0) /5/	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[8] 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*	As per the CDM Project Standard for Project Activities (CDM-PS-PA) /15/, in the context of the renewal of crediting period for a previously registered CDM project activity, the PDD valid for its 3rd and last 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 such previously applied CDM methodology was replaced by and/or consolidated into. As confirmed by the Applus+ Certification's team, the project activity was previously registered as a CDM project activity by applying the CDM baseline and monitoring methodology AM0003 – Simplified financial analysis for landfill gas capture projects (version 3) /28/. As also confirmed by the Applus+ Certification's team, the project activity applied the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) /30// for its currently expired 2nd 7-year crediting period. While ACM0001 (version 19.0) /5/ represents the latest valid version of the ACM0001 baseline and monitoring methodology and by also taking into account that AM0003 (version 3) /28/ was previously replaced/consolidated into ACM0001, including its latest version (version 19.0) /5/ thus represents the CDM baseline and monitoring methodology to be applied in the context of the renewal of crediting period for the project activity. Applicability criteria (a) is correctly regarded as 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 where no LFG capture system was previously installed under the pre-project scenario. While condition (b) is correctly regarded as not applicable, condition (c) is also fulfilled as the project activity design encompasses only collection and destruction of LFG in a set of 6 high temperature enclosed flares (project's methane destruction devices). Condition (d) is also correctly regarded as applicable as there have been no expected changes in the operation of the CGR Paulínia landfill as a result of the implementation of the

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

(iii) Supplying the LFG to 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."*	project activity and no change is expected to occur in the future either. These aspects and conditions are sufficiently explained and demonstrated in the updated PDD /2/. As also appropriately outlined and justified in the updated PDD /2/, no change in the current practice of landfilling of MSW at the CGR Paulínia landfill has occurred after the implementation of the project activity either. With or without the project activity, no recycling of the organic fraction of the solid waste, neither aerobic treatment of solid waste, neither incineration of solid waste have occurred or are expected to occur at the CGR Paulínia landfill. Recycling of organic matter, aerobic treatment and incineration of solid waste is sufficiently demonstrated in the updated PDD /2/ not to be common practice in Brazil and in the region of influence of the CGR Paulínia landfill. As part of validation assessment, in order to confirm the applicability of the selected CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/, interview was conducted with representatives of the project participant ESTRE Ambiental S/A and it was confirmed that the design and/or operation of the CGR Paulínia 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 detailed information made available in the updated PDD /2/ regarding how the condition (d) is met + assessment of credible documented information/evidences /40 /41/ /42/, it is the opinion of the Applus+ Certification's validation team that the updated PDD /2/ sufficiently justifies the plausibility and correctness of related information made available. Therefore, the Applus+ Certification's validation team is of the opinion that it is sufficiently justified and demonstrated that the implementation and operation of the project activity has never represented (and it is not expected to represent) any driver or incentive for the promotion of any kind of reduction in the amount of organic waste that would be recycled at the CGR Paulínia landfill and/or at any other existent or potential (hypothetical) waste treatment or utilization facility under the area of influence of this particular landfill in the absence of the project activity (baseline scenario). The prevailing waste management practices pertinent to organic solid waste recycling in the region attended by the CGR Paulínia landfill were also assessed by the Applus+ Certification's 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 CGR Paulínia landfill and in other regions of Brazil) are included in the related documented evidences assessed by the Applus+ Certification's validation team 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 Applus+ Certification's 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 Applus+ Certification's validation team (including both related sources indicated in the updated PDD /2/ evidences as well as other credible sources selected by the validation team). 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 CGR Paulínia landfill and also based on interview conducted with representatives of the project participant ESTRE Ambiental S/A, the Applus+ Certification's 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 CGR Paulínia landfill or in any other site by the host-country project participant or by any other party. 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 Applus+ Certification's validation team (based on its sectoral expertise and performed assessment of related sectoral literature /39/ /40/), that the previously occurred implementation and starting of operations of the project activity in September/2006 has not represented (and it is not expected to represent) any potential incentive or driver for any administration of municipality(ies) in the region, for any other public entity or for any other relevant solid waste recycling practitioner (if existent in the future) for the promotion of eventual changes in existent regional policies, rules and practices involving recycling of organic fraction of solid waste in the region. As a conclusion, it is sufficiently demonstrated that under no circumstance the previously occurred implementation and operation of project activity would per se represent a driver or incentive to have any party reducing or even preventing the volume of organic solid waste stream that would be eventually recycled in the baseline scenario. 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*	Applicability condition (a) is fulfilled since, as confirmed by the Applus+ Certification's 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 that would be available in the baseline scenario (absence of the project activity).

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 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."* *(d) In the case of LFG from a Greenfield SWDS, the identified baseline scenario is atmospheric release of the LFG or capture of LFG in a managed SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons.*	The project activity does encompass generation of electricity using collected LFG as gaseous fuel. Furthermore, no on-site heat requirements at the CGR Paulínia landfill are identified in the description of the project design, the project design does not encompass generation of heat using LFG as fuel either. Supply LFG for heat generation off-site is not considered either. Therefore, applicability conditions (b - i) and (b – ii) are not an applicable alternatives either. Applicability condition (c) and (d) are 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 dedicated pipeline and the CGR Paulínia landfill does not represent a Greenfield SWDS.
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 19.0) /5/ is applied. Condition (b) is not applicable either as no quantitative or qualitative changes in the operation of the CGR Paulínia 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, interview was conducted with representative of the project participants and it was confirmed that the project participants do not intend or plan to change the operation or design of the CGR Paulínia landfill site under any aspect. Moreover, as claimed by the project participants and described in the

	updated PDD [/2/], the operational conditions and the previously conceived design of the CGR Paulínia 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, 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 CGR Paulínia landfill; – Technical specifications and requirements for the management of the CGR Paulínia landfill; – Applicable local or national regulations dealing with management and operation of existing landfills. As required by ACM0001 (version 19.0) [/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 Applus+ Certification's validation team, demonstration of meeting of applicability conditions for the following methodological tools is sufficiently demonstrated in Section B.2 of the updated PDD [/2/]: – "Project emissions from flaring" (version 03.0) [/10/] – "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) [/11/] – "Emissions from solid waste disposal sites" (version 08.0) [/14/] – "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) [/12/] – "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" (version 03.0.1) [/24/] – "Combined tool to identify the baseline scenario and demonstrate additionality" (version 7) [/13/] As confirmed by the Applus+ Certification's validation team, the applied methodological tools represent the current latest version of such methodological sources and/or the latest version at the time of starting of the validation assessment.

Appendix 6: Assessment of GHG emission reduction calculations

As a result of the deemed acceptable and correct approach from the project participants on applying the CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/ + applied methodological tools /10/ /11/ /14/ /12/ /24/ for completing the updated version of the PDD /2/, the appointed validation team confirmed the overall appropriateness and correctness of the application of related algorithms/formulae for determining emission reduction to be achieved by the project activity along its 3rd and last 7-year crediting period vis-à-vis applicable requirements of such CDM methodology and methodological tools.

While as per ACM0001 (version 19.0) /5/, no leakage emissions are required to be accounted, GHG emissions reductions (ER_y) to be achieved by the project activity during its 3rd and last 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 presented below:

Assessment of the determination of baseline emissions:
As established by selected CDM baseline and monitoring methodology ACM0001 (version 19.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /24/ /27/ 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 19.0) /5/ as follows:

Assessment of the determination of baseline emissions of methane from the SWDS ($BE_{CH4,y}$):
Baseline emissions of methane from the CGR Paulínia landfill ($BE_{CH4,y}$) are correctly determined ex-post 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 19.0) /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 19.0) /5/). Further related assessment details are included in Appendix 7.

$F_{CH4,PJ,y}$ 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 ex-post by following the stepwise approach of ACM0001 (version 19.0) /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 19.0) /5/ as assessed below under the sub-section *"Assessment of the 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. Further related assessment details are included in Appendix 7.

Assessment of the ex post determination of $F_{CH4,PJ,y}$:
As assessed by the Applus+ Certification's validation team, during the 3rd and last 7-year crediting period of the project activity, $F_{CH4,PJ,y}$ will be determined ex-post (in tCH_4/year) as the quantity of methane destroyed by the project's methane destruction devices (set of high temperature enclosed flares) 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)

Assessment of the determination of $F_{CH4,sent\_flare,y}$:

As established by ACM0001 (version 19.0) /5/ and as appropriately outlined in the updated PDD /2/, $F_{CH4,sent\_flare,y}$ is correctly determined by following applicable guidance of the methodological tool "Tool to determine the mass flow of greenhouse gas in a gaseous stream" (version 03.0) /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 of defined requirements are also correctly regarded as applicable:

- The gaseous stream the tool shall be applied to is the LFG stream delivery pipeline to the high temperature enclosed flare. $F_{CH4,sent\_flare,y}$ is thus calculated as the mass flow of methane to the flare(s).
- 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 at least hourly basis in year *y.* As confirmed by the Applus+ Certification's validation team applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ is correctly applied in the updated PDD /2/ for the ex-post determination of $F_{CH4,sent\_flare,y}$ as assessed below:

Assessment of the use of applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" for determining $F_{CH4,sent\_flare,y}$:
As confirmed by the Applus+ Certification's validation team, applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /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" (version 03.0) /12/ are correctly and reasonably 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 its 3rd and last 7-year crediting period, Option A, B, C or D will be selected *ex-post*. The decision of the project participants to select the calculation option on *ex-post* basis (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 actually installed and under operating along its 3rd and last 7-year crediting period).

Thus, along its 3rd and last 7-year 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:

Option A

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

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*. $V_{t,db,j}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $V_{t,db,j}$ are included in Appendix 8.

$v_{CH4,t,db}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a dry basis (in m³ gas *i*/m³ dry gas). $v_{CH4,t,db}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $v_{CH4,t,db}$ are included in Appendix 8.

$\rho_{CH4,t}$ Density of methane in the gaseous stream in time interval *t* (kg gas *i*/m³ 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). P_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further assessment details for the ex-post determination/monitoring of P_t are included in Appendix 8.

T_t Temperature of the gaseous stream (LFG) in time interval *t* (in K). T_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further assessment details for the ex-post determination/monitoring of T_t are included in Appendix 8.

MM_{CH4} Molecular mass of greenhouse gas methane (in kg/kmol). For the considered GHG (CH_4), MM_{CH4} is correctly indicated in the updated PDD /2/ as being ex-ante determined as 16.04 kg/kmol. Further related assessment details are included in Appendix 7.

R_u Universal ideal gases constant (in Pa.m³/kmol.K). R_u is ex-ante determined as 8,314 Pa.m³/kmol.K. Further related assessment details are included in Appendix 7.

Option B

$F_{CH4,t}$ is to be determined by using the equations listed above under Option A, however, 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 m³ dry gas/h).

$V_{t,wb}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis (in m³ wet gas/h). $V_{t,wb}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $V_{t,wb}$ are included in Appendix 8.

$v_{H2O,t,db}$ 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). MM_{H2O} is correctly indicated in the updated PDD /2/ as being ex-ante determined as 18.0152 kg/kmol. Further related assessment details are included in Appendix 7.

As also appropriately outlined 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 methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /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 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). $m_{H2O,t,db,sat}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity as per "Option 2: Simplified calculation without measurement of the moisture content".
$p_{H20,t,Sat}$	Saturation pressure of H_2O at temperature T_t in time interval *t* (in Pa). $p_{H20,t,Sat}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related

assessment details for monitoring of $p_{H20,t,Sat}$ are included in Appendix 8.

T_t Temperature of the gaseous stream in time interval *t* (in K). T_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of T_t are included in Appendix 8.

P_t Absolute pressure of the gaseous stream in time interval *t* (in Pa). P_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of P_t are included in Appendix 8.

MM_{H2O} Molecular mass of H_2O (in kg H_2O/kmol H_2O). MM_{H2O} is correctly indicated in the updated PDD /2/ as being ex-ante determined as 18.0152 kg/kmol. Further related assessment details are included in Appendix 7.

$MM_{t,db}$ 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). For Nitrogen (N_2), MM_{N2} is correctly ex-ante determined as 28.1 kg/kmol. Further related details are included in Appendix 7.

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). For the particular case of the project activity, only Nitrogen is considered. This is under conformance with applicable

In accordance with the simplification given in the methodological "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 m³ 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 m³ gas /m³ wet gas). $v_{CH4,t,wb}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $v_{CH4,t,wb}$ are included in Appendix 8.

$\rho_{CH4,n}$ Density of methane in the gaseous stream at normal conditions (in kg gas *i* /m³ 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). P_n is correctly indicated in the updated PDD /2/ as being ex-ante determined as 101,325 Pa. Further related assessment details are included in Appendix 7.

T_n Temperature at normal conditions (in K). T_n is correctly indicated in the updated PDD /2/ as being ex-ante determined as 273.15 K. Further related assessment details are included in Appendix 7.

MM_{CH4} Molecular mass of greenhouse gas methane (in kg/kmol). For the considered GHG (CH_4), MM_{CH4} is correctly indicated in the updated PDD /2/ as being ex-ante determined as 16.04 kg/kmol. Further related assessment details are included in Appendix 7.

R_u Universal ideal gases constant (in Pa.m³/kmol.K). R_u is ex-ante determined as 8,314 Pa.m³/kmol.K. Further related assessment details are included in Appendix 7.

As also appropriately outlined in the updated PDD /2/, 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 m³ wet gas/h)

$V_{t,wb,j}$ Volumetric flow of LFG stream in time interval *t* on a wet basis (in m³ wet gas/h). $V_{t,wb,t}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $V_{t,wb,t}$ are included in Appendix 8.

P_t Pressure of the gaseous stream in time interval *t* (in Pa). P_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further assessment details for the ex-post determination/monitoring of P_t are included in Appendix 8.

T_t Temperature of the gaseous stream in time interval *t* (in K). T_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further assessment details for the ex-post determination/monitoring of T_t are included in Appendix 8.

P_n Absolute pressure at normal conditions (in Pa). P_n is correctly indicated in the updated PDD /2/ as being ex-ante determined as 101,325 Pa. Further related assessment details are included in Appendix 7.

T_n Temperature at normal conditions (in K). T_n is correctly indicated in the updated PDD /2/ as being ex-ante determined as 273.15 K. Further related assessment details are included in Appendix 7.

Option D

The mass flow of methane $F_{i,t}$ ($i = CH_4$) is to be determined using equations 7 and 8 as outlined in the updated PDD /2/. The volumetric flow of the LFG in time interval *t* on a dry basis ($V_{t,db,j}$) 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 (in m³ dry gas/h). $V_{t,db,j}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $V_{t,db,j}$ are included in Appendix 8.

$M_{t,db,j}$ Mass flow of the LFG stream in time interval *t* on dry basis (in kg/h). $M_{t,db,j}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $M_{t,db,j}$ are included in Appendix 8.

$\rho_{t,db}$ 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 in time interval *t* (in Pa). P_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further

assessment details for the ex-post determination/monitoring of P_t are included in Appendix 8.

T_t Temperature of the gaseous stream in time interval *t* (in K). T_t is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored along the 3rd and last 7-year crediting period of the project activity. Further assessment details for the ex-post determination/monitoring of T_t are included in Appendix 8.

Assessment of the 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 to be ex-post determined using one of the selected methodological approaches as per latest version of the methodological tool "Project emissions from flaring" (version 03.0) /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 methodological tool "Project emissions from flaring" (version 03.0) /10/. The ex-post application of this methodological tool is to encompass the following steps:

STEP 1: Determination of the methane mass flow of the residual gas:
This first step requires that applicable guidance of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ is applied 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 directed to the flare in minute *m* ($F_{CH4,RG,m}$).

As appropriately outlined in the updated PDD /2/, the following requirements are correctly considered:

- The gaseous stream tool shall be applied to the residual gas;
- The flow of the gaseous stream shall be measured continuously;
- CH_4 is the greenhouse gas *i* for which the mass flow should be determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the methodological tool); and
- 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% for the minute in question. Furthermore, as also established by the methodological tool "Project emissions from flaring" (version 03.0), for enclosed flares that are defined as low height flares, the flare efficiency shall be adjusted, as a conservative approach, by subtracting 10 percentile points. For example, the default value applied shall be 80%, rather than 90%.

Option B.1: Measured flare efficiency:
The efficiency of combustion in the flare in minute *m* is determined as the average of at least two measurements[9] of the flare efficiency made in year *y* ($\eta_{flare,calc,y}$), adjusted by an uncertainty factor of 5 percentile points and based on monitored data as per Option B.1: Biannual measurement of the flare efficiency, as follows:

$$\eta_{flare,calc,y} = 1 - \tfrac{1}{2} \sum (F_{CH4,EG,t} / F_{CH4,RG,t}) - 0.05$$

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.

[9] As confirmed by the Applus+ Certification's validation team, the following related disclaimer is appropriately added in the updated PDD /2/:

> *"As also established by the methodological tool "Project emissions from flaring" (version 03.0), if the monitoring period is shorter than one year, the measurement should be at least twice in a monitoring period and in a maximum timeframe of six months between each measurement."*

STEP 3: Calculation of project emissions from flaring
According to the applicable guidance of the methodological tool "Project emissions from flaring" (version 03.0) /10/, Project emissions from flaring ($PE_{flare,y}$) are calculated as the sum of emissions for each minute *m* in year *y* as follows:

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

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 Applus+ Certification's validation team, the application of the 3-step approach is correctly outlined in the updated PDD /2/.

Assessment of the ex-ante determination of $F_{CH4,PJ,y}$:

As established by ACM0001 (version 19.0) /5/, the *ex-ante* estimation of emission reductions for the whole 3rd and last 7-year crediting period of the project activity 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" (version 08.0) /14/. In accordance to ACM0001 (version 19.0) /5/, in the particular context of the *ex-ante* estimations of emission reductions to be achieved by the project activity, the amount of methane in the LFG which is flared and/or used in the project activity in year *y* ($F_{CH4,PJ,y}$) is determined (in tCO_2e) as follows:

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

Where:

$BE_{CH4,SWDS,y}$ 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 by correctly applying guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0). (version 08.0) /14/ where *"Application A - "The CDM project activity mitigates methane emissions from a specific existing SWDS"* of such methodological tool 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*. The Applus+ Certification's validation team confirmed that values for applicable ex-ante determined parameters and values for occurred and project MSW disposal streams are correctly applied and under conformance with its sources.

η_{PJ} Efficiency of the LFG capture system that will be installed in the project activity. η_{PJ} is appropriately *ex-ante* determined as 0.9280 (92.80%), which corresponds to suitable value obtained from credible technical literature /37/ and by also taking into

consideration the design and operational characteristics/aspects of the CGR Paulínia landfill plus the general construction, design and forecasted implementation of the project's LFG collection network during its 3rd and last 7-year crediting period. Further related assessment details are included in Appendix 7.

Assessment of the 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 19.0) /5/:

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 19.0) /5/

Assessment of the existence of regulatory requirements (of contractual and/or non-regulatory and/or non-contractual natures) to destroy methane (as per the applicable definition of "requirement" of ACM0001 (version 19.0) /5/:

Non-existence of regional or national regulatory and/or contractual requirements related to LFG management in the region of the project site:

As confirmed by the Applus+ Certification's validation team, from the time the CGR Paulínia landfill was built until nowadays there has been no applicable legally binding regional or national obligation to capture and destroy the LFG at this landfill.

However, by taking into account the applicable definition of "*requirement*" as per ACM0001 (version 19.0) /5/, it is correctly assumed by the project participant ESTRE Ambiental S/A that, for the particular case of the determination of $F_{CH4,BL,y}$ for the project activity, a non-regulatory and non-contractual requirement to destroy methane indeed exists. As per the design and construction of the CGR Paulínia landfill, its currently valid operational licensing requirements as well as per the day-to-day MSW disposal practice at this particular landfill site since the period of its starting of operations, a non-defined share of LFG has been assumed to be required to be destroyed by combustion in previously existent conventional passive LFG venting/combustion drains in the baseline scenario (absence of the project activity) in order to address odors concerns thus addressing design and operation requirements for the landfill. As argued by the representative of the project participant ESTRE Ambiental S/A, venting and passive combustion of LFG through such previously existent pre-project conventional passive LFG venting/combustion drains would be enough to address related operational safety concerns: reduction of pressure and volume of LFG in the inner section of the landfill in order to minimize the risk and explosions, fire and instability in the landfill cells. As per the applied methodological approach for the determination of $F_{CH4,BL,y}$ defined by ACM0001 (version 19.0) /5/, besides of legal requirements, any other existing non-regulatory or non-contractual requirement to destroy LFG in the landfill (e.g. design requirements in order to address safety and/or odor concerns) is required to be regarded as an "*existing requirement to destroy methane*". Due to that, in the particular context the project activity, as appropriately outlined in the updated PDD /2/, it is thus correctly assumed that a non-regulatory

requirement to destroy methane indeed exists. The following disclaimer is thus confirmed to be correctly and appropriately added in the updated PDD /2/:

"Requirement to destroy methane: YES".

By taking this assumption into account, Case 1 and Case 3 (*Requirement to destroy methane? = No*) 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 for the determination of $F_{CH4,BL,y}$, the remaining possibly valid alternatives (cases) (after the confirmation of existence of non-regulatory and/or non-contractual requirements to destroy methane due to safety and/or odor concerns) are thus Case 2 and Case 4 (*Requirement to destroy methane? = Yes*).

Assessment of existence of "LFG capture and destruction system" at the CGR Paulínia landfill (as per the applicable definition of Existing LFG capture and destruction system" and "existing LFG capture and destruction" of ACM0001 (version 19.0)):
As confirmed by the Applus+ certification's validation team, in the context of the completion of the updated PDD /2/ applying ACM0001 (version 19.0) /5/, it is correctly assumed that, under the baseline scenario (absence of the project), destruction of very small undefined share of generated methane at the CGR Paulínia landfill would occur through combustion in pre-project conventional passive LFG venting/combustion drains that would still being existent (and in additional LFG venting/combustion drains that would otherwise be implemented under the baseline scenario as part of the forecasted expansion of the area of this landfill). By taking into operation the construction and design of the CGR Paulínia landfill, during the pre-project scenario (period from year 2000 until September/2006 (when the project activity initiated its operations)) combustion of small and undefined share of generated LFG in conventional passive venting/combustion drains indeed occurred (in order to address the existing operational requirement of destroying methane for addressing safety and/or odour concerns). Thus it is reasonably assumed that, under the baseline scenario, the pre-project existent set of LFG venting/combustion drains would be kept and would even eventually be expended (addition of new similar drains as a result of forecasted growth of surface with disposed MSW at the landfill). This conventional and inefficient solution based on passive LFG venting/combustion drains is correctly acknowledged to represent an *existent LFG capture destruction system* as outlined in the updated PDD /2/. By correctly taking into account the definition of "*LFG capture system*" and "*existing LFG capture system*" as per ACM0001 (version 19.0) /5/, it is thus also correctly assumed that there were an "*existing LFG capture system*" at the CGR Paulínia landfill (prior to the occurred implementation of the project activity) that would be kept in case the project activity were not implemented (baseline scenario).

Furthermore, while combustion of small and undefined fraction of generated LFG in passive (conventional) venting/combustion drains represents destruction of methane, it is thus also correctly assumed that there were an "*existing LFG capture and destruction system*" at the CGR Paulínia landfill prior to the implementation of the project activity. Therefore, like Case 1 and Case 3, Case 2 (*Existing LFG capture and destruction system? = No*) is thus correctly demonstrated not to be an applicable case either[10].

[10] The Applus+ Certification's validation team confirmed that as per ACM0001 (version 19.0) /5/, "*LFG capture system*" and "Existing LFG capture system" are defined as follows:

- *"Existing LFG capture system - a system that has been in operation in the last calendar year prior to the start of the operation of the project activity;*
- *LFG capture system - a system to capture LFG. The system may be passive, active or a combination of both active and passive components. Passive systems capture LFG by means of natural pressure, concentration, and density gradients. Active systems use mechanical equipment to capture LFG by providing pressure gradients. Captured LFG can be vented, flared or used;"*

The following disclaimer is thus confirmed to be appropriately added in the updated PDD /2/:

"Existing LFG capture and destruction system: YES".

Thus, the only remaining case applicable for the project activity in terms of "*existence of LFG capture and destruction system*" is Case 4 (*Requirement to destroy methane? = Yes and Existing LFG capture and destruction system? = Yes*).

Assessment of LFG management at the CGR Paulínia landfill prior to the implementation of the project activity (which corresponds to the identified baseline scenario for the project activity):

As confirmed by the Applus+ Certification's validation team through review of the previously issued Validation Report /8/ for the project activity, Validation Report for the previously occurred first renewal of 7-year crediting period of the project activity /37/ and Validation Opinion Report for previously occurred post-registration changes in the project activity /43/; prior to the registration of the project activity and its implementation at the CGR Paulínia landfill, as part of the operation of the landfill during the period from March/2000 (when the CGR Paulínia landfill started its operations) to September/2006 (when the project activity started its operating), whenever any existent conventional passive LFG venting/combustion drain was not lid, LFG used to be thus freely emitted into the atmosphere through the drain and through the surface of the landfill. Based on declarations provided by the project participant ESTRE Ambiental S/A, typically only a very small share of generated LFG had been combusted in such previously existent LFG venting/combustion drains during this period prior to the implementation of the project activity. This situation is due to the following reasons:

- It is reasonable to assume that the design of the previously existent pre-project venting/combustion drains was somehow rudimentary and do not allow continuous combustion of LFG under the typical operational circumstances of the landfill where pressure of LFG leaving the drains were not enough high to allow continuous combustion under the typical whether conditions of the site. As appropriately emphasized by the interviewed representative of the project participant ESTRE Ambiental S/A such drains were not conceived for continuous and quantitatively relevant combustion of LFG under adverse climate (wind, temperature) and low LFG gradient pressure conditions. Due to aspects and conditions such as the diameter of the LFG venting/combustion drains, pressure of LFG in the drains, influence of wind and other climate aspects (e.g. rain), as well as the typical MSW disposal operational conditions at the CGR Paulínia landfill (where landfill working staff were not required ever to attempt ensuring to have LFG continuously combusted in the existing venting/combustion drains), there was no practice or attempt to have LFG being continuously and systematically combusted in such existent drains within the pre-project scenario. Furthermore, conventional passive LFG venting/combustion drains (e.g. regular checking whether the drains are lid) have never systematically monitored at the CGR Paulínia landfill in the pre-project scenario due to other working priorities. Moreover, as also declared by the representatives of the project participant, in some of the pre-project drains, the pressure of LFG used to be too low, thus making it difficult to keep the drain lid and constantly combusting LFG at that time.

- Thus, although there has been no legal requirement to destroy methane at the CGR Paulínia landfill, it is however assumed that in the absence of the proposed CDM project activity (baseline scenario), sporadic combustion of LFG through the existent conventional passive LFG venting/combustion drains (and additional similar drains that would otherwise be installed) would remain occurring along the period to be encompassed by the 3rd and last 7-year crediting period (like occurred during the whole period encompassed by the currently expired 1st and 2nd crediting periods) in order to address a non-regulatory requirement for the design and operation of the landfill. It is also noteworthy that, as also acknowledged in the updated PDD /2/, as the operator of the landfill, the project participant ESTRE Ambiental S/A would not have any incentive or demand to convert such existing conventional passive LFG venting/combustion drains into an appropriate and efficient LFG

flaring system in the absence of the project activity (baseline scenario). Based on its sectoral expertise, the validation team also confirms that non-continuous combustion or even complete venting of LFG through conventional passive LFG venting/combustion drains has been a practice in several others landfills and dump sites in Brazil and other countries in Latin America (where no legal requirements for destruction of LFG exist). As appropriately outlined in the updated PDD /2/, combustion of LFG in conventional passive LFG venting/combustion drains (in order to address odors or safety requirements) is not an legal or regulatory requirement. However, in some cases, such as the particular case of the CGR Paulínia landfill, combustion of LFG in in conventional passive LFG venting/combustion drains for such purposes is correctly regarded as a non-regulatory requirement.

In summary, the Applus+ Certification's validation team is of the opinion that, as presented in the updated PDD /2/, Case 4 is correctly selected as the only applicable case for the determination of $F_{CH4,BL,y}$.

Application of methodological guidance valid for Case 4:

As correctly outlined in the updated PDD /2/, under Case 4, the following is applicable as per ACM0001 (version 19.0) /5/ for the determination of $F_{CH4,BL,y}$:

"(…)

$F_{CH4,BL,y}$ shall be determined based on information in contract of regulation requirements and data related to the existing LFG capture system, as follows:

$F_{CH4,BL,y} = max\{F_{CH4,BL,R,y}; F_{CH4,BL,sys,y}\}$

Where:

$F_{CH4,BL,R,y}$	*Amount of methane in the LFG which is flared in the baseline due to a requirement in year y (in tCH_4/yr)*
$F_{CH4,BL.sys,y}$	*Amount of methane in the LFG that would be flared in the baseline in year y for the case of an existing LFG capture system (in tCH_4/yr)*

$F_{CH4,BL,R,y}$ and $F_{CH4,BL.sys,y}$ shall be determined according to the respective procedures for Case 2 and Case 3 (...)".

As also outlined in the updated PDD /2/, by applying the applicable guidance of ACM0001 (version 19.0) /5/ for Case 2 (in the context of application of Case 4) for the particular case of LFG management at the CGR Paulínia landfill; the default and conservative value of LFG destruction rate of 20% is assumed by taking into account the existing non-regulatory and non-contractual nature of the requirement for addressing safety odor concerns and the way such requirements were addressed under the pre-project scenario (partial combustion of LFG which is vented through the drains under a undefined quantity).
As confirmed by the Applus+ Certification's validation team, prior to the implementation of the project activity, for the assumed non-regulatory and/or non-contractual requirement, there was no amount or percentage of LFG that were specified to be destroyed and this situation prevails. The following was confirmed as valid as per ACM0001 (version 19.0) /5/:

"*This default value of 20% is based on assuming a situation in which: the efficiency of the LFG capture system in the project is 50%; the efficiency of the LFG capture system in the baseline is 20%; and, the amount captured in the baseline is flared using an open flare with a destruction efficiency of 50% (consistent with the default value provided in the Tool to determine project emissions from flaring gases containing methane)."*

Thus, as per Case 2, $F_{CH4,BL,R,y}$ is determined (in tCH_4) as follows:

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

Where:

$F_{CH4,PJ,capt,y}$ Amount of methane in the LFG which is captured in the project activity in year *y* (in tCH_4). Since, the project design encompasses combustion of LFG in flares and in internal combustion gas engines, $F_{CH4,PJ,capt,y}$ is thus regarded as equal to the amount of methane supplied to the flare(s) ($F_{CH4,sent\_flare,y}$) + amount of methane in the LFG which is combusted by the internal combustion gas engines ($F_{CH4,EL,y}$).

As also outlined in the updated PDD /2/, by applying the applicable guidance of ACM0001 (version 19.0) /5/ for Case 3 in the particular context of the CGR Paulínia landfill prior to the implementation of the project activity, since there were no monitored or historic data on the amount of methane that was captured in the year prior to the implementation of the project situation then $F_{CH4,BL.sys,y}$ is correctly determined (in tCH_4) as follows:

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

Since, in the particular case of the project activity, $F_{CH4,PJ.,y}$ is equal to $F_{CH4,flared.,y} + F_{CH4,EL,y}$ $F_{CH4,BL.sys,y}$ is thus determined as follows:

$$F_{CH4,BL.sys,y} = 0.2 * (F_{CH4,flared,y} + F_{CH4,EL,y})$$

By comparing the aplicable guidance for Case 2 and Case 3 (both in the context of application of guidance for Case 4), the following relevant aspect is appropriately outlined in the updated PDD /2/:

> *"By comparing the aplicable guidance for Case 2 and Case 3 (both in the context of application of guidance for Case 4), the following is relevant:*
> *While the term "0.2 * $F_{CH4,PJ,capt,y}$" > "0.2 * $F_{CH4,PJ,y}$" (by considering the equation valid for the determination of $F_{CH4,PJ,y}$); it is thus fair and correct to assume that $F_{CH4,BL,R,y} > F_{CH4,BL,sys,y}$.*
> *Thus, the following is applicable for the determination of $F_{CH4,BL,y}$ by following the guidance for Case 4:*
>
> $$F_{CH4,BL,y} = F_{CH4,BL,R,y} = 0.2 * F_{CH4,PJ,capt,y}$$
>
> *Where: In accordance with applicable guidance of ACM0001 (version 19.0), $F_{CH4,PJ,capt,y}$ is to be determined as the sum of the amount of methane that is sent to the project's methane destruction devices (i.e. set of high temperature enclosed flares) in year y (however by not taking into account flare efficiency values in the particular case of its utilization for the determination of $F_{CH4,BL,y}$)."*

In summary, $F_{CH4,BL,y}$ is determined as follows:

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

As per applicable guidance of ACM0001 (version 19.0) /5/, $F_{CH4,PJ,capt,y}$ is to be determined as the sum of the amount of methane that is sent to all installed high temperature enclosed flares (methane destruction devices) in year *y*, however by not taking into account applicable values for flare efficiency in the particular case of its utilization for the determination of $F_{CH4,BL,y}$. The following explanative disclaimer is added in the updated version of the PDD /2/:

> *"In the particular case of the determination of $F_{CH4,BL,y}$ for project activity, while for a given monitoring period, $F_{CH4,PJ,capt,y}$ is thus equal to the sum of the accumulated values for amount of methane in the LFG which is destroyed by flaring in year y (in tCH_4) ($F_{CH4,flared,y}$) (in tCH_4/yr) for the underlying period (with values being calculated/determined without considering/monitoring the hours h that each individual flare has operated under conformance with operational requirements (as established/defined by the flare manufacturer) and by assuming a flare efficiency of 100% (project emissions from flaring being considered as zero (null)). This*

represents a conservative approach as the calculated value for $F_{CH4,BL,y}$ is maximized, and baseline emissions are reduced proportionally.

Assessment of the determination of project emissions:

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

$PE_y = PE_{EC,y}$

Where:

$PE_{EC,y}$ Project emissions due to the consumption of electricity by the project activity. Assessment details for the determination of $PE_{EC,y}$ is included below.

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:

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

Where:

$PE_{EC,grid,y}$ Project emissions from consumption of grid electricity due to the project activity in year *y.*

$PE_{EC,captive,y}$ Project emissions from consumption of electricity generated by a captive off-grid electricity generators fuelled by fossil fuel (diesel) in year *y* (in tCO_2/yr)

By correctly following applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, valid for Scenario C (Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s)) with Case C.III (Electricity from both the grid and captive power plant(s)) being selected as a generic approach; project emissions due to grid electricity consumption by the project activity ($PE_{EC,grid,y}$) are correctly determined as follows:

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

Where:

$EC_{PJ,grid,y}$ Quantity of grid sourced electricity consumed by the project activity in year y. As correctly indicated in the updated PDD /2/, $EC_{PJ,grid,y}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored as per the provisions of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ along the 3rd and last 7-year crediting period of the project activity. Further related assessment details for monitoring of $v_{CH4,t,wb}$ are included in Appendix 8. In the particular context of the ex-ante estimation of emission reductions to be achieved by the project activity within the 3rd and last 7-year crediting period, $EC_{PJ,grid,y}$ is estimated on 2,820 MWh per year. This value is appropriately assumed based on the nominal power output for the main electrical equipment currently installed as part of the project activity (e.g installed centrifugal blowers + ancilary equipement) and also by assuming that such equipment will work continuously (24 hours a day) under full power during the whole period.

$TDL_{grid,y}$ Average technical transmission and distribution losses for grid sourced electricity consumed by the project activity in year *y.* $TDL_{grid,y}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored as per the provisions of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ along the 3rd and last 7-year crediting period of the project activity. In the particular context of the ex-ante estimation of emission reductions to be achieved by the project activity within the 3rd and last 7-year crediting period, the value for $TDL_{grid,y}$ is assumed as being 20%. This value represents the applicable default value as per Option C.III of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/.

$EF_{EL,grid,y}$ CO_2 emission factor for grid-sourced electricity in year y (in tCO_2/MWh). $EF_{EL,grid,y}$ will be determined ex-post by following applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ where the following above-quoted options of the methodological tool (Options A.1, A.2, B.1 and B.2.) may thus be analysed ex-post for the determination of $EF_{EL,grid,y}$ (with the most conservative (higher) value being chosen in the particular case of Scenario C.III) as follows:

- Option A.2: $EF_{EL,grid,y}$ is to be directly determined as 1.3 tCO_2/MWh (applicable conservative default value of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/).

- Option B.2: $EF_{EL,grid,y}$ is to be directly determined as 1.3 tCO_2/MWh (applicable conservative default value of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/)

- Option A.1: $EF_{EL,grid,y}$ will be calculated ex-post as the combined margin (CM) emission factor ($EF_{grid,CM,y}$) as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 07.0) /27/. $EF_{grid,CM,y}$ is determined as a weighted average of following two CO_2 emission factors pertaining to the electricity system:
  - the CO_2 operating margin emission factor ($EF_{OM,y}$) and;
  - the build margin emission factor ($EF_{BM,y}$).

- Option B.1.: $EF_{EL,grid,y}$ is calculated ex-post based in the CO_2 emissions for the fossil fuel diesel consumed by the installed backup captive off-grid electricity generators as well as based on the ration between the amount of fuel consumed by such generators and amount of generated electricity during the time period *t* (with the fuel net caloric value also being considered) as follows:

$$EF_{EL,grid,y} = \frac{FC_{Diesel,t} \times NCV_{Diesel} \times EF_{CO2,Diesel}}{EG_{Diesel\text{-}generator}}$$

Where:

$FC_{Diesel,t}$ Amount of fossil fuel diesel consumed by the installed backup captive off-grid electricity generators during

the time period *t*

NCV_{Diesel} Net calorific value for fossil fuel diesel (in GJ/liters or GJ/kg)

$EF_{CO2,Diesel}$ CO_2 emission factor of fuel diesel (in tCO_2/GJ)

$EG_{Diesel\text{-}generator,y}$ Amount of electricity generared by the installed backup captive off-grid electricity generators during the period *t* (in MWh)

In the particular context of the ex-ante estimation of emission reductions to be achieved by the project activity within the 3rd and last 7-year crediting period, the value for $EF_{EL,grid,y}$ is assumed as being 1.3 tCO_2/MWh. This value represents the applicable default value as per Option C.III of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ Options A.2 and B.2).

By also following applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, applicable for Scenario C with Case C.III being selected as a generic approach; project emissions from the consumption of electricity generated by backup captive off-grid electricity generators (fuelled by diesel) ($PE_{EC,captive,y}$) are to be calculated as follows:

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

Where:

$EC_{PJ,captive,y}$ Amount of electricity sourced by the backup captive off-grid electricity generators (fuelled by diesel) and consumed by the project activity. $EC_{captive,y}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored as per the provisions of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ along the 3rd and last 7-year crediting period of the project activity. In the particular context of the ex-ante estimation of emission reductions to be achieved by the project activity within the 3rd and last 7-year crediting period, $EC_{PJ,captive,y}$ is estimated on 0 MWh per year. This value is appropriately assumed based on the expectation that the installed backup captive off-grid electricity generators (fuelled by diesel) will not the used within the whole 3rd and last 7-year crediting period.

$TDL_{captive,y}$ Average technical transmission and distribution losses for electricity sourced by the captive electricity generators. $TDL_{captive,y}$ is correctly indicated in the updated PDD /2/ as being ex-post determined/monitored as per the provisions of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ along the 3rd and last 7-year crediting period of the project activity. In the particular context of the ex-ante estimation of emission reductions to be achieved by the project activity within the 3rd and last 7-year crediting period, the value for $TDL_{captive,y}$ is assumed as being 20%. This value represents the applicable default value as per Option C.III of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/.

$EF_{EL,captive,y}$ CO_2 emission factor for electricity sourced by the captive off-grid electricity generators (in tCO_2/MWh). Like in the case of $EF_{EL,grid,y}$, $EF_{EL,captive,y}$ will be determined ex-post by following applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ as follows:
Like in the case of the determination of $EF_{EL,grid,y}$, the Options A.1, A.2, B.1 and/or B.2 of the methodological tool will be analysed ex-post for the determination of $EF_{EL,captive,y}$.

Assessment of the determination of leakage emissions:

In accordance with ACM0001 (version 19.0) /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 Applus+ Certification's 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 19.0)) /5/.

Ex-ante estimation of emission reductions to be achieved by the project activity during its 3rd and last 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 Applus+ Certification's validation team. The performed assessment included checking of input parameters and formulas contained in the spreadsheet cells for estimating baseline and project emissions along its 3rd and last 7-year crediting period. The Applus+ Certification's 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 within its 3rd and last 7-year crediting period are appropriately listed in the updated PDD /2/.
Furthermore, formulas, parameters and values are complete, accurate and transparent.

Baseline emissions generated from waste disposal at the SWDS ($BE_{CH4,y}$) are correctly and reasonably *ex-ante* estimated to be (on annual average) 692,239 tCO_2e per year over the 3rd and last 7-year crediting period of the project activity. By correctly taking into account estimated annual amount of grid-sourced electricity to be consumed by the project activity within its 3rd and last 7-year crediting period, the *ex-ante* estimated project emissions (PE_y) are determined as 949 tCO_2e per year.

As confirmed by the Applus+ Certification's validation team, emission reductions (ER_y) to be achieved by the project activity are correctly *ex-ante* estimated as the difference of *ex-ante* estimation of baseline emissions and *ex-ante* estimation of project emissions. ER_y are correctly estimated to be (on the average) 691,290 tCO_2e per year over the 3rd and last 7-year crediting period of the project activity.

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/) are deemed correct[11] and can be reproduced using data and parameter values provided in the updated PDD /2/ and supporting files submitted to the Applus+ Certification's 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 Applus+ Certification's validation team however highlights that forecasted/estimated emission reductions for the project activity over its 3rd and last 7-year 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 Applus+ Certification's 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" (version 08.0) /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 along its 3rd and last 7-year crediting period starting on 14/09/2020 and ending on 13/09/2027 are summarized as follows:

Year	Emission reductions (tCO_2e)
2020	221,632
2021	765,861
2022	785,570
2023	803,563
2024	711,222
2025	632,164
2026	564,274
2027	354,743
Total	**4,839,029**
Annual average	691,290

In summary, the Applus+ Certification's validation team confirmed that calculations for *ex-ante* estimates of emission reductions to be achieved by the project activity along its 3rd and last 7-year crediting period, as reported in the updated PDD /2/, are deemed complete and transparent.

[11] As noted by the Applus+ Certification's validation team, the following disclaimer is added in the emission reduction calculation spreadsheet /4/ enclosed to the updated PDD /2/:

> *"Note:* Values applicable for years 2020 and 2027 are valid for the 109-day and 256-day fractions of these years which are encompassed by the 3rd and last 7-year crediting period: from 14/09/2020 to 31/12/2020 and from 01/01/2027 to 13/09/2027 respectively. It is relevant to note that, as reflected in related calculations, year 2020 is leap year (bissextile year) including 366 days. Estimates of emission reductions for the109-day share of crediting period within year 2020 are thus calculated based on the ratio 109/366."

While the above summarized assumption is not material and, more importantly, it is applied uniquely in the particular context of the ex-ante estimates of the emission reductions to be achieved by the project activity along its 3rd crediting period, it is the opinion of the Applus+ Certification's validation team that it is deemed acceptable as its impact on overestimating emission reductions for the 109-day length share of the crediting period within year 2020 is very low.

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 its 3rd and last 7-year crediting period and/or for the determination of baseline and/or project emissions for the project activity along such new crediting period. The selection and definition of applicable values for the following ex-ante determined parameters are verified to be under conformance with ACM0001 (version 19.0) /5/ + the following applicable methodological tools:

- Emissions from solid waste disposal sites (version 08.0) /14/
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0) /11/
- Project emissions from flaring (version 03.0) /10/
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0) /12/

Assessment details for parameters determined *ex-ante*[12]

Parameter / data	Unit	Value applied	Source of used data/ Applus+ 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 19.0) /5/ is correctly selected and indicated in the updated PDD /2/. In summary, the parameter and its selected value are correctly reported and are determined under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
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 correctly reported and are determined 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 Applus+ Certification's validation team, selected value reasonably corresponds to suitable value which is obtained from credible technical literature /37/ and by also taking into consideration the design and operational characteristics/aspects of the

[12] 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.

			CGR Paulínia landfill plus the general construction, design and forecasted implementation of the project's LFG collection network during its 3rd and last 7-year crediting period[13]. In summary, the parameter and its selected value are correctly reported and are determined appropriately determined (under consistency with the selected CDM baseline and monitoring methodology).
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 correctly reported and are determined 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	

[13]As confirmed by the Applus+ Certification's validation team, the following related disclaimer is appropriately outlined in the updated PDD /2/:

> *"The technical paper "Measuring landfill gas collection efficiency using surface methane concentration" (which was published by Raymond L. Huitric and Dung Kong, from the Solid Waste Management Department of the Los Angeles County Sanitation Districts), states the following regarding LFG collection efficiency for a well-managed LFG collection system:*
>
> > *"Measuring landfill gas collection efficiency is important for gauging emission control effectiveness and energy recovery opportunities. Though researched for years, practical measures of collection efficiency are lacking. Instead, a default efficiency of 75% based on surveys of industry estimates is commonly used, for example, by the United States Environmental Protection Agency (US EPA). Though few, actual emission measurements indicate substantially higher efficiencies ranging from 85 to 98%."*
>
> *This document also mentions "(…) landfill gas collection efficiencies should routinely reach 100%."*
> *Practical results, shown on table 4 of the study: Weighted average collection efficiency, show a collection efficiency of 92.8 to 96.1% on well-engineered landfills with vacuum systems to extract LFG.*
> *The paper "Measuring landfill gas collection efficiency using surface methane concentration" is available at https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.498.2784&rep=rep1&type=pdf"*

The Applus+ Certification's validation team reviewed the content of the above-quoted credible technical literature /37// and was able to confirm the above-quoted disclaimer included in the updated PDD is deemed reasonable and correct.

CO_2 emission factor for grid-sourced electricity ($EF_{EL,grid}$)		tCO_2/MWh	1.3	Values for the ex-ante determined parameters $EF_{EL,grid}$ and $EF_{EL,captive}$ are correctly selected as the applicable default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/. In summary, the parameters and their selected values are correctly reported and are determined under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).	
CO_2 emission factor for electricity sourced by the captive off-grid electricity generators ($EF_{EL,captive}$)		tCO_2/MWh	1.3		
Default value for the 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" (version 08.0) /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 CGR Paulínia landfill). In summary, the parameters and their selected values are correctly reported and are determined under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).	
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		
Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS. ($DOC_{f,default}$)		Weight fraction	0.5		
Methane correction factor ($MCF_{default}$)		-	1.0	Assessment details are presented below under "*Additional assessment details for the ex-ante determined parameter $MCF_{default}$, DOC_j , k_j and w_j*"	
Fraction of degradable organic carbon (by weight) in the waste type *j* (weight fraction) (DOC_j)		-	Assessment details are presented below under "*Additional assessment details for the ex-ante determined parameter $MCF_{default}$, DOC_j , k_j and w_j*"		
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	Flares 1, 2, 3, 4, 5 and 6 850 (min)	Flares 1, 2, 3, 4, 5 and 6 1,200 (max)	Values are correctly indicated as per the information assessed in the clarification letter provided by the flare manufacturer "Biotecnogás srl". In summary, the parameters and their selected values are correctly reported and are determined under consistency with the selected CDM baseline
	Operational LFG flow (for continuous operation):	Nm^3/h	Flares 1 and 2 400 (min)	Flares 1, 2, 3, 4, 5 and 6 2,000 (max)	

			Flares 3, 4, 5 and 6 500 (min)		and monitoring methodology and/or applicable methodological tool(s).
	Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material):	Days	Every 6 months		
	Required/ recommended minimum frequency for replacement of the flare isolation ceramics revetment material:	-	After 10 years of regular and appropriate operation		
Weighting of build margin emissions factor (w_{BM})		%	75		Applicable conservative default values are correctly selected as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 07.0) /27/. In summary, the parameters and their selected values are correctly reported and are determined under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Weighting of operating margin emissions factor (w_{OM})		%	25		

Build margin CO_2 emission factor in year *y* ($EF_{grid,BM,y}$)	tCO_2/MWh	0.2010	The value previously determined for the currently expired 2nd 7-year crediting period of the project activity is also correctly applied for its 3rd and last 7-year crediting period. The previously selected value valid for the currently expired 2nd 7-year crediting period of the project activity is confirmed to be the value calculated by the DNA of Brazil and valid for year 2012 ($EF_{grid,BM,2012}$) /46/. Value is correctly determined as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system" (version 07.0) /27/. In summary, the parameter and its selected value are correctly reported and are determined under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
CO_2 emission factor for grid-sourced electricity ($EF_{EL,grid}$)	tCO_2/MWh	1.3	Values for the ex-ante determined parameters $EF_{EL,grid}$ and $EF_{EL,captive}$ are correctly selected as the applicable default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/. 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).
CO_2 emission factor for electricity sourced by the captive off-grid electricity generators ($EF_{EL,captive}$)	tCO_2/MWh	1.3	

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 CGR Paulínia landfill and also by assessing the operational requirements as established in the valid operational and environmental license (permit) for this particular landfill /29/), the Applus+ Certification's validation team was able to confirm that MSW has been disposed in the landfill sites with depths greater than 5 meters and appropriate MSW landfilling measures have been systematically undertaken. Such operational aspects are expected to continuing being applied/performed throughout the whole landfill operational lifetime (i.e. effective mechanical compacting, leveling and covering of disposed MSW). The Applus+ Certification's 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 under conformance with applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/. In summary, the parameter and its selected values are correctly reported and are determined 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" (version 08.0) /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 CGR Paulínia 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 Applus+ Certification's validation team to be deemed appropriate and correct. Values of mean temperatures and precipitation data for the city of Paulínia in Brazil 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" (version 08.0) /14/.

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%	0.06	2.6%
Garden, yard and park waste	20%	0.1	0.0%
Glass, plastic, metal, other inert	0%	0	30.7%

waste			

In summary, the parameters and their selected values are correctly reported and are determined 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 all *ex-ante* determined (fixed) parameters in the updated the PDD (version 5.0, dated 20/11/2020) /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 Applus+ Certification's 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 5.0, dated 20/11/2020) /2/ as required by ACM0001 (version 19.0) /5/ + the following applicable methodological tools:

- Emissions from solid waste disposal sites (version 08.0) /14/
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0) /11/
- Project emissions from flaring (version 03.0) /10/
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0) /12/

The updated PDD /2/ correctly and sufficiently includes in its Sections B.7.1 and B.7.3 details about all parameters to be monitored *ex-post* along the 3rd and last 7-year crediting period of the project activity for which related assessment is included in the table below:

Parameter monitored ex-post	Assessment details
Management of SWDS	As appropriately outlined in the updated PDD /2/, the design and operational conditions of the CGR Paulínia 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 CGR Paulínia landfill vis-a-vis eventual related eventual changes; - Applicable local or national regulations As required by ACM0001 (version 19.0) /5/, the design and operational conditions of the CGR Paulínia 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 19.0) /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 ($V_{t,wb,j}$)	As appropriately outlined in the updated PDD /2/, continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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	As appropriately outlined in the updated PDD /2/, continuous measurements will be recorded/reported at least with an every-minute

a dry basis ($V_{t,db,j}$)	frequency. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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 fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db,j}$)	As appropriately outlined in the updated PDD /2/, 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 ($v_{CH4,t,wb,j}$)	As appropriately outlined in the updated PDD /2/, continuous measurements will be recorded/reported with an every-minute frequency. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under 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 ($M_{t,db,j}$)	As appropriately outlined in the updated PDD /2/, continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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).
Temperature of the LFG stream in time interval *t* (T_t)	As appropriately outlined in the updated PDD /2/, measurements for T_t will be recorded and reported in ºC. 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 events in related monitoring instrument(s) are also indicated as required to be performed under 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)	As appropriately outlined in the updated PDD /2/, 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 events in related monitoring instrument(s) are also indicated as required to be performed under 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* ($EC_{PJ,grid,y}$)	As appropriately outlined in the updated PDD /2/, continuous measurements will be aggregated manually or automatically. Accumulated measurement records will be recorded and reported at least with an at least once a week frequency. Measurement records will be cross-checked against available electricity consumption receipts/invoices issued by the local electricity distribution company. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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).

Operation margin CO_2 emission factor in year y ($EF_{grid,OM,y}$) = Dispatch data analysis operating margin CO_2 emission factor in year y ($EF_{grid,OM-DD,y}$)	As appropriately outlined in the updated PDD /2/, data will be determined as per applicable guidance for dispatch data analysis operating margin CO_2 emission factor of the methodological tool "Tool to calculate the emission factor for an electricity system" (version 07.0) /27/. Annual values calculated and made publicly available by the DNA of Brazil /46/ may be considered. 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* ($F_{CH4,EG,t}$)	As appropriately outlined in the updated PDD /2/, $F_{CH4,EG,t}$ will be 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 monitoring frequency is biannual. However, as established by the methodological tool "Project emissions from flaring" (version 03.0), if the monitoring period is shorter than one year, the measurement should be at least twice in a monitoring period and in a maximum timeframe of six months between each measurement. 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 participant 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). 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* ($p_{H2O,t,Sat}$)	As appropriately outlined in the updated PDD /2/, this parameter is solely a function of the LFG stream temperature T_t and can be found ex-post at literature /23/. 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* ($T_{EG,m}$)	As appropriately outlined in the updated PDD /2/, $T_{EG,m}$ will be 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* ($Flame_m$)	As appropriately outlined in the updated PDD /2/, detection of flame in the flare(s) will be recorded with an every-minute frequency as a minute that the flame was on, otherwise recorded as a minute that the flame was off. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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).
Maintenance events completed in year *y* as monitored by the project participant ($Maintenance_y$)	As appropriately outlined in the updated PDD /2/, the date(s) that related maintenance events are completed in year *y* will be recorded. 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).
Quantity of electricity generated by / consumed from captive diesel backup generators during the year *y* ($EC_{PJ,captive,y} = EG_{Diesel-generator,y}$)	As appropriately outlined in the updated PDD /2/, recording of measurements will be performed by using appropriate electricity meter with continuous related measurements being monitored with frequency not lower than once a month. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per manufacturer 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).
Quantity of fuel diesel combusted by the captive off-grid electricity generators ($FC_{Diesel,y}$)	As appropriately outlined in the updated PDD /2/, recording of measurements of diesel consumed by by the captive off-grid electricity generators will be performed by using appropriate flow or volume or mass meter(s) with continuous related measurements being monitored with frequency not lower than once a month. As an alternative measurements will be based on records of an integrated electronic

	system of the generators, which shows the percentage of stored fuel. Calibration events in related monitoring instrument(s) are also indicated as required to be performed under frequency as per instrument manufacturer 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).
Net calorific value of the fuel diesel in year *y* ($NCV_{Diesel,y}$)	As appropriately outlined in the updated PDD /2/, value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories /9/) will be considered (with any future revision of the IPCC Guidelines /9/ being taken into account if applicable). 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).
CO_2 emission factor of fuel diesel in year *y* ($EF_{CO2,Diesel,y}$)	As appropriately outlined in the updated PDD /2/, value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories /9/) will be considered (with any future revision of the IPCC Guidelines /9/ being taken into account if applicable). Appropriate net calorific value (NCV) for diesel may be used for converting energy basis data into mass basis data. If the diesel supplier does provide related NCV values and CO_2 emission factor for the delivered fuel on the invoice and these two values are based on measurements for this specific fuel, this source will be used for the determination of values for the monitoring parameter $NCV_{Diesel,y}$. 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).
Average technical transmission and distribution losses for grid sourced electricity consumed by the project activity ($TDL_{grid,y}$)	As appropriately outlined in the updated PDD /2/, annual value is to be determined and should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses in the grid should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation. 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).
Average technical transmission and distribution losses for grid sourced electricity	As appropriately outlined in the updated PDD /2/, annual value is to be determined and estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. Value can

consumed by the project activity ($TDL_{captive,y}$)	either be calculated by the project participants or be based on relevant references. 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)	As appropriately outlined in the updated PDD /2/, continuous measurements will be performed. Monitoring parameter "Status of biogas destruction device" it is thus correctly regarded as applicable to consider the same monitoring procedure as the one applied for parameter $Flame_m$ in the particular case of high temperature enclosed flares. Monitoring and documenting may be undertaken through continuous monitoring of by recording the operational status of the flare (by means of a flame detector) in order to demonstrate the occurrence of methane destruction in this particular type of installed biogas destruction device. Emission reductions will not accrue for periods in which the underlying destruction device (high temperature enclosed flare) is not operational. 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).

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Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: · Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN) and version 02.0 of the "CDM project cycle procedure for project activities" (CDM-EB93-A06-PROC); · Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
01.0	23 March 2015	Initial publication.

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