

TEMPLATE

TRANSITION REQUEST FORM - PROJECT

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VERSION **1.0**

RELATED SUPPORT

- **TEMPLATE GUIDE Key Project Information & Project Design Document v.1.2**

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Summary:

The projects transitioning from **CDM or other Standards to Gold Standard for Global Goals (GS4GG)** shall submit the transition request form and PDD (this document). The **Transition Request Form** is also to be completed for projects that are already registered with GS4GG for CER labelling and seek to move to GSVER stream to issue Gold Standard VERs.

This document contains the following Sections

Section - Transition Request Form

[TRF.1 ELIGIBILITY CHECK FOR TRANSITION](#)

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Key Project Information

Section - Project design document

Q – Description of project

Q – Application of approved Gold Standard Methodology (ies) and/or demonstration of SDG Contributions

Q – Duration and crediting period

Q – Summary of Safeguarding Principles and Gender Sensitive Assessment

Q – Outcome of Stakeholder Consultations

[Appendix 1](#) – Safeguarding Principles Assessment (mandatory)

Q – Contact information of Project participants (mandatory)

Q – LUF Additional Information (project specific)

Q – Summary of Approved Design Changes (project specific)

The following table summarises how different sections of this document shall be filled to facilitate request for transition from other standard to GS4GG.

Section	Required for	How to complete the section
Transition Request Form		
TRF.1 Eligibility check for transition	All projects	Answer the assessment questions and provide supporting information as needed
TRF.2 Transition project information	All projects	Provide project information pertaining to the standard the project is transitioning from (e.g., CDM)
TFR.3 Transition checklist	All projects	Answer the assessment questions and provide supporting in the section in the PDD section as needed
Project Design Document		
Key project information	All projects	Include project details pertaining to GS4GG
		Provide information as needed. Any section/subsections
Section A to E	All projects	- that requires information/justification or additional information as per transition checklist, AND - that involves update/revision to the information provided for registration with other standards. In such cases, the project shall copy and paste the information from registered PDD (other standard) and mark the additional information in track changes.

SECTION – TRANSITION REQUEST FORM

TRF.1 ELIGIBILITY CHECK FOR TRANSITION

To be completed for all projects seeking transition to GS4GG from other standards.

Requirement	To be completed by project developer
The project must have a crediting period start date with CDM/other standard on or after 01 January 2016	Is the project crediting period start date after 01 January 2016? ☒ Yes ☐ No (go to questions below)
The project that has a crediting period start date with CDM/other standard before 01 January 2016 shall demonstrate the risk of discontinuation without carbon revenue.	
The project that has a crediting period start date with CDM/other standard before 01 January 2016 shall demonstrate how the project has been operational in the absence of carbon revenue, if carbon credits have not been issued to the project in recent years.	
List of supporting documents	

TRF.2 TRANSITION PROJECT INFORMATION

Project developer shall provide project information (in grey rows), pertaining to the standard, the project is transitioning from (e.g., CDM) in the table below.	
Name of the original standard	☒ CDM ☐ Other (Add the standard name here)
Project status with original standard	<i>The current status of project with CDM/other standard at the time of submission of this form.</i> ☒ Active (registration status is valid) ☐ Withdrawn (deregistered) ☐ Provisional (awaiting guidance from the CMP at CMP 16, CDM PoA only)
CDM/ other standard reference ID	<i>Reference number/ID allocated to the project by CDM/other standard.</i> CDM 1165
Project reference weblink	<i>The weblink of the project page of CDM/other standard.</i> https://cdm.unfccc.int/Projects/DB/SGS-UKL1181685608.94/view?cp=2
Title of Project	<i>The title of the project used for registration with CDM/other standard.</i> PROBIOGAS-JP – João Pessoa Landfill Gas Project
New title of Project (if applicable)	<i>The title of the project if it has been changed for registering with Gold Standard.</i> Ecoparque João Pessoa Landfill Gas Project
Activity Scale	<i>Project scale registered with CDM/other standard.</i> Large Scale
Methodology used	<i>Methodology title and the version number applied for registration with CDM /other standard.</i> ACM0001 - Flaring or use of landfill gas (version 19.0)
Amount of reductions	<i>Average annual emission reductions (tCO₂eq/year).</i> 245,594 tCO ₂ e
Registration date	<i>The project registration date with CDM/other standard.</i> 01/06/2023
Type of crediting period	☒ renewable crediting period ☐ fixed crediting period
Crediting period	<i>The project registered crediting period start date and end date with CDM/other standard.</i> Start date: 27/11/2008 (1 st Crediting period) End date: 26/11/2015 Start date: 27/11/2015 (2 nd Crediting period) End date: 26/11/2022 Start date: 27/11/2022 (3 rd Crediting period) End date: 26/11/2029

Total Monitoring Periods issued	<i>The total period that has already been issued by CDM/other standard.</i> Start date: 27/11/08 (1st crediting period) End date: 12/05/2011 Start date: 09/12/2018 (2nd crediting period) End date: 31/12/2020	
Latest monitoring period	<i>The latest monitoring period that has already been issued or submitted for issuance to CDM/other standard.</i> Start date: 01/01/2020 End date: 31/12/2020	
	Issuance Status Date of Issuance, if issued.	☒ Issued ☐ Awaiting issuance 17/03/2022
Declaration	<i>Click on the tick box to confirm.</i>	
	The Project Developer/Representative hereby acknowledges that project developer; ☐ Option 1 - has included information in this document that has not been validated/verified as part of CDM PDD OR ☒ Option 2 - has copied all validated information as it appears in the original and then used tracked changes to highlight any information that not been validated/or has changed - <i>Note if option 2 is selected the project developer shall fill all sections in the PDD template of this document.</i> The Project Developer/Representative hereby acknowledges that project developer; ☒ is aware that for a given vintage, a registered Gold Standard project can request the issuance of the emission reductions under only one standard/certification scheme. (applicable to all projects). ☒ is aware that all projects that transition to GS4GG shall demonstrate Ongoing Financial Need at the time of renewal of their crediting period following applicable GS4GG requirements. (applicable to all projects). ☒ confirms that the project developer/representative will make a declaration, in writing, in the monitoring report submitted to Gold Standard that (applicable to CDM PoA/CPAs) - project will/has not issue both a CER/other compliance units under Paris Agreement and a GSVER for the same vintage.	

	- project developer agrees to comply with all future UNFCCC COP/CMP decisions¹ including adjustment of GWP values
Project Developer/ authorised signatory	<i>Name and designation of the project developer/authorised signatory</i> Orizon Valorização de Resíduos S.A.

TRF.3 TRANSITION CHECKLIST

Project developer shall answer all assessment questions listed below and provide additional information/justification in the PDD section, where required. Please note that the checklist is based on the [GHG Emissions Reductions and Sequestration Product Requirements](#).

The checklist also provides relevant requirements applicable to project transitioning to GS4GG for easy referencing. The PD shall refer to relevant GS4GG documents, as applicable, for further details. It is recommended that PD refers to Guidelines in the table below for more information on the requirements and flexibilities provided. This document (in word) shall be submitted to SustainCERT along with other required documents **for preliminary review** as listed below –

- [Cover Letter](#)
- [Terms and Conditions](#)
- [Official Development Assistance declaration](#)
- [Stakeholder Consultation Report](#)
- Project Design Document (PDD) final version (CDM/other standard)
- Validation report submitted to CDM/other standard
- Last Monitoring and Verification report submitted to CDM/other standard

¹ CDM clarification available on this topic as on date can be referred to [here](#).

1 Transition pathway	
1.1 Option 1: Is project seeking registration with GS4GG to issue GSCERs while maintaining the CDM registration? (Ref: GHG Product Requirements)	☐ Yes ☒ No
1.2 Option 2: Is project seeking registration with GS4GG to issue GSVERs only and/or conversion of issued CERs to GSVERs ? (Ref: Annex B, GHG Product Requirements) <i>Note – for conversion of issued CERs to GSVERs, the project must be registered with GS4GG.</i>	☒ Yes ☐ No
1.3 Option 3: Is project seeking registration with GS4GG to issue GSVERs only and/or conversion of emission reduction to GSVERs issued by standard other than CDM ? (Ref: Annex B, GHG Product Requirements)	☐ Yes ☒ No
Requirement: All projects submitting request for transition on or after 1/1/2021 must demonstrate compliance with requirements stated in Annex B, GHG Product Requirements. The project following option 1 above; - may seek registration under GS4GG based on provisional CDM EB decision - may seek issuance of GSVERs in exchange of provisional CERs based on CDM EB decision but must transfer issued CERs to the Gold Standard Swiss CDM Registry Account. If there are any implications for issued volume or project eligibility due to CMP decision regarding GWP, additionality or any other decision, the PD must address these issues, as applicable in consultation with SustainCERT/GS. - A/R projects are not eligible for option 1. The project transitioning to GS4GG following option 2 above, - may convert issued CERs to GSVERs - are not required to deregister from CDM but shall not claim emission reductions under both GS4GG and CDM for the same vintage - Eligible LUF project is required to deregister from CDM to issue GSVERs. The project transitioning to GS4GG following option 3 above, - may convert issued emission reductions unit to GSVERs - may issue GSVERs - shall deregister project from other standard before registration with GS4GG Guidelines: Project already undergoing design certification for CER labelling can continue with their existing process. SustainCERT shall be notified of the intention to switch to GSVER stream, at the earliest possible opportunity. Project already certified for CER labelling can switch to GSVER stream by completing this form and notifying SustainCERT. Such project may leave the PDD section blank as this information has been captured in GS4GG PDD version submitted earlier.	
2 Transition approval procedure	
2.1 Option 1 - Is the project undergoing a preliminary review by sustainCERT , validation by VVB and design review by SustainCERT ?	☒ Yes ☐ No
2.2 Option 2 - Is the project undergoing a combined preliminary review ,	☐ Yes

validation, and design review by SustainCERT ? (restrictions apply, see 5.3 below)	☒ No
2.3 Option 3- Is the project undergoing preliminary review by SustainCERT , combined validation & verification by VVB , followed by combined design and performance review by SustainCERT?	☐ Yes ☒ No

Requirement:

The project certification under GS4GG involves following key steps. Refer to Section 5. Project cycle Principles and Requirements for details.

Preliminary review - Preliminary Review is conducted once at the time of first submission to Gold Standard. It involves desk review of the Key Project Information and Draft Project Design Document by SustainCERT.

Design certification (validation + design review) - Design certification involves validation by VVB and design review by SustainCERT. With successful design certification the Project will obtain 'Certified design' status that is equivalent to registration under CDM and other standard.

Performance certification (verification + performance review) - Performance certification involves verification by VVB and performance review by SustainCERT. The positive conclusion of the Performance Review period shall result in Gold Standard 'Certified Project status' and Project can issue GSVERs. The project may opt for combined Design Certification, conducting both the first Verification and Performance Review under GS4GG at the same time.

To minimise disruption and keep the transition review time and costs minimum, the projects are provided with flexibilities as summarised in the table below;

Certification outcome	Certification stage	Option 1 Normal certification pathway	Option 2* Combined Preliminary review + Validation + Design review	Option 3 Combined validation + verification followed by combined design + performance review
Listing	Preliminary review	SustainCERT		SustainCERT
Certified Design = Registration	Validation	VVB	SustainCERT	VVB
	Design review	SustainCERT		SustainCERT
Certified project = Issuance	Verification	VVB	VVB	VVB
	Performance review	SustainCERT	SustainCERT	SustainCERT
Comments		Project shall go through preliminary review by SustainCERT (4 weeks) Design review (minimum 4 weeks) is conducted after Validation by VVB and is concluded when all CARs/CLs are successfully closed.	Project may combine preliminary review with validation and design review. All these steps can be combined and completed by SustainCERT. VVB shall complete the verification.	Project shall go through preliminary review by SustainCERT (4 weeks) Project Developers may combine Design Certification with first Verification and Performance Review. VVB may combine site visits and VVB submits positive Validation and Verification Reports at the same time.

	Performance review (minimum 3 weeks) is conducted after Verification by VVB and is concluded when all CARs/CLs are successfully closed.	Performance review (minimum 3 weeks) is conducted after verification by VVB and is concluded when all CARs/CLs are successfully closed	Concurrent Design Review and Performance Review (minimum 6 weeks) is conducted after submission of validation and verification reports by VVB and is concluded when all CARs/CLs are successfully closed.
For option 1, a validation site visit by VVB is not required as long as the VVB conducted a site visit as part of validation/verification in last three years (from time of first submission for preliminary review) and new/updated information can be audited based on desk review and/or using remote audit approaches. For Option 2, SustainCERT conducts project design elements desk based audit and approve project transition, without VVB's opinion. <u>Note that this option will involve additional review fee levied by SustainCERT. The project developer shall confirm the applicable fee and timelines with SustainCERT (help@sustain-cert.com) before submitting the request for transition.</u> If transition project is applying a new/latest version of the methodology which requires full audit but VVB, option 2 cannot be applied.			
3 Project Eligibility			
3.1 Is the project eligible project type under Gold Standard for the Global Goals?			☒ Yes ☐ No
Requirement: The transitioning project shall be one of the eligible project types for issuance of Gold Standard VERs (Ref: GHG Product Requirements). Guidelines: Typical eligible project types are Renewable Energy Supply, End-Use Energy Efficiency Improvement, Waste Handling & Disposal, Land Use and Forests. - Afforestation/Reforestation project registered with CDM/other standard may transition to GS4GG for issuance of GSVERs only but are not eligible for labelling of issued emission reduction units. - RE projects shall refer to Renewable Energy Activity Requirements for eligibility check. - RE projects for example - · Hydropower · biomass resources · landfill gas and biogas from agro-processing, wastewater and other residues · Waste Heat/Gas recovery · Fossil co-generation · Waste incineration and gasification · Waste handling and disposal are required to demonstrate compliance with the specific eligibility requirements. Refer to Annex – A of Renewable Energy Activity Requirements for further details. - Community Services Activities projects for example - Hydropower · biomass resources · landfill gas and biogas from agro-processing, wastewater and other residues · Waste Heat/Gas recovery · Fossil co-generation · Waste incineration and gasification · Waste handling and disposal · Relighting · End-use fossil switching are required to demonstrate compliance with the specific eligibility requirements. Refer to Annex – A of Community Services Activity Requirements for further details.			

4 Compliance with relevant Activity Requirements		
4.1 	Does the project conform to the relevant Activity Requirements (CSA/RE / LUF)?	☒ Yes ☐ No
4.2 	Does any specific eligibility criteria/requirement stipulated in Annex A of CSA/RE requirements apply to the project? (see section 2.0 for LUF)	☒ Yes ☐ No
4.3 	Does specific eligibility criteria/requirement stipulated in Annex A of CSA/RE requirements that apply to the project, lead to any change in the registered PDD? If Yes, please provide a full explanation in section A.1.1. below.	☐ Yes ☒ No
Requirement: (Ref: Section 4.1.1 of GHG Product Requirements) Projects shall conform to the relevant Activity Requirements and Gold Standard Approved Methodologies, including eligible CDM Methodologies. RE rule update / RE PoA rule update: Grid connected Renewable Energy projects seeking to transition from another carbon crediting scheme to GS4GG or labelling of emission reductions under GS4GG are exempted from eligibility requirements listed in para 2.1.3 of the RE Activity Requirements. This exemption is only allowed to projects that started the first crediting period with the original carbon crediting scheme from 01/01/2016 or later but before 24/01/2020. (Ref: Section 2.1.1 and 2.1.2 of RU 2020 AR –RE V1.2) Specific Renewable Energy Activity requirements (refer to Annex A): Hydropower, biomass resources, landfill gas and biogas from agro-processing, wastewater and other residues, Waste Heat/Gas recovery, Fossil co-generation, Waste incineration and gasification, Waste handling and disposal. Specific Community Service Activity requirements (refer to Annex A): Hydropower, biomass resources, landfill gas and biogas from agro-processing, wastewater and other residues, Waste Heat/Gas recovery, Fossil co-generation, Waste incineration and gasification, Waste handling and disposal, Relighting, End-use fossil switching.		
5 Applicability of the methodology/tool version		
5.1 	Does the project apply an eligible GS methodology? Refer to list of the eligible methodologies here .	☒ Yes ☐ No
5.2 	Does the project apply the version of the methodology and applicable tools applied for CDM/other standard registration or renewal ?	☒ Yes ☐ No
5.3 	Does the project apply the latest version of the methodology and applicable tools available at the time of first submission of this form ? If Yes, please provide a full explanation in section B below. And note that the project cannot opt for option 2 mentioned transition approval procedure.	☐ Yes ☒ No
Requirement: (Ref: Annex B of GHG Product Requirements) Transition project shall - conform to the relevant Activity Requirements and Gold Standard Approved Methodologies, including eligible CDM Methodologies. - also meet the additional GS4GG methodology eligibility requirements, where applicable. Refer to CDM Methodologies for Gold Standard Eligibility Requirements. Transition project shall apply the version of GS approved CDM methodology or methodology tool for transition to GS4GG as follows;		

a. version applied at the time of registration/renewal of crediting period with other standard, OR b. version available at the time of first submission (preliminary review) this form.	
6 Demonstration of additionality	
6.1 Are you aware that the transitioning project will be required to demonstrate Ongoing Financial Need as per the relevant GS rules and requirements available at the time of renewal of crediting period? (Refer to para 4.1.51 – 4.1.53 of Principles & Requirements.)	☒ Yes ☐ No
Requirement: - The CDM and JI project are not required to carry out additional assessment for demonstration of additionality over and above what has been done for registration/determination with the CDM unless the project falls into a category that is deemed non-additional in an applicable Gold Standard Activity Requirement. In such cases the relevant Activity Requirement shall take precedence. Ref: Annex B GHG Product Requirements. - Transition projects registered with standards other than CDM are required to undergo additionality revalidation to re-establish the validity of the underlying assumptions applied in the demonstration of additionality at the time of registration with the other standard. - The projects seeking combined transition and renewal of crediting period with GS4GG are not required to demonstrate OFN at the time of transition but must demonstrate OFN at the time of Crediting Period renewal after transitioning to GS4GG.	
7 Sustainable Development Assessment	
7.1 Does the project positively contribute towards minimum three Sustainable Development Goals (SDGs) - SDG13 (mandatory) + two other SDGs?	☒ Yes ☐ No
7.2 Have you identified the monitoring parameters linked with selected SDGs and corresponding SDG targets? For example – the monitoring parameter <u>Amount of GHGs emissions avoided or sequestered</u> is linked with SDG 13. Climate action, SDG target 13.2 Integrate climate change measures into national policies, strategies and planning.	☒ Yes ☐ No
Fill section B.6. Sustainable Development Goals (SDG) outcomes and B.7 Monitoring plan, below for SDGs monitoring parameters not covered in registered PDD with other standards. Fill Table 1 – Estimated Sustainable Development Contributions below. Requirement: The transitioning project shall demonstrate a clear, direct contribution to sustainable development, defined as making demonstrable, positive impacts on at least three Sustainable Development Goals (SDGs), one of which must be SDG 13 (Ref: Section 4.(c) of Principles and Requirements) Refer to Annex B, GHG Product Requirements for further guidelines for transition projects. Guidelines: Selected SDG impacts must not result from a one-off from design/construction/distribution/ start-up or decommissioning of the project. You may refer to /use the SDG impact Tool (under consultation currently) to identify the relevant	

monitoring indicator, SDGs and corresponding SDG targets and design monitoring plan for identified indicators.	
8 Start date and duration of the crediting period	
8.1 Has the crediting period of the transitioning project registered with other carbon standard/certification scheme changed and/or extended?	☐ Yes ☒ No
8.2 Is the total duration of the crediting period (i.e. including period that had been issued under the host standard) less than/equal to the maximum crediting period allowed under relevant GS4GG activity requirements?	☒ Yes ☐ No
Complete the section C.2.2 Total length of crediting period below. Requirement: - The crediting period of the transitioning project/PoA/CPA registered with other standards or certification schemes cannot be changed/extended. - Maximum crediting period allowed under GS4GG are as CSA – 15 Yrs, RE – 15 Yrs, LUF 30 – 50 Yrs, AGR – 10 Yrs, if not defined in activity requirement or applicable methodology – 10 Yrs. - The start date of the GS crediting period shall be same as the start date of the CDM crediting period. (Annex B, GHG Product Requirements) - For a transitioning project, PoA/CPA, the total duration of the crediting period, including the period that has been claimed under the host standard, shall not exceed the maximum crediting period allowed under relevant GS4GG activity requirements. If a given project transitioning to GS4GG, was registered under Standard X with - • fixed crediting period (10 years): The total crediting period (Standard X + GS4GG) must remain 10 years. The project can only claim remaining years of its 10-year crediting period after transitioning to GS4GG. • renewable crediting period (7*3 year): The total crediting period (Standard X + GS4GG) must be equal to that allowed under relevant GS4GG activity requirements. The project can only claim remaining years of the maximum allowed crediting period after transitioning to GS4GG. For example; the maximum crediting period allowed for renewable energy project is 15 years. A renewable energy project that has already claimed 5 years under Standard X can only claim remaining 10 years of the total 15 years of its allowed crediting period after transitioning to GS4GG - For a transitioning project, the start date of the Gold Standard Crediting Period starts with crediting period start date with other standard or maximum two years before the date of first submission (submission for preliminary review), whichever occurs later. (Ref: Annex B, GHG Product Requirements)	
9 Safeguarding Principles Assessment	
9.1 Does the project conform to the Gold Standard Safeguarding Principles and Requirements?	☒ Yes ☐ No
9.2 Is there any risk and/or likely adverse outcomes of the project?	☐ Yes ☒ No
9.3 If answer is yes for Q9.3, can the project achieve requirements with regards to the relevant principle through design, management or risk mitigation?	☐ Yes ☐ No
9.4 If answer is yes for Q9.4, have the Mitigation Measures added to the Monitoring Plan (if required)?	☐ Yes ☐ No

Complete the Annex 1 and section D. Summary of Safeguarding Principles below. Requirement: The transitioning project shall conform to the Gold Standard Safeguarding Principles and Requirements. (Ref: Section 4.1.19 of GS4GG Principles and Requirements) Guidelines: The detailed Safeguarding Principles and Requirements checklist is available in Annex 1 of this document.	
10 Stakeholder Consultation Requirements	
10.1 Has the project conducted a Stakeholder Consultation in accordance with the requirements of Gold Standard Stakeholder Consultation & Engagement Requirements? The answer to Q 10.1 is "No", if any of the questions below is answered as "No". The project should take the question(s) into account and address the gap when conducting supplementary stakeholder consultation to comply with GS4GG requirements. Please answer the below question with regards to the stakeholder consultation conducted to comply with CDM/other standard requirements?	☒ Yes ☐ No
10.2 Did you conduct the stakeholder consultation before the project start date?	☐ Yes ☒ No
10.3 Did you discuss identified direct positive and negative impacts of the projects with stakeholders?	☒ Yes ☐ No
10.4 Does the invited stakeholder covers all stakeholder groups (a to g) listed in paragraph 3.1.1. of STAKEHOLDER CONSULTATION AND ENGAGEMENT REQUIREMENTS?	☒ Yes ☐ No
10.5 Did the invitation methods solicit input from women and marginalised groups?	☒ Yes ☐ No
10.6 Were the stakeholders invited at least 30 days before the stakeholder meeting?	☒ Yes ☐ No
10.7 Did a local language version of the non-technical summary with information required as per paragraph 5.1.1. of STAKEHOLDER CONSULTATION AND ENGAGEMENT REQUIREMENTS, shared with stakeholders?	☒ Yes ☐ No
10.8 Was a physical meeting conducted?	☒ Yes ☐ No
10.9 Was a gender lens applied to assessing comments? (for example, if only men provided comments on household device project, was this taken into consideration when assessing the relevance of the comment?)	☒ Yes ☐ No
10.10 Were any serious, reasonable and proportional concerns raised and taken into account and satisfactorily addressed?	☒ Yes ☐ No
10.11 Were any points that warrant 'Mitigation measures' marked as such and monitoring plan has been designed and included in the PDD?	☒ Yes ☐ No
10.12 Is the mandatory Continuous Input / Grievance Expression Process Book's location clearly stated (and therefore usable)?	☒ Yes ☐ No

10.13 Does PDD include a summary report of the comments received from local stakeholders?	☒ Yes ☐ No
Complete the section <u>E. Summary of Local Stakeholder Consultation</u> below. Requirement: Ref: Section 4.1.25 of GS Principles and Requirements. Guidelines: Project that conducted a stakeholder consultation meeting to comply with CDM/other standard requirements, should conduct, at minimum, one round of consultation for identified gaps i.e., gaps due to differences in stakeholder consultation requirements of GS4GG and CDM/other standard. For instance, if original consultations only involve one physical meeting, CME/PD should conduct a stakeholder feedback round covering all the identified gaps. The additional stakeholder consultations may involve a physical meeting or stakeholder feedback round, as necessary. If COVID interim measures are applicable (currently till 30/06/2021), the physical meeting and stakeholder feedback round may be postponed, and a draft SCR shall be mandatorily submitted to cover the consultation activities carried out till date.	

KEY PROJECT INFORMATION

GS ID of Project	GS12045
Title of Project	Ecoparque João Pessoa Landfill Gas Project
Time of First Submission Date	21/03/2023
Date of Design Certification	14/07/2023
Version number of the PDD	3.0
Completion date of version	14/07/2023
Project Developer	Orizon Valorização de Resíduos S.A.
Project Representative	Dalton Canelhas
Project Participants and any communities involved	Orizon Valorização de Resíduos S.A. ² First Climate (Switzerland) AG
Host Country (ies)	Brazil
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Scale of the project activity	☐ Micro scale ☐ Small Scale ☒ Large Scale
Other Requirements applied	-
Methodology (ies) applied and version number	ACM0001: "Flaring or use of landfill gas" (version 19.0)
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☒ Renewable Energy Label ☐ N/A
Project Cycle:	☐ Regular ☒ Retroactive

² While the project activity was previously implemented by Rumos Construções Ambientais Ltda., such company was recently merged with Orizon Valorização de Resíduos S.A., which is now the owner and operator of the project activity.

Table 2 – Estimated Sustainable Development Contributions

Sustainable Development Goals Targeted	SDG Impact (defined in B.6.)	Estimated Annual Average	Units or Products
13 Climate Action (mandatory)	Amount of GHGs emissions avoided or sequestered	245,594	tCO ₂ e per year
7 Affordable and Clean Energy	Total electricity produced: Renewable	51,344	MWh of renewable energy per year
8 Decent work and Economic Growth	Total number of jobs	6	Jobs

SECTION A. DESCRIPTION OF PROJECT

A.1 Purpose and general description of project

>>

Summarized description of the project activity:

The proposed GS project activity titled “Ecoparque João Pessoa Landfill Gas Project” encompasses collection and destruction/utilization of landfill gas (LFG) generated at the Ecoparque João Pessoa landfill (hereinafter termed JP landfill). This well-managed landfill was previously owned and was operated by the CDM host-country project participant Rumos Construções Ambientais and it is located in the city of João Pessoa, capital city of the State of Paraíba, Brazil.

The JP landfill counts on the best management practices for permanent disposal of Municipal Solid Waste (MSW) using landfilling techniques/practices. Modern engineering techniques have been applied during the design and operation of the JP landfill. Leachate generated at the JP landfill is collected and treated under conformance with applicable requirements and all the relevant environmental variables are continuously monitored.

The purpose of the project activity is promoting reduction of emissions of the greenhouse gas (GHG) methane (CH₄) through the implementation and operation of a highly efficient forced LFG collection system; LFG flaring infrastructure (using high temperature enclosed flare(s)) and an electricity generation infrastructure (encompassing 5 engine-generator sets³ (+ all required ancillary equipment and systems) fueled uniquely by LFG and with total combined nameplate power generation capacity of 7.13 MW. The project activity will also promote permanent and real CO₂ emissions reductions due to generation of electricity from unconventional renewable energy source (in addition to GHG emission reductions due to destruction of methane).

³ As per the implementation schedule for electricity generation, from 2021 onwards 5 engine generator sets were installed.

The JP landfill is located in the Metropolitan Region of João Pessoa, the capital of Paraíba State. The JP landfill receives MSW from João Pessoa city and from five cities around João Pessoa city which represents MSW disposal of about 2,000 tons of MSW per day. As per its design configuration, the JP landfill is forecasted to regularly receive MSW reaching 13,000,000 tons of disposed MSW by year 2028. The JP landfill has an estimated lifetime of more than 26 years.

Summarized description of the baseline scenario for the project activity under its 1st GS crediting period:

The baseline scenario for LFG management at the JP landfill is the same as the scenario existing prior to the occurred implementation of the project activity:

- Largest share of LFG generated at the JP landfill being directly emitted into the atmosphere through the surface of the landfill and through pre-project conventional LFG venting/combustion drains, with a minor share of generated LFG being collected and combusted in the pre-project venting/combustion drains (under non-efficient and non-continuous basis), with no active (forced) system to collect LFG nor any systematic and monitored flaring system implemented.
- No utilization of LFG as gaseous fuel for electricity generation, with equivalent amount of electricity generated by the project activity being generated in existing electricity generation sources connected to the National Electricity Grid of Brazil (including fossil fuel fired power plants) and addition of new electricity generation sources within such electricity grid.

Environmental and climate change positive aspects of the project activity:

Since methane is a powerful greenhouse gas (GHG), the pre-project situation of emission of LFG into the atmosphere thus contributes to climate change. Collection and destruction/utilization of LFG as a result of the occurred implementation and operation of project activity promotes real, permanent, and measurable abatement of CH₄ emissions at the JP landfill. Furthermore, by promoting electricity generation through the utilization of LFG as a renewable energy source, the project activity also promotes real and permanent CO₂ emission reductions due to displacement of electricity that

would be otherwise generated by existent grid-connected electricity generation sources (including fossil fuel fired power generation sources) and addition of new grid-connected power generation sources along the baseline scenario.

Besides climate change mitigation, the project activity provides other important local environmental benefits: LFG contains trace amounts of volatile organic compounds, which are regarded as local air pollutants. Capturing LFG using an active forced collection system and its combustion thus also promote reduction of emission of local pollutants.

Other contribution of the project activity towards Sustainable Development locally and in the whole country Brazil:

The project provides the following additional important local environmental and social benefits:

- Destruction of other air pollutants, such as hydrogen sulphide, that are present in trace quantities in LFG.
- Improved LFG management at the JP landfill promotes reduction of risks of occurrence of fire and explosion at the landfill as well as reduction of odor.
- Generation of electricity using non-conventional renewable energy source
- Promotion of local job opportunities.

Non-representing of CPA excluded from a previously registered PoA:

The proposed GS project activity was previously registered under the CDM (with registration date of 30/01/2008). The proposed GS project activity therefore does not represent a Component Project Activity (CPA) that has been excluded from a previously registered CDM Programme of Activities (CDM-PoA) as a result of erroneous inclusion of CPAs.

A.1.1. Eligibility of the project under Gold Standard

As per applicable GS rules and definitions, the GS project activity which encompasses flaring of LFG and utilization/generation of electricity from renewable energy source (LFG generated from decomposition of MSW disposed at the Ecoparque João Pessoa landfill) represents a pre-identified "GHG Emissions Reduction & Sequestration" and

"Renewable energy" project type and it meets the eligibility criteria of the GS4GG "Principles and requirements".

The GS project activity is not registered with any other voluntary or compliance schemes other than its registry as a CDM project activity.

While being hosted in Brazil, the GS project activity is not located in a host country, region, locality or state that has an emission reduction cap enforced or has the possibility to trade emissions that include the scope of the proposed project. There is no regional or national GHG emission reduction cap enforced in Brazil. Furthermore, there is no domestic regional or national GHG emission trading scheme implemented in Brazil either.

While the GS project activity represents the only project-based initiative implemented in the municipality of João Pessoa (within the State of Paraíba) promoting GHG emission reductions due to destruction/utilization of landfill gas (there are no other Gold Standard or other voluntary or compliance standard program of a similar nature implemented or planned to be implemented nearby the GS project activity), there are no potential for double counting of impacts.

The following requirement of the "GS4GG Renewable Energy Activity Requirements" is also applicable to the GS project activity:

"Methane recovery project activities shall be eligible for emission reductions from both methane avoidance (including from the flared biogas fraction) and non-renewable fuel substitution as long as evidence is provided on time for validation to demonstrate that the system was designed in a way to at least make use of some of the biogas recovered for the delivery of energy services (e.g., electricity, heat)."

Since as per the project design, collected LFG is to be primarily used as gaseous fuel for electricity generation, such requirement is thus fully met.

Finally, as further demonstrated in Section B.4, the GS project activity is regarded as under full compliance with applicable Host Country's legal, environmental, ecological and social regulations.

A.1.2. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

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While being the registered owner of all project-related infrastructure of the GS project activity and while having been granted with all applicable permits and authorizations for the operation of both the GS project activity and the Ecoparque João Pessoa landfill, the project developer Orizon Valorização de Resíduos S.A. has full and uncontested legal ownership of all products that are generated under Gold Standard Certification.

A.2 Location of project

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The JP Landfill is located at the BR 101 highway, km 23, in the city of João Pessoa, the capital of Paraíba State, Brazil.

The geographical coordinates of the project site are as follows:

Format	Latitude	Longitude
Decimal	-7.134	-34.5723
DMS ⁴	7° 13' 4" S	34° 57' 23" W

The following images show the location of the project activity:

⁴ Degree, Minute, Second.

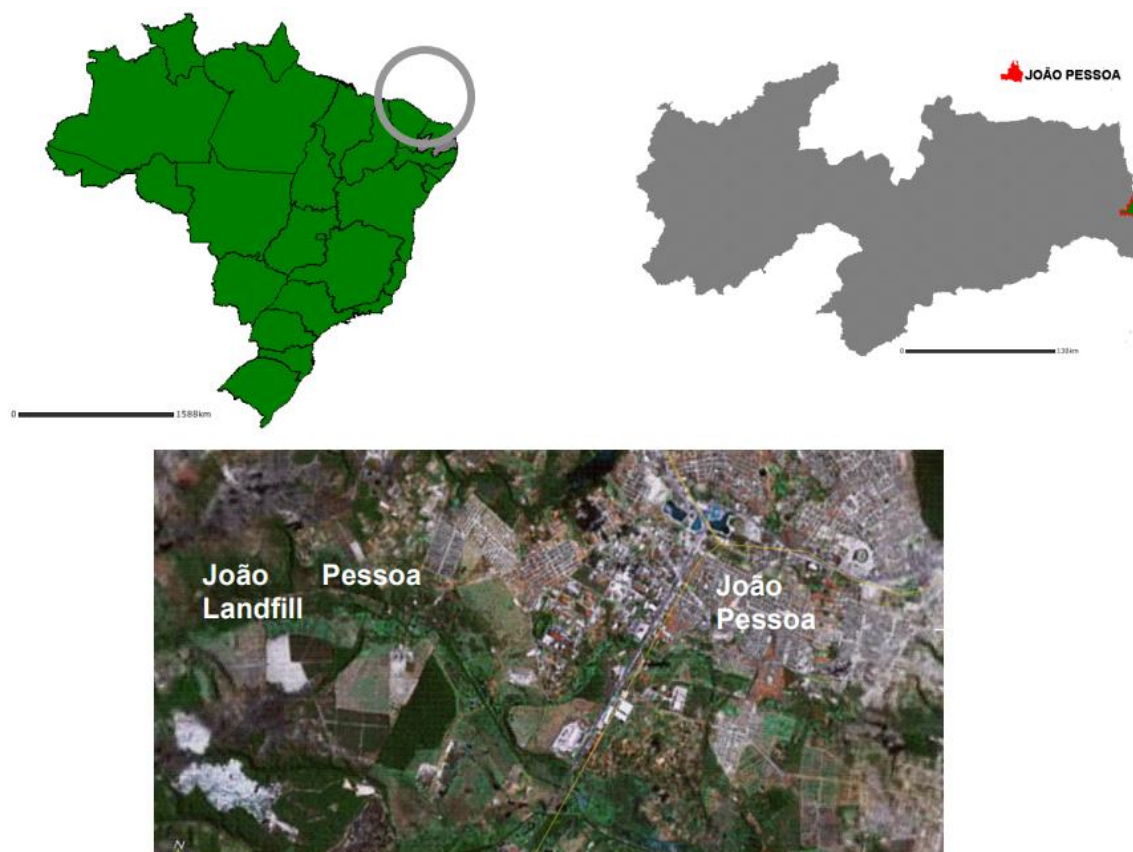


Figure 1: João Pessoa Landfill Gas Project location (Source: IBGE⁵ and Google Earth)

A.3 Technologies and/or measures

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Pre-project situation at the JP landfill:

Municipal Solid Waste (MSW) disposal at the JP landfill started in the year 2003. The previously validated pre-project situation (situation prior to the occurred implementation and starting of operations of the project activity) at the JP landfill represents the non-existence of any appropriate equipment/infrastructure and/or practice dedicated to promoting effective and efficient LFG management (LFG collection and destruction/utilization) at this particular landfill site. As part of the previously performed CDM validation for the project activity, the above summarized pre-project situation was identified to represent the baseline scenario for the project activity. Under

⁵ Adapted from <<http://mapas.ibge.gov.br>>

the baseline scenario, a set of conventional, and to some extent rudimentary, passive LFG venting drains had been used in the landfill's permanent MSW disposal area as the only LFG management measure (in order to allow venting of LFG (in order to avoid significant accumulation of LFG in the inner section of the landfill (and thus reducing the risk of fire and explosions)).

For the whole time period encompassing the 1st GS crediting period of the project activity (from 01/01/2021 to 26/11/2023), it is assumed that in the baseline scenario, proper infrastructure for promoting effective and efficient LFG collection and destruction would remain inexistent at the JP landfill site. Currently, there are still no legal municipal, state or national requirements in the city of João Pessoa, Paraíba State nor in the country of Brazil (respectively) that establish any requirement and/or guidance in terms of LFG management in new or existing landfills or waste dumpsites.

The baseline scenario for emissions of methane (largest share of generated CH₄ being directly emitted into the atmosphere) is identical to the scenario existing prior to the CDM registration and implementation of the GS project activity (pre-project scenario) and remains unchanged for its 1st GS crediting period.

The baseline scenario for electricity generation (no generation of electricity on site using LFG and/or any other fossil or renewable fuel/energy source) is identical to the scenario existing prior to the registration and implementation of the project activity (pre-project scenario) and remains unchanged for its 1st GS crediting period.

The previously conceived overall design, operation and management plan of the JP landfill have not changed, and they are not expected to be compromised and/or changed because of the implementation and starting of operations of the project activity. Since the practice to deliberately increase methane generation has never occurred at the JP landfill, none of such practices is present in the project's history nor after the implementation of the project activity or is expected to occur along its 1st GS crediting period. As required by the applied baseline and monitoring methodology ACM0001 (version 19.0), the eventual occurrence or planning of any change in the management of the JP landfill during the 1st GS crediting period of the project activity will be reported and will be justified by referring to applicable technical or regulatory specifications.

Technology and measures encompassed by the project design:

Employed technology encompasses the implementation of appropriate LFG destruction infrastructure (through flaring of LFG in high temperature enclosed flare(s)) and infrastructure for utilization of collected LFG as gaseous fuel for electricity generation in an electricity generation infrastructure at the JP landfill. Collection of LFG occurs through an active LFG collection system composed by appropriate LFG vertical collection wells, LFG transportation pipeline network with methane destruction and utilization occurring through combustion of collected LFG in high temperature enclosed flare(s) and engines of the project's electricity generation infrastructure, respectively.

The project system is to be equipped with all required monitoring system and procedures in order to ensure that all required measurements and other monitoring related activities are performed under full conformance with applicable requirements established in ACM0001 (version 19.0) and applicable CDM methodological tools. Such measurements include continuous monitoring of LFG flow to the flare(s) and engines, continuous monitoring of methane content in collected LFG, continuous monitoring of operational conditions/status of the flare(s) and engines combusting LFG, measurement of generation of electricity, measurement of consumption of electricity (sourced by the electricity grid or by backup diesel generator). In summary, the project technology and monitoring related equipment/system and procedure are environmentally and technically safe and sound.

LFG flaring equipment:

The project activity encompasses the following characteristics to promote efficient and controlled combustion of collected LFG through flaring:

- Safe and low emission combustion of LFG guaranteed by the utilization of high temperature enclosed flare(s) that allow safe, controlled and efficient combustion of LFG.
- Use of best practice safety devices for the flare(s) (such as flame detector(s) and slam shut valve(s)).

- Continuous measurement of temperature of the exhaust gas of each individual flare (with continuous monitoring of the flare status (with every minute recording of the status signal of flame detector(s)) being available.

While the applied CDM baseline and monitoring methodology ACM0001 (version 19.0) and applicable methodological tools require ex-post monitoring on whether flaring equipment combusting LFG operates under compliance with operational requirements and recommendations of the equipment manufacturer, the main operational characteristics and specifications of the high temperature enclosed flare currently installed as part of the GS project activity ^{6 7} are defined as follows:

⁶ The currently installed single high temperature enclosed flare represent the only equipment combusting LFG installed as part of the project activity of which compliance with operational specifications/requirements (as established by equipment manufacturer) should be monitored as per applicable guidance of ACM0001 (version 19.0) and applicable methodological tool "Project emissions from flaring". Thus, operational specifications and characteristics of this equipment are reported in this Section. Design and/or operational specifications of other equipment which are part of the project's LFG collection and destruction infrastructure (e.g. centrifugal blowers, valve(s), flow meter(s), CH₄ content gas analyzer unit, etc.) are not reported in this Transition Request Form + GS4GG PDD. However, specification details of all equipment and instrument are expected to be regularly reported in the Monitoring Reports to be issued along the 1st GS 5-year crediting period of the project activity.

⁷ The project participants acknowledges that more than one high temperature enclosed flare may be eventually installed and under operation as part of the project activity in order to fully accommodate previously projected potential gradual increase in the amount of LFG to be collected. This is under conformance with the project design conceptualization (which considers gradual installation of additional flare(s) and other equipment (e.g. centrifugal blowers) within the project lifetime in order to eventually address forecasted increase in LFG collection by the project activity.

In case installation of more than one flare occurs, information made available in different Sections of this Transition Request Form + GS4GG PDD will be updated accordingly by applying applicable GS procedure for addressing post-registration changes.

LFG combustion flaring equipment	Characteristics/specifications
Flare 1	Manufacturer: Biotechnogás (BTG) Min. LFG flaring capacity (for continuous operation): Flow rate of 500 Nm³/h Max. LFG flaring capacity (for continuous operation): Flow rate of 2,500 Nm³/h Required min. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH₄ destruction efficiency): 850°C Required max. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH₄ destruction efficiency): 1,200 °C

Source: Equipment technical declarations made available by Biotechnogás (BTG).



Figure 2: View of the project's LFG destruction infrastructure (flaring station)

Electricity generation infrastructure:

As part of the project activity, methane is to be destroyed through combustion of collected LFG in a set of up to 5 engine-generator sets (engines) fully powered by LFG which represent the major components of the project's electricity generation infrastructure. The engines are currently implemented and operational during the 1st GS crediting period as follows:

Year	Number of engines	Installed capacity (in MW)
2021	5	7.13
2022	5	7.13
2023	5	7.13

The state-of-the-art engine type 4, manufactured by GE Jenbacher GmbH & Co OHG has individual nameplate power generation capacity of about 1.4 MW.



Figure 3: View of the engine-generator set Type 4, manufactured by GE Jenbacher GmbH & Co OHG

The GE Jenbacher lean-burn engine fueled by LFG have CH₄ destruction efficiency in the range of 99.5%⁸. The engines are assembled under a container-based modular power generation package set design. Each container includes ancillary equipment (cooling fan, coolant radiator, etc.).

The picture below includes a view of the currently implemented project's electricity generation infrastructure.

⁸ Source: Publicly available declaration from GE Jenbacher– USA.

Available online: <https://www.jenbacher.com/en/gas-engines/type-4>.



Figure 4: View of the project's electricity generation infrastructure

Consumption of electricity by the project activity:

As per the project design, electricity demand for the GS project activity is to be met by consumption of grid-sourced electricity, by electricity sourced by the project's electricity generation infrastructure or by a backup diesel generator. The backup diesel generator is activated automatically (through automatic switching control) whenever supply of grid-sourced electricity to the GS project activity is interrupted. Such automatic switching control does not allow the backup diesel generator to be connected to the electricity grid. Thus, under no circumstance the project's electricity demand can be met simultaneously by grid-sourced electricity and by the backup diesel generator. Furthermore, under no circumstance electricity generated by the backup diesel generator can be exported through the electricity grid the project activity is connected to.

The expected operational lifetime for the project's LFG collection and destruction/utilization infrastructure is at least 20 years. However, related equipment and infrastructure lifetime may exceed 20 years if required service and maintenance is performed correctly and in case the GS project activity is always operated as per recommendation and requirements set by manufacturers/suppliers of included equipment/instruments.

No change in the design and operational conditions of JP landfill:

The Project Design and operational aspects of the JP landfill are not expected to be changed during the 1st GS crediting period of the GS project activity. The JP landfill is expected to still be operated with the application of the same and previously applied MSW landfilling technics and procedures.

The JP landfill was designed and has been managed and operated under conformance with its previously conceived design, construction, operational and management requirements (as required and established in the environmental permits and licenses applicable for the landfill and as per best available practices for landfill construction and operation in Brazil).

The whole management and operation plan of the JP landfill has been approved and has been regularly monitored by the competent environmental authority of Paraíba State.

The JP landfill is regarded as a very well-designed and very well-managed landfill. As established by the valid environmental and operational permits, disposed MSW is constantly covered and levelled with the use of heavy equipment (excavators, compacting equipment, etc.). Furthermore, safety requirements are defined and addressed as part of the operation of the landfill by using a preventative approach.

History of project activity

The GS project activity "Ecoparque João Pessoa Landfill Gas Project" is registered under the CDM and it was not previously included as a component project activity (CPA) in a registered CDM programme of activities (PoA). Prior to being registered under the CDM, the project activity did not represent any part or a whole previously registered CDM project activity that had been deregistered. Moreover, prior to being registered under

the CDM, the GS project activity was not part of a previous CPA that has been excluded from a previously registered CDM PoA either.

The GS project activity does not represent nor is part of a previously registered CDM project activity CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) which existed within the same or other geographical location as the proposed GS project activity.

A.4 Scale of the project

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Large scale.

A.5 Funding sources of project

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There is no public funding involved in the GS project activity.

SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

B.1. Reference of approved methodology (ies)

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The following CDM baseline and monitoring methodology is applied: Consolidated baseline and monitoring CDM methodology ACM0001 - "Flaring or use of landfill gas" (version 19.0)

(<https://cdm.unfccc.int/methodologies/DB/JPYB4DYQUXQPZLBDVPHA87479EMY9>)

The following methodological tools are applied:

- Emissions from solid waste disposal sites (version 08.0)
(<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf>)
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)
(<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf>)
- Project emissions from flaring (version 04.0)
(<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v4.0.pdf>)
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)
(<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf>)
- Tool to calculate the emission factor for an electricity system (version 07.0)
(https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf/history_view)
- "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)
(<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>)

- Positive lists of technologies (version 04.0)
(https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-32-v1.pdf/history_view)

B.2. Applicability of methodology (ies)

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Demonstration applicability conditions for ACM0001 (version 19.0) and for all methodological tools referred in Section B.1 are included in the tables below:

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
<i>"The methodology is applicable under the following conditions:</i> <i>(a) Install a new LFG capture system in an existing or new (Greenfield) SWDS where no LFG capture system was or would have been installed prior to the implementation of the project activity; or</i> <i>(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> <i>(i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and</i> <i>(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</i>	As per the CDM project standard for project activities (CDM-PS-PA) and GS4GG related documents, in the context of the transition request under the GS4GG for a previously registered CDM project activity, the Transition Request Form + GS4GG PDD valid for the 1st GS crediting period is to be completed by applying the latest version of the CDM baseline and monitoring methodology previously applied or the same version of the methodology applied in the latest version of the PDD for the project activity under the CDM. The latest version of the Transition Request Form + GS4GG PDD valid for the 3rd CDM crediting period of the project activity was completed by applying the CDM baseline and monitoring methodology ACM0001 (version 19.0). While version 19.0 currently represents the latest version of ACM0001, this version of ACM0001 is thus selected as the applicable

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
<i>amount of LFG capture and flared is available;</i> (c) <i>Flare the LFG and/or use the captured LFG in any (combination) of the following ways:</i> (i) <i>Generating electricity;</i> (ii) <i>Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or</i> (iii) <i>Supplying the LFG to consumers through a natural gas distribution network;</i> (iv) <i>Supplying compressed/liquefied LFG to consumers using trucks;</i> (v) <i>Supplying the LFG to consumers through a dedicated pipeline;</i> (d) <i>Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.”</i>	methodology for the transition request of the proposed GS project activity. The project design encompasses the installation of a new active (forced) LFG capture system in an existing SWDS partially replacing a previously existent conventional passive LFG combustion system (using conventional passive LFG venting/combustion drains⁹. In this sense, condition (b – i) of the quoted applicability criteria is met. The GS project activity was registered under the CDM as a project-based initiative promoting flaring and utilization (as gaseous fuel for electricity generation) of collected LFG. In this sense, condition (c.i) of the quoted applicability criteria is met. As a result of the occurred implementation of the project activity, no quantitative, qualitative, procedural

⁹ The installed active LFG capture system as part of the project activity encompasses entirely new equipment (e.g. LFG collection wells, LFG transporting pipeline, centrifugal blowers, etc.). By assuming that the project activity replaces the previously existent pre-project passive LFG venting and combustion system, in the particular context of the demonstration of meeting of applicability criteria for ACM0001 (version 19.0), it is assumed that condition (a) is not applicable and condition (b – i) is applicable.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	or regulatory change has occurred and/or is expected to occur in terms of related MSW management activities and policies valid for the JP landfill (or eventually applicable in any other potential waste treatment or disposal facility under the area of influence of this landfill (that would be promoted or triggered by the project activity)) in comparison with the situation under the baseline scenario. This situation is expected to remain valid during the 1st GS 5-year crediting period of the GS project activity. By taking into consideration the nature of the GS project activity and aspects related to recycling of organic fraction of MSW in the region of landfill and in the rest of Brazil, the implementation of the project activity <i>per se</i> has not promoted or triggered (and it is not expected to promote or trigger) any quantitative change in waste disposal activities undertaken at the JP landfill. Furthermore, no quantitative or qualitative changes in terms of waste management practices are expected to be promoted or triggered in any other existent or potential waste disposal or waste treatment facility (located or to be located in the region of influence of the

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	JP landfill) as a direct outcome or consequence of the operation of the GS project activity during its 1st GS 5-year crediting period. Thus, the mere occurred implementation of the project and its operation have not promoted or triggered (and they are not expected to promote or trigger) any reduction (or prevention) in the amount of organic type of MSW (or any other type of solid waste) that would eventually be recycled or re-utilized in the region of influence of the JP landfill. As demonstrated in the applicable construction, design and operational requirements valid for the JP landfill, this landfill has not included and is not expected to include any activity or initiative promoting recycling or utilization of organic fraction of waste disposed at this landfill. Without any organic waste recycling activity or initiative under operation within the limits of the JP landfill, it is thus clearly not expected that the occurred implementation of the project activity would eventually reduce organic waste recycling activities in the JP landfill.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	Currently there is not even any existent or planned large-scale MSW sorting, recycling or utilization facility for organic fraction of MSW (e.g. a large-scale waste composting plant) with comparable capacity and located in the region of influence of the JP landfill. As a matter of fact, recycling and utilization of organic fraction of MSW is still not being a common practice in the whole country of Brazil. In this sense, the occurred implementation of the project activity does not represent any perverse incentive or driver for the promotion of any supposed quantitative or qualitative reduction or prevention of waste recycling related activities (or initiatives for any type of organic fraction of solid waste or solid residues) that would occur in the region of influence of this landfill¹⁰ in the absence of the project activity.

¹⁰ As per the Brazilian Federal Law 12.305/10 (passed in year 2010), waste recycling is defined as a process of transformation of waste material and residues through promotion of changes in their physical, chemical or biological properties in order to allow and promote use/utilization of such materials as raw material or even as new products. Although waste recycling is being regarded in the national sector directives for waste management

as a priority goal in the whole country, solid waste recycling initiatives in Brazil are still being quite limited (especially in the case of organic fraction of MSW) mainly due to economic restrictions. As outlined in the publication "*Panorama dos Resíduos Sólidos no Brasil – 2022*" (title translated into English language as "*Outlook of Solid Waste Sector in Brazil – year 2022*" and available online at: <https://abrelpe.org.br/panorama-2022/>), solid waste recycling initiatives in Brazil have encompassed mainly the following by-products/waste types with higher economic value:

- aluminum (mainly beverage aluminum cans),
- pre-separated/sorted clean (not contaminated) paper,
- pre-separated/sorted (not contaminated) plastic material (mainly PET beverage bottles),
- glass material.

The "*Panorama dos Resíduos Sólidos no Brasil*" is a publication annually published by the Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE (translated into English language as "Brazilian Association for Municipal Solid Waste and Special Waste") and has represented one of the most credible annual outlook and statistics source for the solid waste management in the country. The most recent Greenhouse Gases Emissions National Inventory (published by the Brazilian Ministry of Technology and Science in 2010 and available online at: http://www.mct.gov.br/upd_blob/0213/213909.pdf) also confirms that non-conventional MSW treatment alternatives (such as composting of organic fraction of MSW and waste incineration) are not meaningful practices in Brazil (including the region where the project activity is implemented).

In fact, in year 2012 the Brazilian Ministry of City Infrastructure (through its National Secretary of Sanitation) has published the year 2017 edition of a very comprehensive and detailed sectoral analysis/diagnostic about the whole MSW sector in Brazil: the publication "*Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2017*" (title translated into English language as "Diagnostics of Urban Solid Waste Management - 2017" and available online at: <http://www.snis.gov.br/diagnostico-residuos-solidos/diagnostico-rs-2017>). Like the Report "*Panorama dos Resíduos Sólidos no Brasil – 2022*", this Government official publication also includes relevant and detailed statistics for MSW management for the main municipalities, States and regions in Brazil. Available statistics includes prevailing practices in terms of waste management practices (collection, disposal and re-use/recycle). In the particular case of the region under potential influence of the JP landfill (cities from which generated MSW is disposed at the landfill), all solid waste materials (organic or inert) to be eventually/potentially recycled (very small share of collected MSW) are normally previously sorted (under very limited percentiles) in the waste generation sources (prior to be mixed with other types of MSW to be disposed in landfills or waste dump sites in the region).

In the particular case of recycling of organic fraction of waste material to be disposed in landfills or dump sites, the current *status quo* is also expected to be the prevailing situation valid in the future: paper waste streams (mixed with other MSW types), food residues, textile, wood waste etc. when ready to be disposed in landfills/dump sites or already disposed in a particular landfills or dump sites) are not even regarded as recyclable material (and thus not even accounted in the available statistics for recyclable material).

Under the category “*organic MSW fraction*” only clean (not contaminated) and previously appropriately sorted pulp/paper/cardboard waste materials have actually been regarded as recyclable material as per both available statistics and available recycling practices. Besides some particular inert waste materials with attractive commercial value (e.g., aluminum packaging material (e.g., cans), some types of clean plastic material and some types of glass), no other waste materials have been normally collected from stream of MSW to be disposed in landfills in order to be eventually recycled in the region where the project activity is implemented and/or even transported to be recycled in other region. This has also been the typical waste recycling scenario in other regions of Brazil.

Thus, in the particular case of the JP landfill, both under the baseline and project scenarios (with or without the implementation of the project activity), no organic fraction of solid waste stream that has been directed to this particular landfill would be expected to be collected and directed to any type of recycling facility (e.g. composting facility) after or prior its disposal at the landfill site. This situation is expected to remain being the practice in the future. In fact, as established by related construction and design documents for the JP landfill, no waste pickers or waste sorting teams have ever operated in the landfill area. No composting plant for organic waste (or any other type of alternative management for MSW organic content) was ever implemented or is expected to be implemented in the area in the future either.

All of the above-summarized facts and aspects confirms that no relevant sorting and collection of recyclable organic material from MSW already disposed in the JP landfill are expected to occur regardless of the implementation of the project activity (under both baseline and project scenarios). Thus, recycling or alternative use/utilization of organic fraction from waste already disposed in the landfill are not expected to occur either (regardless of the implementation of the project activity).

In summary, based on information and data included in the “*Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2017*”; information and data available in the “*Panorama dos Resíduos Sólidos no Brasil – 2022*” and also based on common practice for waste collection, currently existing very limited and not relevant recycling initiatives in the region of the project activity and even in other regions in Brazil, and by also taking into account the particular situation at the region of the project site, the following assertions are valid for potential of recycling of organic fraction of MSW in the region of influence of the JP:

- The current MSW management practice in Brazil (and its trend for the future) represents disposal of collected MSW in existing and new landfills (and still existing open dump sites). This practice currently represents almost all undertaken management for all stream of MSW which is actually collected (in mass basis); with very reduced share of collected MSW in Brazil being currently treated under non-conventional methods such as waste incineration (0.03%) and composting (0.11%) (in mass basis as per data of year 2019 (data organized and published in year 2021)).
- It is important to note that in all regions in Brazil with existing MSW disposal activities using landfilling techniques (in existing landfill or existing dump sites) significant quality improvements in terms of MSW disposal services and techniques are still being required especially for cases where solid waste is disposed in existing not-well-managed landfill or dump sites. Such required improvements include construction of better-designed landfills, use of more appropriated technics for waste compacting and covering, etc. In

this particular sense, the JP landfill represents a very well designed and very well managed landfill. The main barrier for improving MSW management in Brazil is still being lack of capital and investment capacity from municipalities to face high associated costs for implementing environmentally friendly MSW management operations. Under the region of influence of the JP landfill, organic fraction of solid waste material that is collected as MSW has been historically disposed by applying landfilling techniques.

- In all geographical regions in Brazil, relative very low share of previously sorted pulp/paper/cardboard (clean and not contaminated) waste materials have been used as recycling material in the region. Materials under such conditions are termed in the available statistics as “dry recyclable material” and are normally not mixed with MSW stream to be sent to landfills or dump sites. It is important to note that the initiatives and businesses involving recycling of previously sorted dry pulp/paper/cardboard materials (clean and not contaminated materials) have their particular dynamics and characteristics and with not so detailed statistics in some cases. However, under no circumstance such activities are to be affected or even influenced by change, improvements or aspects related to MSW disposal activities employing good landfilling technics (for example: in most of the well managed landfills in Brazil, the landfill is implemented in a closed and controlled area without waste pickers collecting waste from the landfill as a way or living). By taking into consideration the dynamics of initiatives promoting recycling of paper material, it is correct to assume that, differently than for MSW disposal activities; policies, planning and practices related to MSW collection and sorting could indeed under a certain limit play a role such initiatives.
- By merely promoting efficient collection and destruction/utilization of LFG in a landfill (where LFG is generated due to anaerobic degradation of organic fraction of MSW which is to be disposed in the landfill under the framework of contracts for MSW disposal signed with municipalities in the region), the occurred implementation of the project activity and its continuous operation *per-se* clearly have not represented and are not expected to represent any driver or incentive for promoting any change in the MSW management situation in the region where it is implemented (including waste recycling practices or initiatives for organic content of MSW to be disposed in landfills or dump sites).

By taking into account (i) the institutional and regulatory framework for the public service of MSW management; (ii) the dynamics of MSW sector in the region where the project activity is to be implemented and in Brazil, and (iii) magnitude of average costs for existing MSW management options (which could be regarded as alternatives to disposal of MSW in landfills (e.g employment of MSW composting techniques)), (iv) the available related statistics, the following aspects are also to be noted:

- it is clear that promotion or even disincentive of recycling of organic fraction of MSW are not waste policy aspects that would be under any influence or willingness of the project participant Rumos Construções Ambientais Ltda. (as owner and operator of the JP landfill). Aspects and actions related to promotion of any increase or even reduction of recycling of organic fraction of waste (and/or recycling of any other type of solid waste material) in the region where the project activity is to be implemented, are to be seen as dependent in a last instance on public service policies (including policies, laws, regulations and programs) to be set by competent governmental authorities (under a regional and national level) and by

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	The same is actually also applicable for recycling of inert waste material.

practitioners of recycling. In Brazil, the administrations of municipalities are responsible for addressing all MSW management services. Furthermore, there are federal directives and laws to be considered by Municipalities for the implementation and operation of their local waste management policies. This is the case in the geographical region of the project site. Waste collection and disposal services are normally performed by the municipality and/or are performed by private companies hired and paid by one or more municipalities (under contractual commercial agreements for provision of public service on behalf of such municipality (ies)) for the provision of MSW collection and/or MSW disposal services by completely following directives and requirements established by the municipalities in signed contracts. In this context, both under the baseline and project scenarios (with or without the implementation of the project activity), the project participant Rumos Construções Ambientais Ltda. is not under a position to design or plan the implementation of any initiative promoting recycling or use of organic waste (e.g. operation of a solid waste composting plant) at the JP landfill or at other location in the region.

- The occurred implementation and operation of the project-based initiative promoting collection of LFG and its destruction/utilization in high temperature flare and set of engine-generator sets at the JP landfill *per se* have not triggered and would not trigger any change in the regional policies and practices for MSW management in the region or outside its region of influence either. As further discussed in Section B.6.1, so far, there is still no legal restriction neither requirement for LFG gas collection and its destruction using high temperature enclosed flares, engine-generator sets and/or in any other combustion device in Brazil. Moreover, there is still no legal restriction neither requirement for passive venting of LFG or its combustion in conventional LFG destruction systems either. There is no applicable regulation/law that deals with LFG management in Brazil. Thus, the occurred implementation (and operation) of more appropriate and environmentally safe management of LFG at the JP landfill (as part of the project activity) does not represent a driver or incentive to promote incremental disposal of organic waste stream at this landfill thus displacing or preventing such waste stream from being treated under an existent or potential (hypothetical) MSW recycling/utilization facility (e.g. a hypothetical waste composting plant) instead.

In summary, by taking into consideration the nature of project activity and all facts/aspects and information above presented, the project activity clearly does not pose any risk or potential to promote any relative decrease of the amount of organic fraction of MSW that would be otherwise recycled or utilized or prevention of any mean of waste recycling or utilization.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	In Brazil, the administrations of municipalities typically are the entities responsible for all MSW management services. In this context, waste management companies operating landfill sites normally act as service providers, providing MSW collection and disposal services as per directives and contractual requirements set by the municipalities from which generated MSW are to be managed (collected and disposed). Thus, such companies are not in a position to promote any reduction or prevention of organic waste recycling in the region where they operate. Finally, the implementation of the GS project activity has not represented (and it is not expected to represent) any incentive or driver for involved municipalities, any other public entity or any other relevant recycling practitioner for the promotion of changes in policies and practices related to recycling of inert or organic solid waste in the region of influence of the JP landfill (or even beyond such region). No change in this sense is expected to occur during the 1st GS 5-year crediting period of the project activity either.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	As outlined in Sections B.4 and B.6.1, so far, there are still no legal restrictions or requirements for LFG gas collection and its destruction using high temperature enclosed flare(s) and/or any other device/equipment in Brazil. Moreover, there are still no legal restrictions neither requirement for venting and/or combustion of LFG in conventional passive LFG destruction systems either (where combustion of small and not defined share of generated LFG through use of conventional passive LFG venting/combustion drains is identified as the baseline scenario for the project activity). There are no applicable regulations that deal with LFG management in Brazil at all. Thus, the implementation of appropriate and environmentally safe management of LFG at the JP landfill has not represented (and it is not expected to represent) any driver or incentive to dispose incremental amount of MSW in the JP landfill (when compared to the situation that would occur in the absence of the project) either. Thus, under no circumstance, the GS project activity is expected to promote any displacement of volumes of organic waste stream from treatment/utilization being performed in

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
	an existent or hypothetical MSW recycling/utilization facilities in order to be disposed at the JP landfill as a direct result of the implementation of the project activity. Therefore condition (d) is also satisfied.
<i>“The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is</i> <i>(a) Atmospheric release of LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and</i> <i>(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> <i>(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or</i> <i>(ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary.”</i>	As further demonstrated in Section B.4, the baseline scenario for methane emissions at the JP landfill remains being the release of LFG from the SWDS directly into the atmosphere and through pre-project passive LFG venting/combustion drains (with only a small and not defined share of generated LFG share of generated LFG being destroyed). The application of the procedure to identify the baseline scenario thus falls into (a). While the project design does encompass utilization of LFG as gaseous fuel for electricity generation, (b-i) is thus also applicable. While the JP landfill does not represent a Greenfield SWDS, (d) is not applicable.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
(c) <i>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.</i> (d) <i>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.</i>	
Non applicability conditions	Justification
<i>"This methodology is not applicable:</i> (a) <i>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;</i> (b) <i>If the management of the SWDS in the project activity is deliberately changed in order to increase</i>	Neither option (a) or (b) occur. The only GHG emission reductions claimed by the GS project activity are due to destruction of LFG (rich in methane) through combustion (in high temperature enclosed flare(s)) and utilization of LFG as gaseous fuel for electricity generation in the project's electricity generation infrastructure (thus displacing electricity that would be otherwise generated in existent electricity generation facilities connected to the grid and/or addition of new power generation sources).

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 19.0)	Justification
<i>methane generation compared to the situation prior to the implementation of the project activity.</i>	After the occurred implementation of the project activity under the CDM, the landfill operator has continued with MSW disposal activities at the JP landfill as per its normal and previously planned/defined operational conditions and practices (as per practices, technics and routines defined prior to the implementation of the GS project activity). MSW disposal practices and management at the JP landfill has not changed during the currently expired 1st and 2nd crediting periods of the project activity and are not expected to change during its 1st GS crediting period either¹¹. The quoted applicability condition is thus satisfactorily met.

Regarding the applied CDM methodological tools, the tables below summarize how the project activity meets their applicability conditions:

¹¹ The operation of the JP landfill in terms of disposal of MSW (practices of waste disposal, covering, levelling, compacting, leachate management, etc.) is not expected to change after the implementation of the project activity within its 1st GS 5-year crediting period either. There is no valid action promoting increase in methane generation (like e.g. through addition of liquids, pre-treating waste, changing the shape of the landfill) that would be triggered or promoted by the implementation of the project activity at the JP landfill (when compared to the situation prior to the occurred registration of the project activity under the CDM and/or its implementation).

Applicability conditions of the tool "Project emissions from flaring" (version 04.0)	Comments
<i>"This tool provides procedures to calculate project emissions from flaring of a residual gas, where the component with the highest concentration is methane. The source of the residual gas is biogenic (e.g. landfill gas or biogas from wastewater treatment) or coal mine methane.</i> <i>(...)</i> <i>This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the CDM-PDD the type of flare used in the project activity.</i> <i>This tool is applicable to the flaring of flammable greenhouse gases where:</i> <i>(a) Methane is the component with the highest concentration in the flammable residual gas; and</i> <i>(b) The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).</i> <i>The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. For the case of an enclosed flare, there shall be operating</i>	As part of the GS project activity, collected LFG (whose component with the highest concentration is methane) is combusted in high temperature enclosed flare(s). ACM0001 (version 19.0) requires that, as part of the determination of baseline emissions, project emissions from flaring are to be determined. LFG is a flammable gas generated from the anaerobic decomposition of organic waste material disposed in the JP landfill. LFG is thus a gas from a biogenic source. Methane is the component with the highest concentration in LFG. No auxiliary fuel is required to make the flammability of LFG sufficient enough to be combusted in the project flare. As demonstrated below, the applicability conditions for the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" are sufficiently met. Thus, the quoted applicability conditions defined in the methodological tool are sufficiently met.

<i>specifications provided by the manufacturer of the flare.</i> <i>This methodological tool refers to the latest approved version of "TOOL08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream".</i>	
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Applicability conditions of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)	Comments
<i>"This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity, and procedures to monitor the amount of electricity generated by the project power plant.</i> <i>(...)</i> <i>If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:</i> <i>(a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to</i>	As established by ACM0001 (version 19.0), consumption of electricity by the GS project activity is to be accounted as project emissions. Furthermore, generated electricity is to be accounted for the determination of baseline emissions. Electricity demand of the GS project activity is expected to be met through imports of grid-sourced electricity, electricity sourced by the project's electricity generation infrastructure or electricity sourced by a backup diesel generator. Thus, Scenario C of the tool is applicable. In summary, the quoted applicability criteria defined in the methodological tool are sufficiently met.

<i>provide electricity to the electricity consumer;</i> <i>(b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or</i> <i>(c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid."</i>	
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Applicability conditions of the tool "Emissions from solid waste disposal sites" (version 08.0)	Comments
<i>"This tool provides procedures to calculate baseline, project or leakage emissions of methane from solid waste disposed or prevented from disposal at a solid waste disposal site (SWDS)."</i> <i>"The tool can be used to determine emissions for the following types of applications:</i> <i>(a) Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or combusting the methane (e.g., "ACM0001: Flaring or use of landfill gas"). The methane is generated from waste disposed in the past, including prior to the start of the CDM project activity. In these cases, the tool is only applied for an ex ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g. measuring the amount of methane captured from the SWDS);</i> <i>(b) Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. An example of this application of the tool is ACM0022, in which municipal solid waste (MSW) is treated with an alternative option, such as composting or</i>	The GS project activity mitigates methane emissions from a landfill as one of its GHG abatement measures. The applicability of the methodological tool is thus met. Application A in the methodological tool is selected and applied in the context of calculations of ex-ante estimates of emission reductions to be achieved by the project activity during its 1st GS 5-year crediting period as established by ACM0001 (version 19.0). Thus, the quoted applicability criteria defined in the methodological tool are sufficiently met.

<i>anaerobic digestion, and is then prevented from being disposed of in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions.</i>	
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Applicability conditions of the "Tool to calculate the emission factor for an electricity system" (version 07.0)	Comments
<i>This methodological tool determines the CO₂ emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "combined margin" emission factor (CM) of the electricity system.</i> (...) <i>The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the "operating margin" (OM) and the "build margin" (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CDM project activity.</i>	Project emissions due to the consumption of electricity by the GS project activity and baseline emissions for electricity generation are both determined by applying applicable guidance of methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (of which ACM0001 version 19.0 refers to). The methodological tool "Tool to calculate the emission factor for an electric system" is referred to in the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" for the purpose of calculating project emissions in case where a GS project activity consumes electricity from the grid.

(...) <i>This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).</i> (...) <i>In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country."</i>	The CO₂ emission factor for the electricity grid which sources electricity to the project activity is determined as the combined margin CO₂ emission factor¹². The electricity grid (to which the project activity is connected) is not located partially or totally in an Annex I country. The relevant applicability conditions of the methodological tool are thus fully met.
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Applicability conditions of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)	Comments
<i>"Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions, which is the case of the present project activity"</i>	As established by ACM0001 (version 19.0), this tool is applied as per the methodology for determining the mass flow of CH₄ which is sent to the project's methane destruction devices (flare(s) and engines).

¹² The CDM Designated National Authority (DNA) of Brazil has regularly calculated and reported values for the CO₂ emission factor of the National Electricity Grid of Brazil. Such values are reported as being determined/calculated through application of the CDM methodological tool "Tool to calculate the emission factor for an electricity system" (version 07.0 and previous versions).

	The applicability condition of the methodological tool is thus met.
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Applicability conditions of the tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.1)	Comments
<i>"This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism."</i>	As per applicable CDM rules, as part of the process for the transition request of the GS project activity, it is required to assess the continued validity of the baseline and to update the baseline. ACM0001 (version 19.0) refers to the tool. The applicability conditions of the methodological tool are thus met.

Applicability conditions of the tool "Positive lists of technologies" (version 04.0)	Comments
<i>"This methodological tool contains lists of technologies and associated conditions that confer automatic additionality to CDM project activities and CDM PoAs that apply such technologies and meet specified conditions (hereinafter referred to as positive lists).</i> <i>The methodological tool specifies the validity, process for update and timelines for the update of the positive list (see appendix of this document).</i> <i>The use of this methodological tool is not mandatory for the project participants of a CDM project activity or CDM PoA for demonstrating their additionality.</i> <i>This methodological tool shall be applied in conjunction with a small-scale or large-scale methodology which refers to this tool."</i>	The applied CDM baseline and monitoring methodology ACM0001 (version 19.0) defines that project proponents for the proposed GS project activity may apply the Simplified procedures (as described in section 5.3.1 of the referred methodology) for both the identification of baseline scenario and assessment and demonstration of additionality of the GS project activity. In this case, as also defined by ACM0001 (version 19.0), applicable guidance from the methodological tool "Positive lists of technologies" (version 4.0) is therefore directly applied for the identification of the baseline scenario. Among the technologies listed in the referred

	methodological tool, the following is applicable to this project activity: <i>"Landfill gas recovery and its gainful use The project activities and PoAs at new or existing landfills (greenfield or brownfield) are deemed automatically additional, if it is demonstrated that prior to the occurred implementation of the project activities and PoAs the landfill gas (LFG) was only vented and/or flared (in the case of brownfield projects) or would have been only vented and/or flared (in the case of greenfield projects) but not utilized for energy generation, and that under the project activities and PoAs any of the following conditions are met:</i> <i>(a) The LFG is used to generate electricity in one or several power plants with a total nameplate capacity that equals or is below 10 MW;</i> <i>(b) The LFG is used to generate heat for internal or external consumption;</i> <i>(c) The LFG is flared."</i> While the above-summarized conditions are met by the GS project activity, the applicability conditions of the methodological tool are thus met.
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B.3. Project boundary

>> Leave this section blank if there is no change in registered PDD.

Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1	CO ₂	
		CH ₄	
		N ₂ O	
		...	
	Source 2	CO ₂	
		CH ₄	
		N ₂ O	
		...	
	...	...	
		...	
		...	
		...	
Project scenario	Source 1	CO ₂	
		CH ₄	
		N ₂ O	
		...	
	Source 2	CO ₂	
		CH ₄	
		N ₂ O	
		...	
	...	...	
		...	
		...	
		...	

B.4. Establishment and description of baseline scenario

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This Section includes the application of the stepwise approach of the latest version of methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.1) in order to confirm the validity of the previously identified baseline scenario for the GS project activity within its 1st GS crediting period.

Application of the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period":

As per applicable guidance of the CDM project cycle procedure for project activities (CDM-PCP-PA) and GS4GG related documents, the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (hereinafter referred to as "baseline validity tool") is to be applied in order to confirm the validity of the previously determined baseline scenario of the GS project activity.

Step 1 (of the "baseline validity tool"): Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

Prior to the registration and implementation of the project as a CDM project activity, there was indeed no legal obligation to capture and destroy/utilize LFG (by using active (forced) collection systems and high temperature enclosed flare(s), engines and/or any other methane destruction devices) at the JP landfill and/or in any other existing (under operation or not) landfills in Brazil. This situation currently remains prevailing¹³.

¹³ Currently, there are still no legal requirements for LFG gas collection and its destruction using active or passive high temperature enclosed flares in Solid Waste Disposals Sites (SWDS's) in Brazil (from open waste dumpsites to well-managed landfills). Moreover, there are still no legal restrictions neither legal requirement for passive venting of LFG or combustion of LFG in conventional LFG destruction systems (e.g. passive flares) valid for SWDS's located in the country either. There are still no applicable regulations that deals with LFG management in Brazil.

The Brazilian National Policy on Waste Management:

After years of studies and negotiations, the Brazilian Regulation termed National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree) was finally published on 23/12/2010. In force since its publication and with no modifications/complementation since its issuance, this decree regulates the National Policy on Waste Management (PNRS) as established by Federal Law No. 12,305 (the LPNRS) and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. This Brazilian Regulation of the National Policy on Waste Management does not establish any requirement, obligation or recommendation related to LFG management at landfills in Brazil. The following is pointed out by the law firm "Tauil & Chequer Advogados" about the *Regulation of the National Policy on Waste Management* in an article published in year 2011:

"(...) The Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on December 23, 2010. In force since its publication, the Decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. The main purpose of the PNRS Interministerial Committee is to support the PNRS structuring and implementation, in order to enable the accomplishment of the provisions and goals set forth by the LPNRS. The Steering Committee has the basic function of guiding the implementation of reverse logistics. Among the instruments regulated by the Decree are the Reverse Logistics Systems, the Waste Management Plans (PGRS) and the National Registry for Hazardous Waste Operators. The Decree lists three specific instruments for the implementation and operation of the reverse logistic systems: (i) sectorial agreements, executed between public authorities and the industry; (ii) regulations, issued by the executive branch; and (iii) commitment agreements—which are to be adopted in the absence of sectorial agreements and regulations and when specific circumstances require more restrictive obligations—to be approved by the competent environmental agency. Regarding the obligation to prepare a PGRS, which should be required within environmental permitting proceedings, the Decree mentions the possibility of jointly submitting the PGRS under specific conditions and in cases where activities are conducted in the same condominium, municipality, micro-region or metropolitan/urban areas. Additionally, the Decree establishes that small companies that generate household waste, as provided for by article 30 of the LPNRS, are not required to submit a PGRS. Regarding the National Registry for Hazardous Waste Operators, which must be integrated to the already existing Federal Technical Registry of IBAMA, the Decree establishes a registration obligation for companies that manipulate or operate hazardous waste. The Decree also describes those who are considered generators or operators of hazardous waste, establishing several requirements for their authorization or permitting. These include the preparation of hazardous waste management plan, the demonstration of technical and economic capacity and the obtaining of civil liability insurance for environmental damages." [SIC]

The Brazilian Solid Waste Plan (recently published in April/2022):

After years of further studies and negotiations, the Brazilian Solid Waste Plan (Plano Nacional de Resíduos Sólidos - "PLANARES"), established by Decree No. 11,043/2022 (the Decree) was finally published

The demonstration of continuation of the previously derived baseline scenario for the GS project activity (in terms of both methane emissions and electricity generation) is thus under full compliance with existing/valid applicable mandatory national, regional and/or sectorial policies and requirements.

in on 14/04/2022. In force since its publication, this decree regulates the previously established National Policy on Waste Management (PNRS) as established by Federal Law No. 12,305 (the LPNRS), proposes guidelines and strategies for waste management in the country. Like previously occurred with the National Policy on Waste Management (PNRS), the Brazilian Solid Waste Plan (PLANARES) does not establish any requirement, obligation or recommendation related to LFG management at landfills in Brazil.

The following is pointed out by the law firm "Tauil & Chequer Advogados" about the regulation of the year 2022 Brazilian Solid Waste Plan (PLANARES) in an article published in April/2022:

"On April 14, 2022, Decree No. 11,043 was issued by Brazilian government, approving the Brazilian Solid Waste Plan (Plano Nacional de Resíduos Sólidos - "Planares"). Planares is provided in Federal Law No. 12,305/2010, which instituted the Brazilian Solid Waste Policy (Política Nacional de Resíduos Sólidos - "PNRS") and had been submitted for public consultation by the Ministry of the Environment.

Awaited by society for more than a decade, Planares aims to guide the management of solid waste nationally and over a 20-year horizon, taking into consideration (i) an analysis of waste generated in Brazil, (ii) the expected scenarios for managing different types of waste (based on national, international and macroeconomic trends), (iii) the applicable targets for managing different types of waste, (iv) the guidelines and strategies proposed to enable environmentally sound solid waste management, (v) the programs and actions for adequate solid waste management, (vi) the norms and technical conditions to enable access to government-funded resources, (vii) the norms and guidelines for the adequate final disposal of tailings (or residues, when applicable) and (viii) the means of control and inspection to implement and operationalize environmentally sound solid waste management. Planares provides important management instruments, such as the national inventory of solid waste (which must be recorded by companies) and the Waste Transport Manifest (MTR), which aim at tracking and controlling the process for proper solid waste management. The plan presents objectives, including goals related to expanding the collection of urban solid waste, maximizing the recovery of materials, the energetic use of waste, the environmentally sound final disposal of waste, the closure of dumps and controlled landfills, the implementation of charges by municipalities related to solid waste management services, the progressive increase of solid waste mass recovery nationally, the formalization of contracts between municipalities and collector associations, and the implementation of initiatives for recovering organic waste."

Step 1.2: Assess the impact of circumstances

The previously identified baseline scenario for emissions of methane at JP landfill and baseline scenario for electricity generation are not changed for the transition request under the GS4GG.

Since the baseline scenario for emissions of methane and electricity generation at the JP landfill represent the continuation of the pre-project practice and electricity generation occurring in existent grid-connected electricity generation sources (and addition of new power generation sources) without any investment, an assessment of the changes in market characteristics was thus required for the renewal of the crediting period. This is required by the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period".

As an outcome of such analysis, it is confirmed the following:

- The conditions and circumstances previously considered or taken into account to determine the baseline emissions of methane and electricity generation at the JP landfill in the previously 3rd CDM crediting period remain being valid.
- LFG (rich in CH₄) generated at the JP landfill would still be unutilized and would be freely emitted into the atmosphere with only a small share of generated LFG being combusted in the pre-project conventional passive LFG venting/combustion drains in the absence of the GS project activity.
- There are no changes in market or regulatory characteristics/aspects (incl. 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 emissions of methane at the JP landfill for the 1st GS crediting period of the GS 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.

Since the baseline scenario identified at the previously performed validation stage of the project activity was not selected at that time 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*”, this step is thus not applicable in the context of determination of baseline for emissions of methane.

Step 1.4: Assessment of the validity of the data and parameters

While the registered version of the CDM PDD valid for the 3rd CDM crediting period applies the CDM baseline and monitoring methodology ACM0001 (version 19.0), the ex-ante selected data and parameters as per the registered version of the CDM PDD for the 3rd CDM crediting period are still valid.

As a conclusion, since (i) the demonstration of validity of the previously derived baseline scenario, (ii) determination of baseline emissions of methane for the 1st GS crediting period and (iii) ex-ante determined parameters and default values are all determined as per ACM0001 (version 19.0) + applicable methodological tools, the validity of most of the previously defined ex-ante determined parameters is thus limited for the project activity.

The methodological approaches for the demonstration of validity of the previously derived baseline scenario, baseline emissions, ex-ante determined parameters and monitored parameters for the project activity are all presented and justified in this Section, Section B.6.1, Section B.6.2 and Section B.7.1 + B.7.3 respectively.

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

Step 2.1: Update the current baseline

The baseline scenario for the GS project activity is not changed for its 1st GS crediting period (when compared to the baseline scenario assumed for the currently expired 1st and 2nd CDM crediting periods and also the 3rd CDM crediting period). Anyhow, for completeness reasons, this section includes the whole determination of the baseline scenario for the GS project activity as per the applicable guidance and requirements and of ACM0001 (version 19.0).

The applied CDM baseline and monitoring methodology ACM0001 (version 19.0) defines that project participant may either apply the Simplified procedures (as described in section 5.3.1 of the referred methodology) or the provisions from the CDM methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (as described in section 5.3.2 of the same methodology) for both the identification of its baseline scenario and assessment and demonstration of additionality of the GS project activity.

As described in the latest version of the CDM PDD valid for the 3rd CDM crediting period, the use of simplified procedures was previously selected for the project activity. In this case, applicable guidance from the methodological tool "Positive lists of technologies" (version 4.0) is therefore directly applied for the identification of the baseline scenario. Among the technologies listed in the referred CDM methodological tool, the following is applicable to this GS project activity:

"Landfill gas recovery and its gainful use

The project activities and PoAs at new or existing landfills (greenfield or brownfield) are deemed automatically additional, if it is demonstrated that prior to the occurred implementation of the project activities and PoAs the landfill gas (LFG) was only vented and/or flared (in the case of brownfield projects) or would have been only vented and/or flared (in the case of greenfield projects) but not utilized for energy generation, and that under the project activities and PoAs any of the following conditions are met:

- (a) The LFG is used to generate electricity in one or several power plants with a total nameplate capacity that equals or is below 10 MW;*
- (b) The LFG is used to generate heat for internal or external consumption;*
- (c) The LFG is flared.”*

For the identification of baseline scenario of the GS project activity, the following is valid/applicable:

- Prior to the occurred implementation and starting of operations of the project activity, largest share of generated LFG was vented with a minor share being destroyed through flaring for safety and odor concerns, or for other reasons, with no utilization of LFG for energy generation therefore occurring.
- The project activity encompasses collection of LFG, flaring of collected LFG in high temperature enclosed flare(s) and utilization of collected LFG as gaseous fuel for electricity generation (with the project’s electricity generation infrastructure having total combined nameplate installed capacity below 10 MW).

Thus, the GS project activity fully meets the applicable requisites from both the methodological tool “Positive lists of technologies” and the Simplified procedures (as described in section 5.3.1 of ACM0001 (version 19.0)) and the GS project activity is therefore automatically regarded as additional. Under such circumstance the following is automatically defined for the project activity in terms of definition of its baseline scenario:

In accordance with ACM0001 (version 19.0) paragraphs 21, 22 and 23, the baseline scenario for methane emissions for the project activity is directly identified as the atmospheric release of generated LFG (with minor share of generated LFG being eventually captured and vented to comply with applicable regulatory or contractual requirements to address safety and odor concerns, or for other reasons).

Furthermore, the baseline scenario for electricity generation is directly identified as electricity generation (in the same amount as the amount

generated by the project activity) occurring in existing electricity generation sources and addition of new power generation sources connected to the electricity grid the project activity is connected to (i.e. National Electricity Grid of Brazil).

Step 2.2: Update the data and parameters

All applicable and required ex-ante determined parameters valid for the 1st GS 5-year crediting period of the GS project activity are presented in Sections B.6.1 and B.6.2.

While some of the ex-ante determined parameters are applied only in the context of ex-ante estimations of emission reductions along 1st GS 5-year crediting period of the GS project activity, other ex-ante determined parameters will however be used for the calculation/determination of emission reductions in an ex-post basis (in conjunction with parameters determined ex-post) along the 1st GS 5-year crediting period of the GS project activity.

Furthermore, as also outlined in Section B.6.2, the value for the Global Warming Potential (GWP) for the GHG methane has changed for the 1st GS 5-year crediting period (when compared to the value previously applied during the 3rd CDM crediting period). The applied revised value for the ex-ante determined parameter GWP_{CH_4} is in accordance with the CDM-EB mandate requiring the application of the lowest global warming potential value from the second, fourth and fifth IPCC assessment reports for each greenhouse gas for a 100-year time

horizon as established in the CDM document "Clarification - Regulatory requirements under temporary measures for post-2020 cases" (version 01.1) ¹⁴.

B.5. Demonstration of additionality

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Specify the methodology, activity requirement or product requirement that establishes deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	It is crucial to consider that the simplified procedure to identify the baseline scenario and demonstrate additionality of ACM0001 (version 19.0) remains being considered for the GS project activity. As per such simplified procedure, the additionality of the project activity is demonstrated as follows: "The following types of project activities at new or existing landfills (greenfield or brownfield) are deemed automatically additional, if prior to the implementation of the project activity the LFG was or would have been only vented and/or flared but not utilized for energy generation:
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¹⁴ As outlined in Section B.6.2, the applied value for the ex-ante determined parameter GWP_{CH_4} represents the lowest value from the Intergovernmental Panel on Climate Change (IPCC) assessment reports for CH_4 for a 100-year time horizon as per "Appendix 1 - Global warming potential values under the temporary measures" of the CDM document "Clarification - Regulatory requirements under temporary measures for post-2020 cases" (version 01.1). Applied values represent the GWP value for the GHG CH_4 as per the IPCC fifth assessment report (AR5) and IPCC fourth assessment report (AR4).

	(a) The LFG is used to generate electricity in one or several power plants with a total nameplate capacity that equals or is below 10 MW; (b) The LFG is used to generate heat for internal or external consumption; (c) The LFG is flared.”
Describe how the proposed project meets the criteria for deemed additionality.	In summary, regardless of the demonstration of additionality is not applicable/required for the transition to GS4GG of a registered CDM project activity, just by taking into account the continuation of the simplified procedure to identify the baseline scenario and demonstrate additionality of ACM0001 (version 19.0) in the context of the demonstration of the validity of the previously derived baseline scenario, the project activity is thus automatically/directly assumed as additional since types a) and c) mentioned above applies for this GS project activity in the context of the transition request under the GS4GG.

B.5.1 Prior Consideration

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N/A

B.5.2 Ongoing Financial Need

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Not applicable. In accordance with the GS4GG "Guide to completing the PDD", "(..) This information need only be included at Design Certification Renewal (...)"

B.6. Sustainable Development Goals (SDG) outcomes

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Relevant Target/Indicator for each of the three SDGs

Sustainable Development Goals Targeted	Most relevant SDG Target	SDG Impact
		Indicator (Proposed or SDG Indicator)
13 Climate Action (mandatory)	13.2: Integrate climate change measures into national policies, strategies and planning	SDG Impact: Reduction in GHGs emissions Indicator: Amount of GHG emissions avoided or sequestered
7 Affordable and Clean Energy	7.2: By 2030, increase substantially the share of renewable energy in the global energy mix	SDG Impact: Renewable energy generation Indicator: Total electricity produced: Renewable
8 Decent work and Economic Growth	8.5 By 2030, achieve full and productive employment for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	SDG Impact: Increased employment opportunities Indicator: Total number of jobs

B.6.1 Explanation of methodological choices/approaches for estimating the SDG Impact

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7 Access to affordable, reliable, sustainable and modern energy for all:

High Positive Impact: The GS project activity is a renewable energy and will displace fossil-generated power. This will increase the share of renewable energy in the energy mix. According to International Energy Agency statistics (IEA, 2020)¹⁵, coal and natural gas are still dominant sources of electricity generation, with 60% a share.

8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work:

High Positive Impact: The project will create employment opportunities. These job opportunities will require both highly qualified and low qualified people. As a general principle, employment recruitments will be made mostly from the nearby regions and municipalities, especially for the labor-intensive jobs.

13 Climate Action:

High Positive Impact: The GS project activity will result in CO₂ emission reduction by displacing fossil power generation with renewable power generation and avoidance of methane.

The emission reductions resulting from the GS project activity are calculated according to the ACM0001 "Flaring or Use of Landfill Gas" (version 19.0) and applicable tools. The calculation approaches for baseline emissions, project emissions and emission reductions are explained below:

¹⁵ <https://www.iea.org/fuels-and-technologies/electricity>

Baseline emission calculation

In accordance with ACM0001 (version 19.0) and applicable methodological tools, emission reductions (ER_y) to be achieved by the project activity during its 1st GS crediting period are to be determined (in tCO₂e) as the difference between baseline emissions (BE_y) and project emissions (PE_y) as follows:

$$ER_y = BE_y - PE_y \quad (0)$$

Where:

BE_y Baseline emissions in year y (in tCO₂e/yr)

PE_y Project emissions in year y (in tCO₂e/yr)

Determination of Baseline Emissions (BE_y):

As per ACM0001 (version 19.0), baseline emissions (BE_y) for a GS project activity promoting LFG collection and destruction/utilization are to be determined according to equation (1) and comprises the following potential generic emission sources:

- a) Baseline methane emissions from the SWDS¹⁶ in the absence of the project activity
- b) Baseline emissions for electricity generation using fossil fuels or supplied by the grid in the absence of the project activity
- c) Baseline emission for heat generation using fossil fuels in the absence of the project activity
- d) Baseline emissions for natural gas use from existing natural gas network in the absence of the project activity

$$BE_y = BE_{CH_4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y} \quad (1)$$

¹⁶ As established by the methodological tool "Emissions from solid waste disposal sites", "SWDS" refers to Solid Waste Disposal Site.

Where:

BE_y	Baseline emissions in year y (in tCO_2e/yr)
$BE_{CH_4,y}$	Baseline emissions of methane from the SWDS in year y (in tCO_2e/yr)
$BE_{EC,y}$	Baseline emissions associated with electricity generation in year y (in tCO_2e/yr)
$BE_{HG,y}$	Baseline emissions associated with heat generation in year y (in tCO_2e/yr)
$BE_{NG,y}$	Baseline emissions associated with natural gas use in year y (in tCO_2e/yr)

As per the project design, no collected LFG is currently expected to be used as gaseous fuel for heat generation purposes; and no LFG to be collected by the GS project activity is expected to be injected in a natural gas distribution pipeline or even displace/complement the use of natural gas either.

Due to that, $BE_{HG,y}$ and $BE_{NG,y}$ are not applicable in the context of the determination of baseline emissions for the project activity during its 1st GS crediting period and are thus regarded as null.

Thus, the determination approach for baseline emissions is summarized as follows:

$$BE_y = BE_{CH_4,y} + BE_{EC,y} \quad (2)$$

Baseline methane emissions ($BE_{CH_4,y}$) is calculated in conformance with ACM0001 (version 19.0) + applicable methodological tools respectively by following the approaches presented below:

Baseline emissions of methane from the SWDS ($BE_{CH_4,y}$)

Baseline methane emissions from the anaerobic waste decomposition in the considered SWDS ($BE_{CH_4,y}$) are determined (in tCO_2e/yr) as per the formula presented below. The determination of $BE_{CH_4,y}$ is based on the amount of methane that is actually captured and combusted by the project activity and also by taking into account the amount of methane that would be captured and destroyed in the landfill in the baseline scenario.

In addition, the effect of methane oxidation (that is assumed as existing in the baseline and not in the project scenario) is also taken into account as also required by ACM0001 (version 19.0).

$$BE_{CH_4,y} = ((1 - OX_{top_layer}) * F_{CH_4,PJ,y} - F_{CH_4,BL,y}) * GWP_{CH_4} \quad (3)$$

Where:

OX_{top_layer}	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario (dimensionless)
$F_{CH_4,PJ,y}$	Amount of methane which is destroyed by the project activity through combustion of collected LFG in project's methane destruction devices in year y (in tCH_4/yr)
$F_{CH_4,BL,y}$	Amount of methane that would be destroyed through flaring of LFG in the baseline scenario (absence of project activity) in year y (in tCH_4/yr)
GWP_{CH_4}	Global warming potential of CH_4 (in tCO_2e/tCH_4)

Ex post determination of $F_{CH_4,PJ,y}$

As per ACM0001 (version 19.0), the amount of methane which is destroyed by the GS project activity through combustion of collected LFG in the project's methane destruction devices (in tCH_4/yr) is to be ex-post determined as the sum of quantities of methane destroyed through combustion of collected LFG in flare(s), power plant(s), boiler(s), air heater(s), glass melting furnace(s), kiln(s) and/or by supply of collected LFG to consumer(s) through natural gas distribution network based on ex-post measurements, as follows:

$$F_{CH_4,PJ,y} = F_{CH_4,flared,y} + F_{CH_4,EL,y} + F_{CH_4,HG,y} + F_{CH_4,NG,y} \quad (4)$$

Where:

$F_{CH_4,flared,y}$	Amount of methane which is destroyed through combustion of collected LFG in the flare(s) in year y (in tCH_4).
$F_{CH_4,EL,y}$	Amount of methane which is used for electricity generation in year y (in tCH_4).
$F_{CH_4,HG,y}$	Amount of methane which is destroyed through combustion of collected LFG in heat generation device(s) in year y (in tCH_4/yr). The project design currently does not encompass combustion of collected LFG in heat generation device(s). Thus, $F_{CH_4,HG,y}$ is assumed as null (zero).

$F_{CH_4,NG,y}$ Amount of methane which is destroyed by supply of collected LFG to consumer(s) through natural gas distribution network in year y (in tCH_4/yr). The project design currently does not encompass supply of collected LFG to consumer(s) through natural gas distribution network. Thus, $F_{CH_4,NG,y}$ is assumed as null (zero).

In summary, by taking into account the design of the GS project activity, the amount of methane which is destroyed by the project activity through combustion/utilization of collected LFG in project's methane destruction devices will be ex-post determined as follows:

$$F_{CH_4,PJ,y} = F_{CH_4,flared,y} + F_{CH_4,EL,y} \quad (5)$$

Determination of the amount of methane which is destroyed through combustion of collected LFG in the flare(s) ($F_{CH_4,flared,y}$)

For each individual flare, $F_{CH_4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any methane emissions from the flare(s), as follows:

$$F_{CH_4,flared,y} = F_{CH_4,sent_flare,y} - \frac{PE_{flare,y}}{GWP_{CH_4}} \quad (6)$$

Where:

$F_{CH_4,flared,y}$	Amount of methane which is destroyed through combustion of collected LFG in the flare(s) in year y (in tCH_4/yr)
$F_{CH_4,sent_flare,y}$	Amount of methane in collected LFG which is sent to the flare(s) 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)
GWP_{CH_4}	Global warming potential of CH_4 (in tCO_2e/tCH_4)

$F_{CH_4, sent_flare, y}$ is determined by following applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. As per the ACM0001 (version 19.0), the following requirements apply for the determination of $F_{CH_4, sent_flare, y}$:

- The gaseous stream that shall be considered in the application of the methodological tool is the stream of collected LFG which is sent for combustion in the flare(s)
- CH_4 is the greenhouse gas for which the mass flow is determined
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the methodological tool)
- The mass flow should be calculated at least on an hourly basis for each hour h in year y

Determination of the amount of methane in collected LFG which is used for electricity generation ($F_{CH_4, EL, y}$)

For each engine of the project’s electricity generation infrastructure, $F_{CH_4, EL, y}$ is determined directly using applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” by applying the following requirements defined in ACM0001 (version 19.0):

- The gaseous stream the methodological tool shall be applied to is the stream of collected LFG which is sent to each engine of the project’s electricity generation facility.
- CH_4 is the greenhouse gas for which the mass flow is determined.
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool).
- The mass flow should be calculated on an hourly basis for each hour h in year y .
- The mass flow calculated for hour h is 0 if the engine is not working in hour h ($Op_{j, h}$ = equipment not working), the accumulated hourly values are then summed to a yearly unit basis.

Applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” will be applied ex-post to determine $F_{CH_4, sent_flare, y}$ and $F_{CH_4, EL, y}$ ¹⁷ by using one of the options of the tool (Option A, B, C or D).

The selection of the determination option will depend on project conditions and monitoring instruments under operation during monitoring periods within the 1st GS crediting period.

Use of Option A, B, C or D for the determination of $F_{CH_4, sent_flare, y}$ and $F_{CH_4, EL, y}$:

Option	Flow of gaseous stream	Volumetric fraction
A	Volume flow dry basis	Dry or wet basis ¹⁸
B	Volume flow wet basis	Dry basis
C	Volume flow wet basis	Wet basis
D	Mass flow dry basis	Dry or wet basis

Option A:

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

- Measure the moisture content of the gaseous stream ($C_{H_2O, t, db, n}$) and demonstrate that this is less or equal to 0.05 kg H₂O/m³ dry gas; or
- Demonstrate that the temperature of the gaseous stream (T_t) is less

¹⁷ In the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” , the mass flow of greenhouse gas in a gaseous stream (which in the particular case of the project activity are the amount of methane in collected LFG which is sent to the flare(s) ($F_{CH_4, sent_flare, y}$) and amount of methane which is used for electricity generation ($F_{CH_4, EL, y}$) is actually represented as $F_{i, t}$.

¹⁸ Flow measurement on a dry basis is not feasible at reasonable costs for a wet gaseous stream, so there will be no difference in the readings for volumetric fraction in wet basis analyzers and dry basis analyzers and both types can be used indistinctly for calculation Options A and D.

than 60°C (333.15 K) at the flow measurement point.

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the corresponding option from the table above should be applied instead.

The mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t} \quad (7)$$

with

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t} \quad (8)$$

Where:

- $F_{i,t}$ Mass flow of greenhouse gas i in the gaseous stream in time interval t (in kg gas/h)
- $V_{t,db}$ Volumetric flow of the gaseous stream in time interval t on a dry basis at normal conditions (in m³ dry gas/h)
- $v_{i,t,db}$ Volumetric fraction of greenhouse gas i in the gaseous stream in time interval t on a dry basis (in m³ gas i /m³ dry gas)
- $\rho_{i,t}$ Density of greenhouse gas i in the gaseous stream (in kg gas i /m³ gas i)
- P_t Absolute pressure of the gaseous stream in time interval t (in Pa)
- MM_i Molecular mass of greenhouse gas i (in kg/kmol)
- R_u Universal ideal gases constant (in Pa.m³/kmol.K)
- T_t Temperature of the gaseous stream in time interval t (in K)

Option B:

The mass flow of greenhouse gas i ($F_{i,t}$) is determined using equations (7) and (8). The volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) is determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,db} = V_{t,wb} / (1 + v_{H_2O,t,db}) \quad (9)$$

Where:

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

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

$v_{H_2O,t,db}$ 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)

The volumetric fraction of H_2O in time interval t on a dry basis ($v_{H_2O,t,db}$) is estimated according to the following equation:

$$v_{H_2O,t,db} = \frac{m_{H_2O,t,db} * MM_{t,db}}{MM_{H_2O}} \quad (10)$$

Where:

$v_{H_2O,t,db}$ 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)

$m_{H_2O,t,db}$ 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_{H_2O} Molecular mass of H_2O (in kg H_2O /kmol H_2O)

In case this Option is selected, the absolute humidity of the gaseous stream ($m_{H_2O,t,db}$) will be determined using Option 2 specified below under “*Determination of the absolute humidity of the gaseous stream*” and the molecular mass of the gaseous stream ($MM_{t,db}$) will be determined using the following equation:

$$MM_{t,db} = \sum_k (v_{k,t,db} * MM_k) \quad (11)$$

Where:

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

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

The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. Simplification is not acceptable if it is differently specified in the underlying methodology.

Option C:

The mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,wb,n} * v_{i,t,wb} * \rho_{i,n} \quad (12)$$

with

$$\rho_{i,n} = \frac{P_n * MM_i}{R_u * T_n} \quad (13)$$

Where:

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

$V_{t,wb,n}$	Volumetric flow of the gaseous stream in time interval t on a wet basis at normal conditions (in m ³ wet gas/h)
$V_{i,t,wb}$	Volumetric fraction of greenhouse gas i in the gaseous stream in time interval t on a wet basis (in m ³ gas i /m ³ wet gas)
$\rho_{i,n}$	Density of greenhouse gas i in the gaseous stream at normal conditions (in kg gas i /m ³ wet gas i)
P_n	Absolute pressure at normal conditions (in Pa)
T_n	Temperature at normal conditions (in K)
MM_i	Molecular mass of greenhouse gas i (in kg/kmol)
R_u	Universal ideal gases constant (in Pa.m ³ /kmol.K)

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

$$V_{t,wb,n} = V_{t,wb} * (T_n/T_t) * (P_t/P_n) \quad (14)$$

Where:

$V_{t,wb,n}$	Volumetric flow of the gaseous stream in a time interval t on a wet basis at normal conditions (in m ³ wet gas/h)
$V_{t,wb}$	Volumetric flow of the gaseous stream in time interval t on a wet basis (in m ³ wet gas/h)
P_t	Pressure of the gaseous stream in time interval t (in Pa)
T_t	Temperature of the gaseous stream in time interval t (in K)
P_n	Absolute pressure at normal conditions (in Pa)
T_n	Temperature at normal conditions (in K)

Option D:

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

- Measure the moisture content of the gaseous stream ($C_{H_2O,t,db,n}$) and

- demonstrate that this is less or equal to 0.05 kg H₂O/m³ dry gas; or
- Demonstrate that the temperature of the gaseous stream (T_t) is less than 60°C (333.15 K) at the flow measurement point.

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the corresponding option from the above table should be applied instead.

The mass flow of greenhouse gas i ($F_{i,t}$) is determined using equations (7) and (8). The volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) is determined by converting the mass flow of the gaseous stream to a volumetric flow as follows:

$$V_{t,db} = M_{t,db} / \rho_{t,db} \quad (15)$$

Where:

- $V_{t,db}$ Volumetric flow of the gaseous stream in time interval t on a dry basis (in m³ dry gas/h)
- $M_{t,db}$ Mass flow of the gaseous stream in time interval t on a dry basis (in kg/h)
- $\rho_{t,db}$ Density of the gaseous stream in time interval t on a dry basis (in kg dry gas/m³ dry gas)

The density of the gaseous stream ($\rho_{t,db}$) should be determined as follows:

$$\rho_{t,db} = \frac{P_t * MM_{t,db}}{R_u * T_t} \quad (16)$$

Where:

- $\rho_{t,db}$ Density of the gaseous stream in a time interval t on a dry basis (in kg dry gas/m³ dry gas)
- P_t Pressure of the gaseous stream in time interval t (in Pa)

T_t	Temperature of the gaseous stream in time interval t (in K)
$MM_{t,db}$	Molecular mass of the gaseous stream in a time interval t on a dry basis (in kg dry gas/kmol dry gas). The molecular mass of the gaseous stream ($MM_{t,db}$) is estimated by using equation (11).

Determination of the absolute humidity of the gaseous stream

The absolute humidity is a parameter required for Options B and E only, thus it will be used only in case Option B is adopted (as Option E is not selected as a measurement option for the project activity). Option 2 of the tool is selected for the GS project activity:

Option 2: Simplified calculation without measurement of the moisture content

This 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 $m_{H_2O,t,db}$ is assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H_2O,t,db}$ is assumed to equal the saturation absolute humidity ($m_{H_2O,t,db,sat}$) and calculated using equation (7).

$$m_{H_2O,t,db,SAT} = \frac{p_{H_2O,t,Sat} * MM_{H_2O}}{(P_t - p_{H_2O,t,Sat}) * MM_{t,db}} \quad (17)$$

Where:

$m_{H_2O,t,db,sat}$	Saturation absolute humidity in time interval t on a dry basis (in kg H ₂ O/kg dry gas)
$p_{H_2O,t,sat}$	Saturation pressure of H ₂ O at temperature T_t in time interval t (in Pa)
T_t	Temperature of the gaseous stream in time interval t (in K)

P_t	Absolute pressure of the gaseous stream in time interval t (in Pa)
MM_{H_2O}	Molecular mass of H_2O (in kg H_2O /kmol H_2O)
$MM_{t,db}$	Molecular mass of the gaseous stream in a time interval t on a dry basis (in kg dry gas/kmol dry gas). $MM_{t,db}$ is estimated by using equation (11).

Determination of $PE_{flare,y}$:

$PE_{flare,y}$ is determined by following applicable guidance of the methodological tool “Project emissions from flaring”. Since share of collected LFG is expected to be combusted in high temperature enclosed flare(s), $PE_{flare,y}$ is thus calculated as the sum of the related emissions for each individual flare (where project emissions from flaring from each one of the flare(s), if applicable, are calculated separately).

For each individual flare, the calculation procedure in the referred methodological tool is applied to determine project emissions from flaring the residual gas ($PE_{flare,y}$) based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare in question ($F_{CH_4,RG,m}$). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

Calculation procedure for the determination of project emissions from flaring is applied as follows under a stepwise approach:

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

STEP 2: Determination of the flare efficiency

STEP 3: Calculation of project emissions from flaring

Step 1: Determination of the methane mass flow in the residual gas:

The methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” shall be used to determine (in kg) the mass flow of methane in the residual gaseous stream in the minute m : $F_{CH_4,m}$.

The following requirements apply for the determination of the mass flow of methane in the gaseous stream in minute m :

- The methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" 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 tool)
- The time interval t for which mass flow should be calculated is every minute m .

$F_{\text{CH}_4,m}$, which is measured as the mass flow during minute m , shall then be used to determine the mass of methane (in kilograms) fed to the flare in question in the minute m ($F_{\text{CH}_4,\text{RG},m}$). $F_{\text{CH}_4,m}$ shall be determined on a dry basis.

Step 2: Determination of flare efficiency:

As required by ACM0001 (version 19.0), the flare efficiency value is to be determined for each installed flare. Also, as per ACM0001 (version 19.0), flare efficiency represents the combustion efficiency of LFG in the flare in terms of CH_4 by also considering the time and condition that the flare in question is operating.

For determining the combustion efficiency for the enclosed flare in question, the selected option of the methodological tool "Project emissions from flaring" are (i) the option to apply a default efficiency value or (ii) determining the flare efficiency based on monitored data (based on applicable measurements and calculations).

The time each of the project's high temperature enclosed flare has operated is determined by monitoring the flame combustion status/condition by using a flame detector and, for the case of the high temperature enclosed flare(s) to be installed as part of the project activity, the monitoring requirements related to operational requirements/conditions (as provided by the manufacturer's specifications for operating conditions) shall be met in addition to the confirmation of flare status/condition.

In the case of the project activity, the flare efficiency for each minute m ($\eta_{\text{flare},m}$) will be, as a priority, determined by following applicable guidance as per Option B.1 of the methodological tool “Project emissions from flaring”, where the flare efficiency will be determined on the basis of the performance of at least biannual basis related measurements. In case at least biannual related measurements are not available for a particular monitoring period, applicable guidance as per Option A (application of default values) of the methodological tool “Project emissions from flaring” will be used as an alternative.

Both options are summarized below:

Option A: Apply default value for flare efficiency.

Option B: Measure the flare efficiency.

Option A: Application of default value:

For each one of the high temperature enclosed flare(s) installed as part of the project activity, the flare efficiency for each minute m ($\eta_{\text{flare},m}$) 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 $T_{\text{EG},m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{\text{RG},m}$) is within the manufacturer’s specification/requirements for the flare (monitoring parameter $\text{SPEC}_{\text{flare}}$) 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, $\eta_{\text{flare},m}$ is set as 0% for the minute in question. Furthermore, for enclosed flare(s) that are defined as low height flare(s), 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: Measured flare efficiency:

For each one of the high temperature enclosed flare(s) which are part of the project activity, the flare efficiency in the minute m is determined as a value which is calculated based on performed related measurements ($\eta_{\text{flare},m} = \eta_{\text{flare,calc},m}$) when the following two 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 $T_{\text{EG},m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{\text{RG},m}$) is within the manufacturer's specification for the flare ($\text{SPEC}_{\text{flare}}$) in minute m ;
- (2) Flame is detected in the flare in minute m (monitoring parameter Flame_m).

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

By applying Option B.1, where the measurement is performed by an accredited independent third-party entity (e.g. an independent inspection/analysis service company) on a biannual basis, the following calculation formula is applied:

Option B.1: Biannual measurement of the flare efficiency:

The calculated flare efficiency $\eta_{\text{flare,calc},m}$ is determined as the average of at least two measurements of the flare efficiency made in year y ($\eta_{\text{flare,calc},y}$), adjusted by an uncertainty factor of 5 percentile points as follows:

$$\eta_{flare,calc,y} = 1 - \frac{1}{2} \sum_{t=1}^2 \left(\frac{F_{CH4,EG,t}}{F_{CH4,RG,t}} \right) - 0.05 \quad (18)$$

Where:

$\eta_{flare,calc,y}$	Flare efficiency in the year y
$F_{CH4,EG,t}$	Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t (in kg)
$F_{CH4,RG,t}$	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 during which the flare efficiency is measured, each a minimum of one hour and separated by at least six months ¹⁹

Note: $F_{CH4,EG,t}$ is measured for each individual flare according to an appropriate national or international standard. $F_{CH4,RG,t}$ is calculated for each flare according to Step 1²⁰, and consists of the sum of methane flow in the minutes m that makes up the time period t .

Step 3: Calculation of project emissions from flaring:

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

¹⁹ As also established by the methodological tool "Project emissions from flaring", 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.

²⁰ As per Step 1 $F_{CH4,RG,t}$ is equal to the sum of methane flow values ($F_{CH4,sent_flare,y}$) in the minutes m that make up the time period t .

$$PE_{flare,y} = GWP_{CH4} * \sum_{m=1}^{525,600} F_{CH4, RG, m} * (1 - \eta_{flare, m}) * 10^{-3} \quad (19)$$

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)
$F_{CH4, RG, m}$	Mass flow of methane in the residual gas in the minute m (in kg)
$\eta_{flare, m}$	Flare efficiency in minute m

Ex-ante estimation of $F_{CH4, PJ, y}$

As established by ACM0001 (version 19.0), $F_{CH4, PJ, y}$ is estimated as follows:

$$F_{CH4, PJ, y} = \eta_{PJ} * BE_{CH4, SWDS, y} / GWP_{CH4} \quad (20)$$

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})
η_{PJ}	Efficiency of the LFG capture system that will be installed in the project activity
GWP_{CH4}	Global warming potential of CH ₄ (in tCO _{2e} /tCH ₄)

$BE_{CH4, SWDS, y}$ is determined using the methodological tool "Emissions from solid waste disposal sites". The following guidance should be taken into account when applying the tool:

- f_y as per the methodological tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for when applying ACM0001 (version 19.0);
- In the tool, x begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and

- Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies.

Thus, for the ex-ante estimation of $F_{CH_4,PJ,y}$, the calculation of $BE_{CH_4,SWDS,y}$ is given by:

$$BE_{CH_4,SWDS,y} = \varphi_y * (1 - f_y) * GWP_{CH_4} * (1 - OX) * \frac{16}{12} * F * DOC_{f,y} * MCF_y * \sum_{x=1}^y \sum_j W_{j,x} * DOC_j * e^{-k_j(y-x)} * (1 - e^{-k_j})$$

(21)

Where:

$BE_{CH_4,SWDS,y}$	Baseline methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (in tCO ₂ e / yr)
x	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period ($x = 1$) to year y ($x = y$)
y	Year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)
$DOC_{f,y}$	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
φ_y	Model correction factor to account for model uncertainties for year y . The default value (as per Option 1 of applicable guidance in the methodological tool) is selected. Thus, $\varphi_y = \varphi_{\text{default}}$
f_y	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y . f_y in the methodological tool "Emission from solid waste disposal sites" shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for when applying ACM0001 (version 19.0). While as per the methodological tool "Emissions from solid waste disposal sites", f_y is presented as a parameter to be monitored ex-post; by considering the related methodological approach of ACM0001 (version 19.0) and assigned value for f_y , this parameter will thus not be monitored ex-post.
GWP_{CH_4}	Global Warming Potential of methane

OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction)
MCF _y	Methane correction factor for year <i>y</i>
DOC _j	Fraction of degradable organic carbon in the waste type <i>j</i> (weight fraction)
<i>k_j</i>	Decay rate for the waste type <i>j</i> (1 / yr)
<i>j</i>	Type of residual waste or types of waste in the MSW

The value and source of information for each of the variables above are given in section B.6.2. It is important to note that the approach to take into account characteristics of the disposed waste (used as inputs for the ex-ante estimation) are the ones recommended by IPCC. Due to that, no sampling of waste is necessary. While the design of the project activity is limited to the promotion of collection and destruction/utilization of LFG at the JP landfill (without promoting any change in the management and operation of this particular landfill), the GS project activity thus does not prevent any solid waste from being disposed at this landfill.

The determination of BE_{CH₄,SWDS,y} in the context of the calculation of ex-ante estimations of emission reductions to be achieved by the project activity during its 1st GS crediting period is included in Section B.6.3. An emission reduction calculation spreadsheet which includes all related calculations for figures presented in Section B.6.3 is enclosed to this Transition Request Form + GS4GG PDD.

Determination of F_{CH₄,BL,y}

As required by ACM0001 (version 19.0), this section represents the application of the stepwise procedure for the determination of the amount of methane that would have been captured and destroyed in the baseline scenario (absence of the GS project activity) at the JP landfill site due to eventually applicable regulatory or contractual requirements and/or to address eventually existent applicable safety and odors concerns (which are collectively referred to as “*requirement*” under this step).

The four cases summarized in the table below are distinguished in ACM0001 (version 19.0):

Possible cases for determining methane captured and destroyed in the baseline as per ACM0001 (version 19.0)

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

Requirement to destroy methane:

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

As further detailed in Sections B.2 and B.4, currently there is still no legal obligation to promote any kind of capture and/or combustion/destruction/utilization of LFG at the JP landfill²¹. Furthermore, this situation is currently not expected to be changed during the time period to be encompassed by the 1st GS crediting period of the GS project activity either. It is important to note that there has been no contractual requirement set by any official (governmental) or private party establishing/requiring collected LFG to be destroyed through combustion for the JP landfill.

²¹ Currently, there are still no legal requirements for LFG gas collection and its destruction/utilization using active or passive high temperature enclosed flares and/or internal combustion engines in Solid Waste Disposals Sites (SWDS's) in Brazil (from open waste dumpsites to well-managed landfills). Moreover, there are still no legal restrictions neither legal requirement for passive venting of LFG nor combustion of LFG in conventional LFG destruction systems (e.g. passive flares) valid for SWDS's located in the country either.

Non-existence of non-regulatory and non-contractual requirements to destroy methane due to safety and odor concerns:

In the particular case of the JP landfill, there is no requirement to destroy methane due to non-regulatory requirements (i.e. due to technical and/or operational requirements as due to safety and odor concerns).

As per the project design and licensing requirements, no LFG is to be combusted in LFG venting drains in order to address any kind of odour or safety concerns. Direct venting of LFG at the JP landfill through LFG venting drains (with no combustion) has been regarded as enough to prevent dangerous accumulation of LFG in the inner section of the landfill.

By taking such assumptions into account, the following is thus valid/applicable for the JP landfill in the baseline scenario:

Requirement to destroy methane: NO

Thus, Case 2 and Case 4 are directly regarded as not applicable for the GS project activity and the remaining possibly valid alternatives (cases) are thus Case 1 and Case 3.

Existence of LFG capture and destruction system at the JP landfill:

By taking into account the definitions of "LFG capture system" and "existing LFG capture system" as per ACM0001 (version 19.0), it is assumed that there was an "*existing LFG capture and destruction system*" at the JP landfill in the pre-project scenario. It is also assumed that such existing LFG capture and destruction system would also be existent along the baseline scenario.

While combustion of LFG in passive (conventional) venting/combustion drains clearly represents destruction of methane (despite of its relatively very low efficiency), it is thus assumed that there was a pre-project conventional LFG capture and destruction system implemented at the JP landfill prior to the implementation of the project activity (which was replaced (under a certain extent) by the project's LFG collection and destruction infrastructure).

The following is thus valid/applicable for the JP landfill in the baseline scenario:

Existing LFG capture and destruction system: YES

Therefore, Case 3 is regarded as an applicable case for the GS project activity. In addition, the last remaining possibly valid alternative, Case 1, is regarded as not applicable.

The following is thus valid in the context of the application of the stepwise procedure for the determination of $F_{CH_4,BL,y}$ for the project activity during its 1st GS crediting period:

Requirement to destroy methane = NO

Existing LFG capture and destruction system = YES

By taking into account the outcome of the above presented analysis the following methodological approach is valid for the determination of $F_{CH_4,BL,y}$:

Application of methodological guidance valid for Case 3:

Under Case 3 of the methodological guidance for the determination of $F_{CH_4,BL,y}$, the following is applicable as per ACM0001 (version 19.0):

$$F_{CH_4,BL,y} = F_{CH_4,BL,sys,y} = F_{CH_4,sent_flare,y}$$

Where:

- $F_{CH_4,BL,sys,y}$ 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 (t CH₄/yr)
- $F_{CH_4,sent_flare,y}$ Amount of methane in the LFG which is sent to the flare in year y (t CH₄/yr)

The amount of methane captured with the existing system will be monitored along with the amount captured under the GS project activity and there is no historic data on the amount of methane that was captured in the year prior to the implementation of the project activity. Thus, the situation to determine $F_{CH_4,BL,y}$ is:

$$F_{CH_4,BL,sys,y} = 20\% * F_{CH_4,PJ,y}; \text{ or } F_{CH_4,BL,y} = 20\% * F_{CH_4,PJ,y} \quad (22)$$

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

As established by ACM0001 (version 19.0), baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) shall be calculated by applying applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". When applying this methodological tool, the following is to be considered:

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

The methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" also declares the following:

"In the generic approach, project, baseline and leakage emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses (...)"

Specifically for baseline emissions, the following equation is applicable:

$$BE_{EC,y} = \sum_j EC_{BL,k,y} * EF_{EL,k,y} * (1 + TDL_{k,y}) \quad (23)$$

Where:

$BE_{EC,y}$	Baseline emissions associated with electricity generation (in tCO ₂ /yr).
$EC_{BL,k,y}$	Net amount of electricity generated using LFG in year y (in MWh)
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y (in tCO ₂ /MWh)

	$EF_{EL,j/k/l,y}$ represents the combined margin (CM) emission factor for the electricity grid to which the project activity is connected to ($EF_{grid,CM,y} = EF_{EL,grid,y}$).
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y
k	Sources of electricity generated identified in the selection of the most plausible baseline scenario

By following the above-quoted applicable guidance of the “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, baseline emissions for electricity generation by the GS project activity ($BE_{EC,y}$), are determined as follows:

$$BE_{EC,grid,y} = EC_{BL,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y}) \quad (23.1)$$

Where:

$EC_{BL,y}$	Net amount of electricity generated using LFG in year y (in MWh).
$EF_{EL,grid,y}$	Emission factor for grid-sourced electricity in year y (in tCO_2/MWh). $EF_{EL,grid,y}$ is determined as the combined margin (CM) emission factor ($EF_{grid,CM,y}$).
$TDL_{grid,y}$	Average technical transmission and distribution losses for providing electricity to the grid and/or for grid-sourced electricity consumed by the project activity.

Determination of the CO_2 emission factor for grid-sourced electricity ($EF_{EL,grid,y}$):

The CO_2 emission factor for grid-sourced electricity ($EF_{EL,grid,y}$) will be determined ex-post by applying Option A.1 or A.2 of the methodological tool “Baseline, project and/or

leakage emissions from electricity consumption and monitoring of electricity generation” as follows²²:

As per Option A.2 of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, $EF_{EL,grid,y}$ is determined by taking into account the following related requirement of the tool:

"Option A2: Use the following conservative default values:

(c) A value of 1.3 tCO₂/MWh if:

(i) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or

²² Along monitoring period(s) of its 1st GS 5-year crediting period the GS project activity potentially fits under Scenario A or Scenario C and under Scenario I or Scenario III of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (depending on whether the backup diesel generator is installed and under operation during the considered period). The methodological tool includes the following definitions:

"Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;

(...)

Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.

This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated:

(a) Scenario I: Electricity is supplied to the grid;

(...)

(c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities."

- (ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the project and leakage sources is greater than the electricity consumption of the baseline sources;
- (d) A value of 0.4 tCO₂/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production, and a value of 0.25 tCO₂/MWh for other electricity grids. These values can be used if:
 - (i) Scenario A applies only to baseline electricity consumption sources but not to project or leakage electricity consumption sources; or
 - (ii) (ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the baseline sources is greater than the electricity consumption of the project and leakage sources."

As per Option A.1 of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", $EF_{EL,grid,y}$ is determined ex-post by taking into account the following related requirement of the tool:

"Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$)."

The "Tool to calculate the emission factor for an electric system" indicates that the emission factor of the electricity grid to which the project activity is to be connected is determined by the following a 6-step approach:

Calculation of $EF_{grid,CM,y}$

Combined margin CO₂ emissions factor is calculated in accordance with the "Tool to calculate the emission factor for an electricity system". This methodological tool determines the CO₂ emission factor for the displacement of electricity generated by grid-connected power plants, by calculating the combined margin emission factor ($EF_{CM,y}$) of the electricity system. As per the "Tool to calculate the emission factor for an electricity system", $EF_{CM,y}$ is determined as a weighted average of two CO₂ emission

factors pertaining to the electricity system: the CO₂ operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$). The operating margin emission factor refers to the group of existing power plants whose current electricity generation would be potentially affected by the proposed GS project activity. The build margin emission factor refers to the group of prospective power plants whose construction and future operation would be potentially affected by the proposed GS project activity.

The applicable procedures of “Tool to calculate the emission factor for an electricity system” tool is described in the following steps:

- Step 1. Identify the relevant electricity systems:

For determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. The spatial extent of the project boundary includes the project site which is connected to the National Electricity Grid of Brazil which is named National Interconnected System (*Sistema Interligado Nacional – SIN*).

- Step 2. Choose whether to include off-grid power plants in the project electricity system (optional): Option I of the tool is chosen which is to include only grid power plants in the calculation.

- Step 3. Select a method to determine the operating margin (OM):

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

- (a) Simple OM; or
- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM.

Any above method can be utilized. However, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. This is not the case for the project

electricity system being considered. Since the simple adjusted OM (option b) emission factor is a variation of the simple OM, where the power plants/units (including imports) are separated in low-cost/must-run power sources and other power sources, this is also not applicable to this project activity. For the similar reason, the option (d), average OM emission factor is not eligible for this project, since it is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance for the simple OM, but including in all equations also low-cost/must-run power plants. Therefore, for the OM calculation method, the option (c) dispatch data analysis is preferred, since the Ministry of Science, Technology and Innovation of Brazil has been updated and published annually the information for power units²³.

For the dispatch data analysis OM, the year in which the GS project activity displaces grid electricity and the emission factor updating annually during monitoring is utilized.

- Step 4. Calculate the operating margin emission factor according to the selected method:

In order to determine the combined margin emission factor, the dispatch data analysis method has been selected among four options proposed in the methodology, since it is publicly available in Brazil.

²³ The Brazilian Ministry of Science, Technology and Innovation have been calculating the CO₂ emission factor according to the methodology tool "Tool to calculate the emission factor for an electricity system" (version 2.2.0), approved by the CDM Executive Board. The CO₂ emission factor was obtained in the Brazilian DNA website. Source of data used: Tool to calculate the emission factor for an electricity system: The actual value has been calculated by Ministry of Science, Technology and Innovation (MCTI), Brazilian Designated National Authority (DNA). The Emission Factor will be monitored through ex-post calculation, following the latest version of Tool to calculate the emission factor for an electricity system. The Brazilian DNA calculated the value based on the Tool. The Combined Margin is calculated through a weighted-average formula, considering both the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} (default values of 0.25 and 0.75, respectively).

The dispatch data analysis OM emission factor ($EF_{grid,OM-DDy}$) is determined based on the grid power units that are actually dispatched at the margin during each hour h where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DDy}$, as the MCTI have been doing.

The operating margin emission factor is calculated as follows:

$$EF_{grid,OM-DDy} = \frac{\sum EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}} \quad (24)$$

Where:

$EF_{grid,OM-DDy}$	Dispatch data analysis operating margin CO ₂ emission factor in year y (in tCO ₂ /MWh)
$EG_{PJ,h}$	Electricity displaced by the project activity in hour h of year y (in MWh)
$EF_{EL,DD,h}$	CO ₂ emission factor for grid power units in the top of the dispatch order in hour h in year y (in tCO ₂ /MWh)
$EG_{PJ,y}$	Total electricity displaced by the project activity in year y (in MWh)
h	Hours in year y in which the project activity is displacing grid electricity
y	Year in which the project activity is displacing grid electricity

- Step 5. Calculate the build margin (BM) emission factor:

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information

available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 2 is selected for the 1st GS crediting period of the GS project activity.

The build margin emissions factor is the generation-weighted average emission factor (in tCO₂/MWh) of all power units *m* during the most recent year *y* for which power generation data is available. The DNA of Brazil has regularly published an official value for EF_{grid,BM,y}²⁴. The applicable published value (applicable for year 2017 as adopted for the currently expired 2nd CDM crediting period and also the 3rd CDM crediting period of the project activity) is thus the value for the ex-ante selected parameter EF_{grid,BM,y} and is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum EG_{m,y} \cdot EF_{EL,m,y}}{\sum EG_{m,y}} \quad (25)$$

²⁴ Details about the determination of values for the CO₂ emission factor for the national electricity grid of Brazil by the DNA of Brazil are made available online on the website of the DNA of Brazil:
<https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao>

Where:

$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)
M	Power units included in the build margin
y	Most recent historical year for which power generation data is available

- Step 6. Calculate the combined margin (CM) emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \cdot w_{OM} + EF_{grid,BM,y} \cdot w_{BM} \quad (26)$$

Where:

$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The values for w_{OM} and w_{BM} are ex-ante selected as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electric system", which includes the following as a requirement:

"The following default values should be used for w_{OM} and w_{BM} :

(a) Wind and solar power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

(b) All other projects: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period,⁶ unless otherwise specified in the approved methodology which refers to this tool."

While values for the parameters w_{OM} and w_{BM} (which are applicable for the whole 1st GS crediting period) are selected ex-ante, annual values for $EF_{grid,BM,y}$ and $EF_{grid,OM,y}$ within the 1st GS crediting period will be determined ex-post as required by the “Tool to calculate the emission factor for an electric system”. Thus, during the 1st GS crediting period, the combined margin CO₂ emission factor will be calculated and updated annually.

The operating margin CO₂ emission factor will be ex-post.

Therefore, the combined margin CO₂ emission factor will be ex-post.

Baseline emissions associated with heat generation ($BE_{HG,y}$)

As the GS project activity does not encompass any utilization of collected LFG for heat generation (in boiler, air heater, glass melting furnace(s) and/or kiln), baseline emissions associated with heat generation in year y ($BE_{HG,y}$) are not considered. In summary, this step is not applicable.

Baseline emissions associated with natural gas use ($BE_{NG,y}$)

As the GS project design does not encompass any utilization of collected LFG displacing the use of natural gas or injection of collected LFG into a natural gas distribution network or used by trucks, baseline emissions associated with natural gas use in year y ($BE_{NG,y}$) are not considered. Thus, this step is not applicable.

Monitoring of the management of the landfill:

As required by ACM0001 (version 19.0), the design and operational conditions of the JP landfill site will be annually monitored on the basis of different sources, including:

- Original design of the landfill;
- Technical specifications for the management of the JP landfill;
- Applicable local or national regulations

Original operational design of the JP landfill site should be confirmed not to be modified in order to ensure that no practice to deliberately or intentionally increase methane

generation at the landfill have been occurring during the period, when compared to the landfill management and operation condition prior to the implementation of the project activity and/or during its currently expired 1st and 2nd CDM crediting periods and also the 3rd CDM crediting period. As required by ACM0001 (version 19.0), any change in the management of the landfill after the implementation of the project activity should be justified by referring to technical or regulatory specifications and impacts of such changes in the determination of baseline emissions should in this case be taken into account appropriately. Such monitoring requirement will be used for the determination/confirmation of baseline emissions and confirmation of the project's implementation as described in the Transition Request Form + GS4GG PDD (in terms of operation and management conditions of the landfill from which LFG is destroyed). Further related monitoring details are included in Section B.7.1 (under parameter "Management of SWDS").

Determination of project emissions (PE_y):

As established by ACM0001 (version 19.0), project emissions (PE_y) for a project activity promoting LFG collection and destruction/utilization are to be calculated (in tCO₂/year) as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} \quad (27)$$

Where:

PE_y	Project emissions in year y (in tCO ₂ /yr)
$PE_{EC,y}$	Emissions from consumption of electricity due to the project activity in year y (in tCO ₂ /yr)
$PE_{FC,y}$	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y (in tCO ₂ /yr)
$PE_{DT,y}$	Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (in tCO ₂ /yr)

Since the GS project activity does not encompass any distribution of compressed/liquefied LFG, there will be no project emissions from the distribution of compressed/liquefied LFG using trucks ($PE_{DT,y} = 0$). Furthermore, while no fossil fuel is

consumed by the GS project activity for purpose other than electricity generation, there will be no related project emissions either ($PE_{FC,y} = 0$)

Determination of project emissions from consumption of electricity due to the project activity ($PE_{EC,y}$):

As required by ACM0001 (version 19.0), project emissions from consumption of electricity by the project activity ($PE_{EC,y}$) shall be calculated by applying the methodological approach established by the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” requirement of the tool being considered:

“In the generic approach, project, baseline and leakage emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses (...)”

ACM0001 (version 19.0) establishes the following when applying this methodological tool:

- *“ $EC_{PJ,k,y}$ ²⁵ in the tool is equivalent to the amount of electricity consumed by the project activity in year y ($EC_{PJ,y}$).”*
- *“If in the baseline a proportion of LFG is destroyed ($F_{CH4,BL,y} > 0$), then the electricity consumption in the tool ($EC_{PJ,j,y}$) should refer to the net quantity of electricity consumption (i.e. the increase due to the project activity). The determination of the amount of electricity consumed in the baseline shall be transparently documented in the CDM-PDD.”*

²⁵ As per the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, $EC_{PJ,j,y}$ is the quantity of electricity consumed by the project electricity consumption source j in year y .

Electricity sources j in the tool corresponds to the sources of electricity consumed due to the GS project activity: (i) grid-sourced electricity and (ii) electricity generated by the backup diesel generator are expected to be consumed for the operation of the project activity. No sources of electricity other than (i) and (ii) are currently expected to be used to meet the electricity demand of the project activity during its 1st GS 5-year crediting period.

Although LFG is destroyed in the baseline scenario ($F_{CH_4,BL,y} > 0$), while the no electricity has been previously used in the pre-project and baseline scenarios for collecting and destroying LFG through the utilization of conventional LFG venting/combustion drains, determination of the amount of electricity consumed in the baseline scenario is thus not applicable/considered.

According to the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", project emissions due to electricity consumption by the GS project activity ($PE_{EC,y}$) are calculated as follows:

$$PE_{EC,y} = \sum EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y}) \quad (28)$$

Where:

$EC_{PJ,j,y}$ Quantity of electricity consumed by the project electricity consumption source j in year y (in MWh).

$EF_{EL,j,y}$ CO₂ emission factor for electricity generation for source j in year y (in tCO₂/MWh).

$TDL_{j,y}$ Average technical transmission and distribution losses for providing electricity to source j in year y

Since grid-sourced electricity and electricity generated by the backup diesel generator represents sources of electricity consumed by the GS project activity, $PE_{EC,y}$ can thus be calculated as:

$$PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y} \quad (29)$$

Where:

- $PE_{EC,grid,y}$ Project emissions from consumption of grid electricity due to the project activity in year y (in tCO_2/yr)
- $PE_{EC,captive,y}$ Project emissions from consumption of electricity generated by a captive off-grid electricity generator fueled by fossil fuel (diesel) in year y (in tCO_2/yr)

$PE_{EC,grid,y}$ and $PE_{EC,captive,y}$ are calculated according to the following approach:

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

By following applicable guidance of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, valid for Scenario C (Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s)); project emissions due to grid electricity consumption by the GS project activity ($PE_{EC,grid,y}$) are determined as follows:

$$PE_{EC,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y}) \quad (30)$$

Where:

- $EC_{PJ,grid,y}$ Quantity of grid-sourced electricity consumed by the project activity in year y . As detailed in Section B.7.1 and B.7.3, $EC_{PJ,grid,y}$ will be measured and monitored in MWh as per the provisions of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.

$TDL_{grid,y}$ Average technical transmission and distribution losses for providing electricity to the grid and/or for grid-sourced electricity consumed by the project activity.

$EF_{EL,grid,y}$ CO₂ emission factor for grid-sourced electricity in year y (in tCO₂/MWh). $EF_{EL,grid,y}$ is determined by following applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" as follows:

"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."

"Where case C.I has been identified, the guidance for scenario A (...) should be applied (use option A1 or option A2)."

The following above-quoted options of the methodological tool (Options A.1 or A.2.) may thus be analyzed ex-post for the determination of $EF_{EL,grid,y}$ as follows:

- Option A.1: $EF_{EL,grid,y}$ is 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" by following approach summarized above in this Section under *"Approach for determination of combined margin (CM) emission factor ($EF_{grid,CM,y} = EF_{EL,grid,y}$)"*.
- Option A.2: $EF_{EL,grid,y}$ is directly determined as 1.3 tCO₂/MWh (applicable conservative default value of the methodological tool

“Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.

Project emissions due to the consumption of electricity sourced by backup diesel generator ($PE_{EC,captive,y}$):

By following applicable guidance of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”; project emissions from the consumption of electricity generated by the backup diesel generator are to be calculated as follows:

As the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, $PE_{EC,captive,y}$ is directly calculated as follows:

$$PE_{EC,captive,y} = EC_{PJ,captive,y} * EF_{EL,captive,y} * (1 + TDL_{captive,y}) \quad (31)$$

Where:

- $EC_{PJ,captive,y}$ Amount of electricity sourced by the backup diesel generator and consumed by the project activity. $EC_{captive,y}$ will be measured and monitored in MWh as per the provisions of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.
- $TDL_{captive,y}$ Average technical transmission and distribution losses for electricity sourced by the captive electricity generator.
- $EF_{EL,captive,y}$ CO₂ emission factor for electricity sourced by the backup diesel generator (in tCO₂/MWh). Like in the case of $EF_{EL,grid,y}$, $EF_{EL,captive,y}$ will be determined by following applicable guidance of the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” as directly determined as 1.3 tCO₂/MWh (applicable conservative default value of the methodological tool).

Determination of leakage emissions (LE_y):

No leakage emissions are expected to occur. Moreover, no leakage effects are accounted for under ACM0001 (version 19.0).

Emission Reduction:

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y,$$

Where:

- ER_y Emission reductions in year y (tCO₂e/yr);
- BE_y Baseline emissions in year y (tCO₂e/yr);
- PE_y Project emissions in year y (tCO₂e/yr);

B.6.2 Data and parameters fixed ex ante

SDG13

Data/parameter	OX_{top_layer}
Unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool "Emissions from solid waste disposal sites"
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value as per the applied CDM baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas" (version 19.0)
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/parameter	GWP_{CH4}
Unit	tCO ₂ e/tCH ₄
Description	Global Warming Potential of CH ₄
Source of data	Applied value represents the GWP value for the GHG CH ₄ as per the IPCC fourth assessment report (AR4) and IPCC fifth assessment report (AR5).
Value(s) applied	25 tCO ₂ e/tCH ₄ (from 01/01/2021 to 31/12/2020) 28 tCO ₂ e/tCH ₄ (from 01/01/2021 to 26/11/2023)
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.

Additional comment	This Transition Request Form + GS4GG PDD may be updated in the future in accordance with any other requirements that may be adopted by the UNFCCC CMP at CMP 16.
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Data/parameter	η_{PJ}
Unit	Dimensionless
Description	Efficiency of the LFG capture system that will be installed in the project activity
Source of data	Value obtained from technical literature
Value(s) applied	0.80
Choice of data or Measurement methods and procedures	Technical letter from the LFG plant operator based on operational expertise ²⁶ .
Purpose of data	Calculation of baseline emissions.
Additional comment	Selected value can also be represented as percentage, since $0.80 = 80\%$

²⁶ Assumptions for the expected LFG collection efficiency of the project activity are based on the definition of the general construction aspects (considered design and planned layout) as well as operational characteristics for the implementation of the project's LFG collection network. Such assumed efficiency for LFG collection is derived by taking into consideration the experience and expertise of the landfill operator.

Data/parameter	R_u
Unit	Pa.m ₃ /kmol.K
Description	Universal ideal gases constant
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Value(s) applied	8,314
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/parameter	MM _i								
Unit	kg/kmol								
Description	Molecular mass of greenhouse gas <i>i</i>								
Source of data	Default values as per the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”								
Value(s) applied	The following values of molecular mass are applicable for CH ₄ (the only GHG which is considered): <table><tr><th>Compound</th><th>Structure</th><th>Molecular mass (kg/kmol)</th></tr><tr><td>Methane</td><td>CH₄</td><td>16.04</td></tr></table>			Compound	Structure	Molecular mass (kg/kmol)	Methane	CH ₄	16.04
Compound	Structure	Molecular mass (kg/kmol)							
Methane	CH ₄	16.04							
Choice of data or Measurement methods and procedures	-								
Purpose of data	Calculation of baseline emissions.								
Additional comment	-								

Data/parameter	MM_k
Unit	kg/kmol
Description	Molecular mass of greenhouse gas <i>k</i>
Source of data	Default values as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Value(s) applied	For considered gases <i>k</i> that are greenhouse gases (GHGs), the values below are applied for MM_k. As per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" the following is applicable for the particular case of the GS project activity: <i>"The determination of the molecular mass of the gaseous stream (MM_{t,db}) requires measuring the volumetric fraction of all gases (k) in the considered gaseous stream. However, as a simplification, only the volumetric fraction of gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. The simplification is not acceptable if it is differently specified in the underlying methodology."</i> ACM0001 (version 19.0) does not include any restriction to such simplification. Thus, only the volumetric fraction of gases that are greenhouse gases and are considered in related calculations (CH₄ in the particular case of the project activity) and the difference to 100% is just considered as pure nitrogen.

	Compound	Structure	Molecular mass (kg/kmol)
	Nitrogen	N ₂	28.01
Choice of data or Measurement methods and procedures	-		
Purpose of data	Calculation of baseline emissions.		
Additional comment	-		

Data/parameter	MM_{H2O}
Unit	kg/kmol
Description	Molecular mass of water
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Value(s) applied	18.0152
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/parameter	P_n
Unit	Pa
Description	Total pressure at normal conditions
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Value(s) applied	101,325
Choice of data or Measurement methods and procedures	-

Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/parameter	T_n
Unit	K
Description	Temperature at normal conditions
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Value(s) applied	273.15
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/parameter	Φ_{default}
Unit	-
Description	Default value for the model correction factor to account for model uncertainties
Source of data	Default value applicable for determination of baseline emissions as per the methodological tool "Emissions from solid waste disposal sites". Value applicable for humid/wet conditions as per Application A is selected (based on the climate conditions valid for the location of the project activity). Source for weather condition data: http://www.bbc.com/weather
Value(s) applied	0.75

Choice of data or Measurement methods and procedures	Determined based on default value of table 3 of the referred methodological tool as per Option 1, Application A (value applicable for humid/wet conditions).
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/parameter	OX
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Applicable default value as per the methodological tool "Emissions from solid waste disposal sites"
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/parameter	F
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	Applicable default value as per the methodological tool "Emissions from solid waste disposal sites"
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the considered SWDS. A default value of 0.5 is recommended by IPCC.
Purpose of data	Calculation of baseline emissions

Additional comment	-
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Data/parameter	DOC_{f,default}
Unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	Applicable default value as per the methodological tool "Emissions from solid waste disposal sites", which refers to applicable value as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. The default value was applied as per Application A of the methodological tool "Emissions from solid waste disposal sites": <i>"The CDM project activity mitigates methane emissions from a specific existing SWDS"</i> .
Purpose of data	Calculation of baseline emissions
Additional comment	Application A of the methodological tool "Emissions from solid waste disposal sites" is the applicable case of the project activity.

Data/parameter	MCF_{default}
Unit	-
Description	Methane correction factor
Source of data	Value is sourced by the methodological tool "Emissions from solid waste disposal sites", that refers to IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value(s) applied	1.0
Choice of data or Measurement methods and procedures	Value is selected as per Application A of the methodological tool, under the following conditions: <i>"1.0: for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste"</i> The day-to-day MSW disposal activities at the JP landfill encompasses utilization of appropriate MSW landfilling practices (covering, leveling and mechanical compacting of disposed material, etc.) as part of the operation of this landfill. The JP landfill is regarded as a well-managed landfill site.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/parameter	DOC_j														
Unit	-														
Description	Fraction of degradable organic carbon in the waste type <i>j</i> (weight fraction)														
Source of data	Values are selected as per applicable guidance of the methodological tool "Emissions from solid waste disposal sites", that refers to IPCC 2006 Guidelines for National Greenhouse Gas Inventories, (adapted from Volume 5, Tables 2.4 and 2.5).														
Value(s) applied	<table border="1"> <thead> <tr> <th>Waste type <i>j</i></th><th>DOC_j (% wet waste)</th></tr> </thead> <tbody> <tr> <td>Wood and wood products</td><td>43</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr> <tr> <td>Textiles</td><td>24</td></tr> <tr> <td>Garden, yard and park waste</td><td>20</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>0</td></tr> </tbody> </table>	Waste type <i>j</i>	DOC _j (% wet waste)	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Waste type <i>j</i>	DOC _j (% wet waste)														
Wood and wood products	43														
Pulp, paper and cardboard (other than sludge)	40														
Food, food waste, beverages and tobacco (other than sludge)	15														
Textiles	24														
Garden, yard and park waste	20														
Glass, plastic, metal, other inert waste	0														
Choice of data or Measurement methods and procedures	The selected values are based on wet waste basis (moisture concentrations in the waste streams as waste is delivered to the SWDS). The IPCC 2006 Guidelines also specify DOC values on a dry waste basis, which refers to the moisture concentrations after complete removal of all moisture from the waste. However, this selection is not practical for the situation/practice at the JP landfill.														
Purpose of data	Calculation of baseline emissions														
Additional comment	-														

Data/parameter	k_j														
Unit	1/yr														
Description	Decay rate for the waste type j														
Source of data	Values are selected as per applicable guidance of the methodological tool “Emissions from solid waste disposal sites”. The methodological tool refers to values as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)														
Value(s) applied	<table><tr><th>Degradation speed</th><th>Waste type</th><th>k_j</th></tr><tr><td rowspan="2">Slowly degrading</td><td>Wood, wood products, rubber and leather</td><td>0.035</td></tr><tr><td>Pulp, paper and cardboard (other than sludge), textiles</td><td>0.07</td></tr><tr><td>Moderately Degrading</td><td>other (non-food) organic putrescible Garden, yard and park waste</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.4</td></tr></table>	Degradation speed	Waste type	k_j	Slowly degrading	Wood, wood products, rubber and leather	0.035	Pulp, paper and cardboard (other than sludge), textiles	0.07	Moderately Degrading	other (non-food) organic putrescible Garden, yard and park waste	0.17	Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.4
Degradation speed	Waste type	k_j													
Slowly degrading	Wood, wood products, rubber and leather	0.035													
	Pulp, paper and cardboard (other than sludge), textiles	0.07													
Moderately Degrading	other (non-food) organic putrescible Garden, yard and park waste	0.17													
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.4													
Choice of data or Measurement methods and procedures	Parameters are selected in accordance with the climate zone valid for the project site: Mean Annual Temperature (MAT) = 25.80 °C Mean Annual Precipitation (MAP) = 1,019 mm Aridity index (MAP/PET) = 5 Source of data for mean annual temperature (MAT) and mean annual precipitation (MAP): https://pt.climate-data.org/search/?q=Jo%C3%A3o+Pessoa														
Purpose of data	Calculation of baseline emissions														
Additional comment	-														

Data/parameter	W_j														
Unit	-														
Description	Weight fraction of the waste type j														
Source of data	Values are selected as per applicable guidance of IPCC 2006 Guidelines for National Greenhouse Gas, Volume 5, Chapter 2, tables 2.3-2.5, MSW composition regional default values for South America.														
Value(s) applied	<table> <tr> <th>Waste type j</th><th>W_j (% wet waste)</th></tr> <tr> <td>Wood and wood products</td><td>4.7</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>17.1</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>44.9</td></tr> <tr> <td>Textiles</td><td>2.6</td></tr> <tr> <td>Garden, yard and park waste</td><td>0.0</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>30.7</td></tr> </table>	Waste type j	W_j (% wet waste)	Wood and wood products	4.7	Pulp, paper and cardboard (other than sludge)	17.1	Food, food waste, beverages and tobacco (other than sludge)	44.9	Textiles	2.6	Garden, yard and park waste	0.0	Glass, plastic, metal, other inert waste	30.7
Waste type j	W_j (% wet waste)														
Wood and wood products	4.7														
Pulp, paper and cardboard (other than sludge)	17.1														
Food, food waste, beverages and tobacco (other than sludge)	44.9														
Textiles	2.6														
Garden, yard and park waste	0.0														
Glass, plastic, metal, other inert waste	30.7														
Choice of data or Measurement methods and procedures	-														
Purpose of data	Calculation of baseline emissions														
Additional comment	No composition analysis for MSW disposed at the JP landfill is currently available.														

Data/parameter	SPEC _{flare}														
Unit	Temperature - °C Flow rate or heat flux – kg/h or Nm ³ /h Maintenance schedule - number of days														
Description	Manufacturer’s flare specifications for temperature, flow rate and maintenance schedule														
Source of data	Flare manufacturer data (for the single flare currently expected to be installed as part of the project activity)														
Value(s) applied	<table><tr><th>SPEC_{flare}</th><th>Min</th><th>Max</th></tr><tr><td>Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH₄ destruction efficiency):</td><td>850 °C</td><td>1,200 °C</td></tr><tr><td>Operational LFG flow (for continuous operation)</td><td>500 Nm³/h</td><td>2,500 Nm³/h</td></tr><tr><td>Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material)</td><td colspan="2">Min. every 6 months</td></tr></table>			SPEC _{flare}	Min	Max	Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH ₄ destruction efficiency):	850 °C	1,200 °C	Operational LFG flow (for continuous operation)	500 Nm ³ /h	2,500 Nm ³ /h	Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material)	Min. every 6 months	
SPEC _{flare}	Min	Max													
Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH ₄ destruction efficiency):	850 °C	1,200 °C													
Operational LFG flow (for continuous operation)	500 Nm ³ /h	2,500 Nm ³ /h													
Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material)	Min. every 6 months														
Choice of data or Measurement methods and procedures	As established by the methodological tool “Project emissions from flaring”, the flare specifications and operational + maintenance requirements (as set/recommended by the equipment manufacturer) are documented and considered for the ex-ante determination of applicable values for the parameter SPEC _{flare} . Ex-ante														

	selected data will be compared against monitored data related to the operation of the flare(s), including: a) Minimum and maximum monitoring records for data regarding inlet LFG flow rate (b) Minimum and maximum monitoring records for data of temperature in the exhaust gas of each individual high temperature enclosed flare; and (c) Duration in days of time periods between maintenance events for each individual high temperature enclosed flare.
Purpose of data	Data is used as a reference for later ex-post determination of values of flare efficiency ($\eta_{\text{flare},m}$) for high temperature enclosed flare in the context of determination of baseline emissions.
Additional comment	All flare specification and operation details/requirements are based on information provided by the manufacturer of equipment currently expected to be installed as part of the GS project activity.

Data/parameter	EF_{EL,grid,y}
Unit	tCO ₂ /MWh
Description	CO ₂ emission factor for grid-sourced electricity in year y
Source of data	Applicable conservative default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (by following option A.2 of the underlying methodological tool).
Value(s) applied	0.25 (for electricity exported by the project activity through the electricity grid) 1.3 (for consumption of grid-sourced electricity by the project activity)
Choice of data or Measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".
Purpose of data	Calculation of project emissions (due to the consumption of electricity by the GS project activity).
Additional comment	The ex-ante determined default value for EF _{EL,grid,y} is to be used for the determination of project emissions due to the consumption of grid-sourced electricity by the project activity (PE _{EC,grid,y}) while applying option A.2 as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" ²⁷ .

²⁷ While applying option A.1 as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", EF_{EL,grid,y} will be determined ex-post as the CO₂

Data/parameter	$EF_{EL,captive,y}$
Unit	tCO ₂ /MWh
Description	CO ₂ emission factor for electricity sourced by the captive off-grid electricity generators
Source of data	Applicable default as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" by following option B2 of the underlying methodological tool).
Value(s) applied	1.3
Choice of data or Measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".
Purpose of data	Calculation of project emissions (due to the consumption of electricity by the project activity).
Additional comment	The ex-ante determined default value for $EF_{EL,captive,y}$ is to be used for the determination of project emissions due to the consumption of electricity sourced by the backup diesel generator by the GS project activity ($PE_{EC,captive,y}$) while

Combined Margin emission factor for the National Electricity Grid of Brazil ($EF_{grid,CM,y}$). Applicable value(s) will be directly also or alternatively determined as the applicable conservative default value(s) as per option A.2 of the same methodological tool which are selected ex-ante. The selection of the calculation approach for the determination of $EF_{grid,y}$ (option A.1 and/or A.2) will be done on an ex-post basis during period verification(s) of the GS project activity within its 1st 5-year GS crediting period and will take into account (i) whether a backup diesel generator will be installed and under operation during the period to be encompassed by the monitoring period(s) in question and (ii) whether required data for the determination of the CO₂ Combined Margin emission factor for the National Electricity Grid of Brazil or related calculation results will be made available.

	applying option B.2 as per methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, if applicable in case the backup diesel generator is installed and has operated during the period.
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Data/parameter	W_{BM}
Unit	%
Description	Weighting of build margin emissions factor
Source of data	Applicable default value as per the methodological tool “Tool to calculate the emission factor for an electricity system”
Value(s) applied	0.75 (75%)
Choice of data or Measurement methods and procedures	The applicable value for the 1 st GS crediting period of the GS project activity as per the methodological tool “Tool to calculate the emission factor for an electricity system” is selected.
Purpose of data	Data is used for determination of project emissions due to the consumption of electricity by the GS project activity.
Additional comment	The ex-ante determined default value for w_{BM} is to be used for the determination of both baseline and project emissions due to generation of electricity and consumption of grid-sourced electricity by the project activity respectively ($BE_{EC,y}$ and $PE_{EC,grid,y}$ respectively) while and/or if applying option A.1 as per the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.

Data/parameter	W_{OM}
Unit	%
Description	Weighting of operating margin emissions factor
Source of data	Applicable default value as per the methodological tool "Tool to calculate the emission factor for an electricity system"
Value(s) applied	0.25 (25%)
Choice of data or Measurement methods and procedures	The applicable value for the 1 st GS crediting period of the GS project activity as per the methodological tool "Tool to calculate the emission factor for an electricity system" is selected.
Purpose of data	Data is used for determination of project emissions due to the consumption of electricity by the GS project activity.
Additional comment	The ex-ante determined default value for W _{OM} is to be used for the determination of both baseline and project emissions due to generation of electricity and consumption of grid-sourced electricity by the GS project activity respectively (BE _{EC,y} and PE _{EC,grid,y} respectively) while and/or if applying option A.1 as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

Data/parameter	EF_{grid,BM,y}
Unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor in year y
Source of data	Selected value valid for the 1 st GS 5-year crediting period of the GS project activity represents the value previously applied for the currently expired 2 nd CDM crediting period and also the 3 rd CDM crediting period of the project activity (value applicable for year 2017) (EF _{grid,BM,2017}) as outlined

	in the Transition Request Form + GS4GG PDD for such currently expired CDM crediting period.
Value(s) applied	0.0028
Choice of data or Measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system".
Purpose of data	Data will be used for the determination of baseline emissions and project emissions (due to generation of electricity and consumption of electricity by the project activity respectively).
Additional comment	The ex-ante determined default value for $EF_{grid,BM,y}$ is to be used for the determination of baseline emissions and project emissions due to generation of electricity and consumption of electricity by the project activity respectively ($BE_{EC,y}$ and $PE_{EC,grid,y}$ respectively) while and/or if applying option A.1 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

B.6.3 Ex ante estimation of SDG Impact

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Emission reductions (SDG 13)

Determination of ex-ante estimates for baseline emissions (BE_y):

Since the GS project activity encompasses methane destruction and electricity generation through the utilization of LFG as gaseous fuel as its GHG abatement measures, baseline emissions (BE_y) are determined as follows:

$$BE_y = BE_{CH_4,y} + BE_{EL,y}$$

Where:

$BE_{CH_4,y}$ Baseline emissions of methane from the SWDS in year y (tCO₂e/yr)

$BE_{EL,y}$ Baseline emissions for electricity generation (tCO₂/yr)

Determination of $BE_{CH_4,y}$:

$BE_{CH_4,y}$ is determined as follows:

$$BE_{CH_4,y} = ((1 - OX_{top_layer}) * F_{CH_4,PJ,y} - F_{CH_4,BL,y}) * GWP_{CH_4}$$

Where:

OX_{top_layer} Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline. OX_{top_layer} is ex-ante determined as 0.1. See Section B.6.2 for further details.

$F_{CH_4,BL,y}$ Amount of methane that would have been captured and destroyed in the baseline scenario (absence of the CDM project activity). As outlined in Section B.6.1, $F_{CH_4,BL,y} = 0.20 * F_{CH_4,PJ,y}$

GWP_{CH_4} Global warming potential of CH₄ (tCO₂e/t CH₄). GWP_{CH_4} is ex-ante determined as 25 tCO₂e/tCH₄ (until 31/12/2020) and 28 tCO₂e/tCH₄ (from 01/01/2021 to 26/11/2023). See Section B.6.2 for further details.

$F_{CH_4,PJ,y}$ Amount of methane in the LFG which is destroyed by the project activity in year y (tCH₄/yr). In the particular context of the ex-ante estimation of

emission reductions to be achieved by the project activity, $F_{CH_4,PJ,y}$ is determined (in tCH₄/year) as follows:

$$F_{CH_4,PJ,y} = \eta_{PJ} * BE_{CH_4,SWDS,y} / GWP_{CH_4}$$

Where:

η_{PJ}	Efficiency of the LFG capture system that will be installed in the project activity. η_{PJ} is ex-ante determined as 0.80. See Section B.6.2 for further details.
GWP_{CH_4}	Global warming potential of CH ₄ (tCO ₂ e/tCH ₄). GWP_{CH_4} is ex-ante determined as 25 tCO ₂ e/tCH ₄ (from 01/01/2021 to 31/12/2020) and 28 tCO ₂ e/tCH ₄ (from 01/01/2021 to 26/11/2023). See Section B.6.2 for further details.
$BE_{CH_4,SWDS,y}$	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y (in tCO ₂ e/yr). $BE_{CH_4,SWDS,y}$ is estimated as follows:

$$BE_{CH_4,SWDS,y} = \varphi_y * (1 - f_y) * GWP_{CH_4} * (1 - OX) * \frac{16}{12} * F * DOC_f * MCF * \sum_{x=1}^y \sum_j W_{j,x} * DOC_j * e^{-k(y-x)} * (1 - e^{-kj})$$

For the determination of $BE_{CH_4,SWDS,y}$, the ex-ante determined values for all parameters in the formulae above as well as historical and forecasts of MSW disposal at the JP landfill site are applied. See Section B.6.2 for details about the ex-ante determined values for such parameters.

Determination of $BE_{EC,y}$:

$BE_{EC,y}$ is determined as follows:

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

Where:

$BE_{EC,y}$ Baseline emissions associated with electricity generation (in tCO_2/yr).

$EC_{BL,y}$ Net amount of electricity generated using LFG in year y (in MWh). Annual values for $EC_{BL,y}$ during the 1st GS crediting period are calculated by considering the currently expected implementation timeline of the project's electricity generation infrastructure (engines to be gradually implemented) as follows:

Year		$EC_{BL,y}$ (MWh)
2021		53,089
2022		53,089
2023	47,853	

$TDL_{grid,y}$ Average technical transmission and distribution losses for providing electricity to the grid and/or for grid-sourced electricity consumed by the GS project activity. For the particular case of determination of $BE_{EC,y}$, $TDL_{grid,y}$ is ex-ante determined as being 3% ($TDL_{grid,export,y}$). Further details are included in Sections B.6.1 and B.6.2.

$EF_{EL,grid,y}$ CO_2 emission factor for grid-sourced electricity in year y (in tCO_2/MWh). In the particular context of ex-ante estimates of emission reductions to be achieved by the project activity within its 1st GS crediting period, $EF_{EL,grid,y}$ is estimated as representing the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) for the electricity grid of Brazil (SIN grid) as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system"²⁸.

²⁸ While applying option A.1 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", $EF_{EL,grid,y}$ will be determined ex-post as the CO_2 Combined Margin emission factor for the National Electricity Grid of Brazil ($EF_{grid,CM,y}$). As an alternative, applicable values will be directly determined as the applicable conservative default values as per option A.2 of the same methodological tool. The selection of the calculation approach for the determination of $EF_{grid,y}$ (option A.1 or A.2) will be done on an ex-post basis during period verification(s) of the project activity within its 1st GS 5-year crediting period and will take into account (i) whether a backup diesel generator will be installed and under operation during the period to be encompassed by the monitoring period(s) in question and (ii) whether required data for the determination of the CO_2 Combined Margin emission factor for the National Electricity Grid of Brazil or related calculation results will be made available.

By following procedure and guidance described in Section B.6.1, the combined margin CO₂ emission factor ($EF_{grid,CM,y}$) for the electricity grid of Brazil (SIN grid) is estimated as follows:

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

Where:

w_{OM}	Weighting of operating margin emissions factor. w_{OM} is ex-ante determined as 25% (0.25). See Section B.6.2 for further details.
w_{BM}	Weighting of build margin emissions factor. w_{BM} is ex-ante determined as 75% (0.75). See Section B.6.2 for further details.
$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y. The build margin CO ₂ emission factor for the national electricity grid of Brazil is ex-ante determined as the value applicable for year 2017 (as determined in the CDM PDD valid for the currently expired 2 nd CDM crediting period and also the 3 rd CDM crediting period). Thus, $EF_{grid,BM,y} = EF_{grid,BM,2017}$ is ex-ante determined as 0.0028 tCO ₂ /MWh. Further details are available in Section B.6.2 ²⁹ .
$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year y (in tCO ₂ /MWh). In the particular case of the project activity, $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$.

²⁹ Details about the determination of the CO₂ Emission Factors for the national electricity grid of Brazil (according to the methodological tool: "Tool to calculate the emission factor for an electricity system (version 07.0 and previous versions) are made available online:

<https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao>

Operational Margin CO₂ emission factor (dispatch analysis calculation method ($EF_{grid,OM-DD,y}$):

In the particular context of ex-ante estimations of emission reductions to be achieved by the GS project activity, the adopted value for $EF_{grid,OM-DD,y}$ is the value published by the DNA of as being the calculated value which is valid for year 2022 (the latest year for which values are available at the time of the completion of the initial version of this Transition Request Form + GS4GG PDD and starting of validation assessment for transition request under the GS4GG of the GS project activity):

Operating Margin Emission Factor of Brazilian Integrated Electric System for year 2022 (dispatch analysis calculation method)

Operating Margin Emission Factor in year 2022											
CO ₂ Emission Factor (tCO ₂ /MWh)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.522	0.488	0.406	0.215	0.280	0.440	0.041	0.456	0.489	0.467	0.403	0.293

The average value of $EF_{grid,OM-DD,2022}$ is thus calculated as 0.4068 tCO₂/MWh. Values of $EF_{grid,OM-DD,2022}$ are determined and reported by the DNA of Brazil. Further details are available online at the website of the DNA of Brazil.

$EF_{grid,CM,y}$ is thus calculated as follows:

$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} = 0.25 * 0.4068 + 0.75 * 0.0028 = 0.1220$ tCO₂/MWh (where related calculations are summarized in the emission reduction calculation spreadsheet enclosed to this Transition Request Form + GS4GG PDD).

As a simplification (only in the particular context of the ex-ante estimation of project emissions), it is assumed that the calculated combined margin grid emission factor ($EF_{grid,CM,y}$) based on the value of $EF_{grid,OM-DD,2022}$ (valid for year 2022) and the value of $EF_{grid,BM,2022}$ is valid/applicable for the determination of ex-ante estimates of emission reductions for all years encompassed by the 1st GS crediting period of the GS project activity (regardless of the fact that annual values for the operating margin CO₂ emission factor ($EF_{grid,OM,y}$) are to be ex-post determined every year, thus potentially affecting the value to be calculated for $EF_{grid,CM,y}$ for each individual year encompassed by the 1st GS crediting period).

This simplification is anyway under conformance with applicable CDM rules³⁰.

Information related to the determination of the combined margin CO₂ emission factor for the national electricity grid of Brazil is made available at the website/web portal of the DNA of Brazil³¹.

³⁰ In the context of ex-ante estimations of project emissions due to consumption of grid electricity by the GS project activity, it is reasonable to consider as a simplification that significant changes in the average and marginal CO₂ intensity for electricity generated at the national electricity grid of Brazil are not expected to occur during the 1st GS -year crediting period of the GS project activity due to the following reason:

- As per official domestic electricity generation related information published by the Brazilian Government, *"The system keeps the predominance of renewable and non-greenhouse gases emitting sources, amounting up to 80% of total capacity. The need of additional power capacity to cope with net peak load appears from 2022 onwards, totaling about 13,200 MW in 2027, which could be provided by storage technologies or flexible thermal power plants"*. (<https://www.epe.gov.br/en/press-room/news/pde-2027-the-ten-year-energy-expansion-plan-2027>).

Thus, no significant/relevant changes in the average and marginal CO₂ intensity of electricity generation in Brazil is expected to occur by considering the high predominance of use of renewable energy sources for the generation of grid-sourced electricity in Brazil in recent years.

- Although the project participant acknowledges that, in the particular case of Brazil, calculated annual values for the CO₂ Combined Margin emission factor for the National Electricity Grid of Brazil is somehow heavy influenced by unpredictable aspects such as rain patterns, level of dams in large hydropower plants, capacity factors for non-conventional renewable energy generation facilities (e.g. wind and biomass power plants, etc.), the above-quoted information represents, under a certain limit, a credible reasons for assuming a fixed value for EF_{grid,CM} in the context of the ex-ante estimations of emission reductions to be achieved by the GS project activity during its 1st GS 5-year crediting period.
- Regardless of the assumption of a fixed value for EF_{grid,CM} in the context of the ex-ante estimations of emission reductions to be achieved by the GS project activity during the 1st GS 5-year crediting period (only in the context of ex-ante estimation of emission reductions), as highlighted in Section B.6.1, the CO₂ combined emission factor for the national electricity grid of Brazil will be annually calculated ex-post (in case this approach is selected).
- The ex-ante estimated values for annual project emissions due to consumption of grid electricity represent (in nominal terms) a very low fraction of estimated total annual emission reductions to be achieved by the GS project activity.

³¹ Calculation of CO₂ emission factor for the National Electricity Grid of Brazil: Data source is available online: <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao>.

An emission reduction calculation spreadsheet is enclosed to this Transition Request Form + GS4GG PDD. This calculation spreadsheet includes all required related calculations for the ex-ante estimation of $BE_{CH_4,y}$ and $BE_{EC,y}$.

The ex-ante estimation of $BE_y = BE_{CH_4,y} + BE_{EC,y}$ is thus summarized as follows:

	Estimation of $F_{CH_4,PJ,y}$ (tCH ₄)	Estimation of $F_{CH_4,BL,y}$ (tCH ₄)	Estimation of $BE_{CH_4,y}$ (tCO _{2e})	Estimation of $BE_{EC,y}$ (tCO _{2e})	Estimation of baseline emissions (tCO _{2e})
Year	$F_{CH_4,PJ,y} = n_{PJ} * BE_{CH_4,SWDS,y} / GWP_{CH_4}$	$F_{CH_4,BL,y} = 0$	$BE_{CH_4,y} = ((1 - OX_{top_layer}) * F_{CH_4,PJ,y} - F_{CH_4,BL,y}) * GWP_{CH_4}$	$BE_{EC,y} = EC_{BL,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y})$	$BE_y = BE_{CH_4,y} + BE_{EC,y}$
2021	12,254	2,451	240,184	6,669	246,853
2022	12,632	2,526	247,585	6,669	254,254
2023	11,719	2,344	229,697	6,011	235,708
Total	36,605	7,321	717,466	19,349	736,815

Note: All values applicable for the year 2023 is valid for the fraction of this year which is encompassed by the 1st GS crediting period: from 01/01/2023 to 26/11/2023 respectively.

Determination of ex-ante estimations for project emissions (PE_y):

As outlined in Section B.6.1, project emissions to be considered in the context of the determination of emission reductions to be achieved by the GS project activity are those due to the consumption of grid-sourced electricity and electricity sourced by the backup diesel generator. The related ex-ante estimations of the corresponding project emissions are determined as follows:

Determination of ex-ante estimations of project emissions due to consumption of grid-electricity by the project activity ($PE_{EC,grid,y}$):

By following the applicable methodological approaches and assumptions + ex-ante determined values presented in Section B.6.1 and B.6.2 respectively, $PE_{EC,grid,y}$ is determined as follows:

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

Where:

$PE_{EC,grid,y}$ Project emissions due to consumption of grid-sourced electricity by the GS project activity in year y (in tCO_2/yr).

$EC_{PJ,grid,y}$ Quantity of grid-sourced electricity consumed by the GS project activity in year y (in MWh). $EC_{PJ,grid,y}$ is estimated as being around 75 MWh per year. Further details are included in Section B.7.1. This value is assumed based on the expected nominal power output for the main electrical equipment to be installed as part of the project activity under its final configuration (e.g installed centrifugal blowers + ancillary equipment) and also by assuming that such equipment will work continuously (24 hours a day) under full power during the whole 1st GS crediting period.

$TDL_{grid,y}$ Average technical transmission and/or distribution losses for grid-sourced electricity consumed by the GS project activity in year y . For the particular case of estimates of $PE_{EC,grid,y}$, $TDL_{grid,y}$ is selected as 20%. Further details are included in Section B.7.1.

$EF_{EL,grid,y}$ CO_2 emission factor for grid-sourced electricity in year y (in tCO_2/MWh). In the particular context of ex-ante estimates of emission reductions to be achieved by the GS project activity within its 1st GS crediting period, $EF_{EL,grid,y}$ is estimated as per guidance of the methodological tool "Tool to calculate the emission factor for an electricity system" as the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) for the electricity grid of Brazil (SIN grid) with its value being estimated as 0.1220 tCO_2/MWh . Further determination details are presented above in this Section under estimates of baseline emissions for electricity generation with related calculations being summarized in the emission reduction calculation spreadsheet.

Determination of ex-ante estimations of project emissions due to consumption of electricity sourced by the backup diesel generator by the project activity ($PE_{EC,captive,y}$):

No consumption of electricity sourced by the backup diesel generator is considered for the ex-ante estimates of emission reductions to be achieved by the GS project activity within its 1st GS crediting period.

In summary, ex-ante estimations of total project emissions for the GS project activity during its 1st GS crediting period are thus summarized as follows:

Year	Consumption of grid-sourced electricity (MWh)	Project emissions due to grid-source electricity consumption (tCO ₂ e)	Consumption of electricity sourced by the captive diesel backup generator (MWh)	Total Project emissions promoted the project activity (due to electricity consumption) ($PE_{EC,grid} = PE_y$) (tCO ₂ e)
	$EC_{PJ,grid,y}$	$PE_{EC,grid,y} = (EC_{PJ,grid,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y,import})) +$	$EC_{PJ,captive,y}$	$PE_{EC,y} = (EC_{PJ,grid,y} * EF_{EL,grid,import,y} * (1 + TDL_{grid,y})) + (EC_{PJ,captive,y} * EF_{EL,captive,y} * (1 + TDL_{captive,y}))$
2021	77	11	0	11
2022	77	11	0	11
2023	69	10	0	10
Total	224	33	0	33

Note: Values of $EC_{PJ,grid,y}$ and $PE_{EC,y}$ applicable for year 2023 is valid for the fraction of this year which is encompassed by the 1st GS crediting period of the GS project activity: period from 01/01/2023 to 26/11/2023 respectively.

Summarized ex-ante estimations of emission reductions (ER_y):

By taking into account the above summarized values for baseline and project emissions, the ex-ante estimations of the emission reductions for the GS project activity along its 1st GS crediting period are summarized as follows:

Emission reductions (tCO ₂ e)	
Year	Emission reductions
2021	246,842
2022	254,243
2023	235,698
Total	736,783

Note: Values of ER_y applicable for year 2023 is valid for the fraction of this year which is encompassed by the 1st GS crediting period of the GS project activity: period from 01/01/2023 to 26/11/2023 respectively.

B.6.4 Summary of ex ante estimates of each SDG Impact

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SDG 13

Year	Baseline estimate (tCO ₂ e)	Project estimate (tCO ₂ e)	Net benefit (tCO ₂ e)
2021	246,853	11	246,842
2022	254,254	11	254,243
From 01/01/2023 to 26/11/2023	235,708	10	235,698
Total	736,815	33	736,783
Total number of crediting years	3		
Annual average over the crediting period	245,605	11	245,594

SDG 7

Year	Baseline estimate (MWh)	Project estimate (MWh)	Net benefit (MWh)
2021	53,089	0	53,089
2022	53,089	0	53,089
From 01/01/2023 to 26/11/2023	47,853	0	47,853
Total	154,033	0	154,033
Total number of crediting years	3		
Annual average over the crediting period	51,344	0	51,344

SDG 8

Year	Baseline estimate (number of jobs per year)	Project estimate (number of jobs per year)	Net benefit (number of jobs per year)
2021	6	0	6
2022	6	0	6
From 01/01/2023 to 26/11/2023	6	0	6
Total number of crediting years	3		
Annual average over the crediting period	6	0	6

B.7. Monitoring plan

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B.7.1 Data and parameters to be monitored

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SDG 13

Data / Parameter	Management of SWDS
Unit	-
Description	Management of SWDS
Source of data	Monitoring performed by the project participants and/or appointed 3rd party. The design and operational conditions of the solid waste disposal site (SWDS) JP landfill will be annually monitored on the basis of different sources, including: - Original construction and operational design of the JP landfill - Technical specifications and requirements for the management of the JP landfill - Applicable local or national regulations dealing with management and operation of existing landfills Any occurred or planned relevant change in terms of management of the JP landfill will be reported and justified.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Original construction and operational design of the JP landfill should be confirmed as not being modified during the 1 st GS crediting period of the GS project activity. This is to ensure that no practice aiming to increase methane generation in the landfill has been occurring after the implementation of the project activity. As required by

	ACM0001 (version 19.0), any change in the management of the JP landfill after the implementation of the project activity should be justified by referring to technical or regulatory specifications.
Monitoring frequency	Annually.
QA/QC procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$V_{t,wb,j}$
Unit	m ³ wet gas/h
Description	Volumetric flow of LFG stream in time interval t on a wet basis for j (where j is the LFG delivery pipeline to each flare or each engine).
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying appropriate LFG flow meters.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Volumetric flow measurement of collected LFG should always refer to the actual LFG absolute pressure and LFG temperature. Use of measuring instrument/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events for the LFG flow meters will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a

	frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter will be monitored in case Options B or C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" are applied for the determination of $F_{CH_4, flared, y}$ and/or $F_{CH_4, EL}$.

Data / Parameter	$V_{t, db, j}$
Unit	m ³ dry gas/h
Description	Volumetric flow of LFG stream in time interval t on a dry basis for j (where j is the LFG delivery pipeline to each flare and/or each engine of the electricity generation infrastructure)
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying appropriate LFG flow meters.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Volumetric flow measurement of collected LFG should always refer to the actual LFG absolute pressure and LFG temperature. Calculated based on the wet basis LFG flow measurement plus water concentration measurement. Use of measuring instrument/equipment with recordable electronic signal (analogical or digital) is assumed.

Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events for the LFG flow meter(s) will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter will be monitored in case Option A of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH_4,PJ,y}$.

Data / Parameter	$V_{CH_4,t,db,j}$
Unit	m ³ CH ₄ /m ³ dry gas
Description	Volumetric fraction of CH ₄ in the collected LFG in time interval t on a dry basis for j (where j is the LFG delivery pipeline to each flare and/or each engine of the electricity generation infrastructure) ³²
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying an appropriate continuous CH ₄ content gas analyzer.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measurements to be performed by appropriate continuous gas analyzer(s) operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. Use of measuring instrument/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events in the continuous CH ₄ content gas analyzer(s) will be performed by utilization of calibration span gas with certified CH ₄ content (for span checking/adjustment). Utilization of an inert calibration

³² By taking into account the design of the GS project activity, a unique instrument may be appropriately positioned/installed at the LFG delivery pipeline serving all methane destruction devices of the project activity (e.g. flares) and used to perform continuous measurements of volumetric fraction of CH₄.

	gas (e.g. N₂) will also occur (for span checking/adjustment). All calibration gases (span gases) must have a certificate provided by the gas supplier and must be under their validity period. Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter will be monitored in case Option B of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH_4,PJ,y}$. This parameter may be monitored in case Options A or D of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" are applied instead.

Data / Parameter	$V_{CH_4,t,wb,j}$
Unit	m ³ CH ₄ /m ³ wet gas
Description	Volumetric fraction of CH ₄ in the collected LFG in time interval t on a wet basis for j (where j is the LFG delivery pipeline to each flare or each engine)
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the project activity by applying appropriate continuous CH ₄ content gas analyzer(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measurements to be continuously performed by appropriate gas analyzer(s) operating in wet-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. (calculated based on the dry basis analysis plus water concentration measurement or continuous in-situ analyzer(s)). Use of measuring instrument/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events in the continuous CH ₄ content gas analyzer(s) will be performed by utilization of calibration span gas with certified CH ₄ content (for span checking/adjustment). Utilization of an inert calibration gas (e.g., N ₂) will also occur (for span checking/adjustment). All calibration gases (span gases) must have a certificate provided by the gas supplier and must be under their validity period.

	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter will be monitored in case Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH_4,PJ,y}$. This parameter may be monitored in case Options A or D of the methodological tool are applied instead.

Data / Parameter	$M_{t,db,j}$
Unit	kg/h
Description	Mass flow of the LFG stream in time interval t on dry basis for j (where j is the LFG delivery pipeline to each flare and/or each engine of the electricity generation infrastructure)
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying appropriate LFG flow meters.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Continuous measurements to be performed by applying appropriate flow meter operating in dry basis. Mass flow measurement should always refer to the actual pressure and temperature (calculated based on the wet basis flow measurement plus water concentration measurement).

	Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events for the LFG flow meter(s) will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter will be monitored only in case Option D of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH_4,PJ,Y}$.

Data / Parameter	T_t
Unit	K ³³
Description	Temperature of the LFG stream in time interval t
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying appropriate LFG temperature sensor.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measured to determine the density of methane ρ_{CH_4} . No separate monitoring of LFG temperature is necessary when using LFG flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (by considering standard temperature and pressure (STP) conditions). Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events will be performed in the LFG temperature sensor by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations.

³³ Measurements for T_t may be recorded and reported in °C. Recorded/reported data will be converted to Kelvin to also being recorded/reported in K.

	Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	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 this parameter may not be required except if the applicability condition related to the gaseous stream flow temperature being below 60°C is adopted. Under this circumstance, this parameter shall be monitored continuously to assure the applicability condition is indeed met.

Data / Parameter	P_t
Unit	Pa ³⁴
Description	Pressure of the LFG stream in time interval t
Source of data	Measurements/monitoring performed by the project participants. Measured as part of the operation of the GS project activity by applying appropriate LFG pressure sensor.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.

³⁴ Depending on installed measurement instrument, measurements for P_t may be recorded and reported in mbar. In such cases, recorded/reported data will be converted into Pascal in order to be also recorded and reported in Pa.

Measurement methods and procedures	Measured to determine the density of methane ρ_{CH_4}. No separate monitoring of LFG pressure is necessary when using LFG flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters (by considering standard temperature and pressure (STP) conditions). Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.
QA/QC procedures	Periodic calibration events will be performed in the LFG pressure sensor by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$P_{H_2O,t,Sat}$
Unit	Pa (depending on measurement instrument, measurement records in mbar will be converted and also reported in Pa)
Description	Saturation pressure of H_2O at temperature T_t in time interval t

Source of data	Data as per the literature " <i>Fundamentals of Classical Thermodynamics</i> "; Authors: Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4 ^o Edition 1994. Published by John Wiley & Sons, Inc.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	This parameter is solely a function of the LFG stream temperature T_t and can be found at above-referenced literature for a total pressure equal to 101,325 Pa.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	-

Data / Parameter	EC_{PJ,grid,y}
Unit	MWh
Description	Amount of grid electricity consumed by the project activity during the year y
Source of data	Measured as part of the operation of the GS project activity by applying appropriate electricity meter(s)
Value(s) applied	It is estimated that the GS project activity will consume around 75 MWh of grid-sourced electricity per year during its 1st GS 5-year crediting period. In the context of the ex-ante estimation of emission reductions to be achieved by the GS project activity during its 1st GS crediting period, it is considered that the project's electricity demand will be met entirely by imports of grid-sourced electricity.
Measurement methods and procedures	Authorized electricity meter(s). Measurement records will be cross-checked against available electricity consumption receipts/invoices issued by the local

	electricity distribution company. The parameter $EC_{PJ,y}$ is equivalent to the parameter $EG_{EC,y}$ as indicated in ACM0001 (version 19.0).
Monitoring frequency	Continuous measurements will be aggregated automatically. Accumulated measurement records will be reported at least once a month.
QA/QC procedures	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of project emissions.
Additional comment	The values considered in the context of the ex-ante estimation of emission reductions were selected based on the probable nameplate power output for the centrifugal blower(s) to be installed as part of the project activity. The centrifugal blower(s) is/are the most electricity intensive equipment to be installed as part of the project activity. Also, as a conservative assumption, it is considered that the project activity will operate 24 hours a day during its 1st GS 5-year crediting period. Measurement records will be cross-checked against available receipts/invoices/reports for imports and/or purchase of grid-sourced electricity.

Data / Parameter	EC_{PJ,captive,y}
Unit	MWh
Description	Quantity of electricity generated in captive diesel backup generator during the year y
Source of data	Measured as part of the operation of the GS project activity by applying appropriate electricity meter(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by the project activity as it is assumed, in this particular context, that all electricity demand of the GS project activity will be met by imports of grid-sourced electricity.
Measurement methods and procedures	Appropriate electricity meter(s).
Monitoring frequency	Measurements will be aggregated manually or automatically. Accumulated measurement records will be reported at with at least every-month frequency.
QA/QC procedures	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of project emissions.
Additional comment	Measurement records will be crosschecked against available diesel consumption receipts/invoices issued by the diesel supplying company. A backup captive off-grid backup electricity generator is expected to be used only for emergency purposes. Thus, in the context of ex-ante estimates of emission reductions to be achieved by the

	GS project activity, there is no estimated amount of electricity to be generated this generator and/or amount of fossil fuel diesel to be consumed by the generators either. Project emissions due to the consumption of electricity sourced by these generators are thus estimated as zero (null) in the context of ex-ante estimates of emission reductions to be achieved by the GS project activity. However, such project emissions will be determined ex-post along the crediting period (based on applicable monitoring and calculation requirements as presented in Section B.6.1) and will be accounted for the determination of emission reductions.
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Data / Parameter	$EF_{grid,OM,y} = EF_{grid,OM-DD,y}$
Unit	tCO ₂ /MWh
Description	Operation margin CO ₂ emission factor in year y = Dispatch data analysis operating margin CO ₂ emission factor in year y .
Source of data	Data will be determined as per applicable guidance for dispatch data analysis operating margin CO₂ emission factor as per Option A.1 of the methodological tool "Tool to calculate the emission factor for an electricity system". The selected value considered for all years encompassed by the 1st GS 5-year crediting period of the project activity in the context of the ex-ante estimation of emission reductions represents the value calculated by the DNA of Brazil and valid for year 2022 (the most recent value available). Data is made available online:

	https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao
Value(s) applied	0.4068
Measurement methods and procedures	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".
Monitoring frequency	Yearly.
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comment	While applying option A.1 as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", $EF_{EL,grid,y}$ will be determined ex-post as the CO ₂ Combined Margin emission factor for the National Electricity Grid of Brazil ($EF_{grid,CM,y}$), for which ex-post determination of $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ is required. As an alternative, applicable values will be directly determined as the applicable conservative default values as per option A.2 of the same methodological tool. The selection of the calculation approach for the determination of $EF_{grid,y}$ (option A.1 or A.2) will be done on an ex-post basis during period verification(s) of the GS project activity within its 1 st GS crediting period and will take into account (i) whether a backup diesel generator will be installed and under operation during the period to be encompassed by the monitoring period(s) in question and (ii) whether required data for the determination of the CO ₂ Combined Margin emission factor for the National Electricity Grid of Brazil or related calculation results will be made available.

Data / Parameter	Op_{j,h}
Unit	-
Description	Operation of the equipment that consumes LFG (engine-generator sets of the electricity generation infrastructure)
Source of data	Measured as part of the operation of the GS project activity.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	For each equipment unit j using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. Document and justify the location and minimum threshold in the Transition Request Form + GS4GG PDD; (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnaces. This option is not applicable to brick kilns. Op_{j,h} = 0 when: (a) One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are made at least every minute); (b) Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); (c) No products are generated in the hour h.

	Otherwise, $Op_{j,h} = 1$
Monitoring frequency	Hourly
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$F_{CH_4,EG,t}$
Unit	Kg
Description	Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t
Source of data	Measurements undertaken by a third-party accredited entity for each operational flare
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measure the mass flow of methane in the exhaust gas of each operational flare according to an appropriate national or international standard (such as the UK's Technical Guidance LFTGN05 or a similar standard). The time period t over which the mass flow is measured must be at least one hour. The average flow rate to the flare during the time period t must be greater than the average flow rate observed for the previous six months.
Monitoring frequency	Biannual.
QA/QC procedures	QA/QC procedures are to be applied by the entity responsible for performing the related measurements as per requirements of the applied standard. Periodic calibration events in the applied instruments will be performed by a third party independent accredited calibration laboratory (in a frequency as per instrument

	specifications and/or instrument manufacturer's recommendations). Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Calculation of baseline emissions.
Additional comment	Monitoring of this parameter is required in the case of enclosed flare(s) and if the project participants select Option B.1 to determine flare efficiency.

Data / Parameter	$T_{EG,m}$
Unit	°C
Description	Temperature in the exhaust gas of the enclosed flare in minute m
Source of data	Measurements performed for each operational flare by the project participants
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measure the temperature of the exhaust gas of each operational high temperature enclosed flare by appropriate temperature measurement equipment (e.g., thermocouples). Measurements outside the operational temperature specified/recommended by the manufacturer may indicate that one or more flares is/are not functioning correctly and may require maintenance. Flare manufacturers must provide suitable monitoring ports for the monitoring of the temperature of the

	exhaust gas of the flare. These would normally be expected to be in the middle third of the flare.
Monitoring frequency	Continuous measurements will be recorded and reported with a least every minute frequency.
QA/QC procedures	Temperature measurement equipment should be replaced or calibrated in accordance with their maintenance schedule.
Purpose of data	Calculation of baseline emissions.
Additional comment	Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. As part of the monitoring procedure, these events will be noted in the site records along with any corrective action that was implemented to correct the issue. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met. Periodic calibration events will be performed in the instruments by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.

Data / Parameter	Flame_m
Unit	Flame status "on" or flame status "off"
Description	Flame detection of flare in the minute <i>m</i>
Source of data	Measurements/monitoring for each operational flare performed by the project participants. Whenever, flame is detected in the flare, flame status "on" is attributed. Whenever flame is not detected in the flare, flame status "off" is attributed.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Measure for each operational flare using a fixed installation optical flame detector: Ultraviolet detector or Infra-red or both.
Monitoring frequency	Once per minute.
QA/QC procedures	Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations.
Purpose of data	Calculation of baseline emissions.
Additional comment	Applicable to the flare(s). The condition will be regularly monitored for each individual high temperature enclosed flare. Periodic calibration events will be performed in the instruments by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice.

	Spare instrument(s) may be kept.
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Data / Parameter	Maintenance_y
Unit	Calendar dates
Description	Maintenance events completed in year <i>y</i> as monitored by the project participants.
Source of data	Measurements/monitoring performed by the project participants.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reductions.
Measurement methods and procedures	Record the date that maintenance events were completed in year <i>y</i> . 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.
Monitoring frequency	Annually.
QA/QC procedures	Records must be kept in a maintenance log for two years beyond the life of the flare.
Purpose of data	Calculation of baseline emissions.
Additional comment	Monitoring of this parameter is required for the case of enclosed flare(s) and the project participant selects Option B to determine flare efficiency. These dates are required so that they can be compared to the maintenance schedule to check that maintenance events were completed within the minimum time between maintenance events specified by the manufacturer (SPEC _{flare}).

Data / Parameter	TDL_{grid,y}
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to the grid and/or for grid-sourced electricity consumed by the project activity
Source of data	Use of recent, accurate and reliable data available within the host country or selection of applicable default values as per Option A of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" or use of recent, accurate and reliable data available within the host country.
Value(s) applied	3% (for generated electricity exported through the electricity grid the GS project activity is connected to (TDL_{grid,export,y})) 20% (for electricity imported by the project activity through the electricity grid the GS project activity is connected to (TDL_{grid,import,y}))
Measurement methods and procedures	The methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" defines, as alternative, default value of 20% for project consumption sources (applicable for determination of project emissions due to consumption of grid-sourced electricity by the GS project activity) and default value of 3% for baseline electricity consumption sources (applicable for the determination of baseline emissions for electricity generation by the GS project activity). The selection of these default values is under conformance with applicable guidance of ACM0001 (version 19.0).

While transmission and distribution sources applicable for both grid-sourced electricity to be consumed by the GS project activity and for electricity generation by the GS project activity (equivalent to electricity consumption of baseline electricity consumption sources when applying the underlying tool) do not fit under Scenario B and/or Scenario C (case II) of the such tool, the selected 20% value for $TDL_{grid,import,y}$ and 3% values for $TDL_{grid,export,y}$ are thus under conformance with applicable guidance of the tool.

The selection of 20% value for $TDL_{grid,import,y}$ and 3% value for $TDL_{grid,export,y}$ meets applicable guidance for Scenarios A and C (cases I and III) of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (whichever of these scenarios are applicable for the particular case of the GS project activity).

As per the project design, the amount of electricity to be consumed by the project activity to which scenario C of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" refers is smaller than the electricity consumption of baseline electricity consumption sources ($EC_{BL,k,y}$) as per such methodological tool (where $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year y ($EG_{PJ,y}$) as defined by ACM0001 (version 19.0)). In summary, the GS project activity generates more electricity than it requires for its operation, with the largest amount of generated electricity being exported through the electricity grid the project activity is connected to. Under these particular conditions, also considering the 3% default value for

	electricity imported by the GS project activity in thesis would represent an acceptable alternative. However, as a conservative approach, the generic 20% default value applicable for project consumption sources is selected. This approach results in higher project emissions, thus reducing emission reductions to be achieved by the GS project activity accordingly.
Monitoring frequency	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures	-
Purpose of data	Data is used for determination of baseline emissions and project emissions.
Additional comment	-

Data / Parameter	TDL_{captive,y}
Unit	-
Description	Average technical transmission and distribution losses for electricity sourced by the captive electricity generator
Source of data	Selection of applicable default values as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Value(s) applied	0
Measurement methods and procedures	-
Monitoring frequency	Annually.
QA/QC procedures	-
Purpose of data	Data is used for determination of project emissions.
Additional comment	-

Data / Parameter	Status of biogas destruction device(s)
Unit	-
Description	Operational status of biogas destruction device(s)
Source of data	Not applicable.
Value(s) applied	Not applicable.
Measurement methods and procedures	Monitoring and documenting may be undertaken through monitoring of the operation of the flare(s) (by means of flame detector in each flare) or engines in order to demonstrate the actual destruction of methane in such installed biogas destruction devices. Emission reductions will not accrue for periods in which the underlying destruction device(s) (high temperature enclosed flare(s) or engines) is/are not operational.
Monitoring frequency	Continuous measurements will be recorded and reported with a least every minute frequency.
QA/QC procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comment	Monitoring records for the monitoring parameter "Flame detection of flare in the minute m " (Flame_m) will be considered for the particular case of the flare(s).

SDG 7 and SDG 13

Data / Parameter	$\text{EC}_{\text{BL},y}$
Unit	MWh
Description	Amount of electricity generated using LFG by the project activity in year y
Source of data	Measured as part of the operation of the GS project activity by applying appropriate electricity meter(s).

Value(s) applied	It is estimated that the project activity will generate electricity along its 1st GS 5-year crediting period as follows: <table> <tr> <th>Year</th><th>Estimation of EC_{BL,y} (MWh)</th></tr> <tr> <td>2021</td><td>53,090</td></tr> <tr> <td>2022</td><td>53,090</td></tr> <tr> <td>2023</td><td>47,854</td></tr> <tr> <td>Total</td><td>154,033</td></tr> </table>	Year	Estimation of EC _{BL,y} (MWh)	2021	53,090	2022	53,090	2023	47,854	Total	154,033
Year	Estimation of EC _{BL,y} (MWh)										
2021	53,090										
2022	53,090										
2023	47,854										
Total	154,033										
Measurement methods and procedures	Authorized electricity meter(s). The parameter EC_{BL,y} is equivalent to the parameter EG_{PJ,y} as indicated by ACM0001 (version 19.0). Measurement records will be cross-checked against available electricity commercialization receipts/invoices										
Monitoring frequency	Measurements will be aggregated manually or automatically. Accumulated measurement records will be reported at with at least every-month frequency.										
QA/QC procedures	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance with appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.										
Purpose of data	Calculation of baseline emissions.										
Additional comment	-										

SDG 8

Data / Parameter	Total number of jobs
Unit	-
Description	Number of employees related to the operation of the GS project activity
Source of data	Employment records
Value(s) applied	6 jobs per year
Measurement methods and procedures	In accordance with records of employees related to the operation of the GS project activity.
Monitoring frequency	Annually.
QA/QC procedures	-
Purpose of data	-
Additional comment	-

B.7.2 Sampling plan

>>

Not applicable.

B.7.3 Other elements of monitoring plan

>>

General monitoring:

The following instruments/equipment will be used to monitor required data along the 1st GS crediting period of the GS project activity (depending on the applied measurement options and calculation approaches - to be chosen ex-post):

Instrument or Source of data	Measurement option	Data monitored
Appropriate volumetric or mass flow meter(s) (one individual LFG flow meter for each operational high temperature enclosed flare and/or each operational engine, with separated measurement data being recorded and reported for each one of these methane destruction devices)	A	Volume flow – dry basis; Volumetric fraction dry or wet basis $V_{t,db,j}$ Volumetric flow of LFG stream j in time interval t on a dry basis (in m ³ dry gas/h). j = LFG delivery pipeline to each operative high temperature enclosed flare and/or each operative engine (i.e. each installed methane destruction device)
	B	Volume flow – wet basis; Volumetric fraction dry basis $V_{t,wb,j}$ Volumetric flow of LFG stream j in time interval t on a wet basis (in m ³ dry gas/h). j = LFG delivery pipeline to each operative high temperature enclosed flare and/or each operative engine (i.e. each installed methane destruction device)
	C	Volume flow – wet basis; Volumetric fraction wet basis $V_{t,wb,j}$ Volumetric flow of LFG stream j in time interval t on a wet basis (in m ³ wet gas/h). j = LFG delivery pipeline to each operative high temperature enclosed flare and/or each operative engine (i.e. each installed methane destruction device)
	D	Mass flow – dry basis; $M_{t,db,j}$ Mass flow of LFG stream j in time interval t on a dry basis (in kg/h). j = LFG delivery pipeline to each operative high temperature

Instrument or Source of data	Measurement option	Data monitored
	Volumetric fraction dry or wet basis	enclosed flare and/or each operative engine (i.e. each installed methane destruction device)
Continuous CH ₄ content gas analyzer unit	-	V_{CH4,t,db/wb,j} Volumetric fraction of methane on the LFG stream directed to the flare(s) and/or engines in a time interval t on a dry or wet basis (in m ³ CH ₄ /m ³ dry or wet gas)
LFG pressure sensor	-	P_t Pressure of the LFG stream directed to the flare(s) and/or engines in time interval t (in Pa or mbar) Note: P_t may not be monitored when using LFG flow meter(s) that automatically considers and measures LFG temperature and LFG pressure, thus expressing LFG volumetric or mass flows in normalized units.
LFG temperature sensor	-	T_t Temperature of the LFG stream directed to the flare(s) and/or engines in time interval t (in K or °C) Note: T_t may not be monitored when using LFG flow meter(s) that automatically considers and measures LFG temperature and LFG pressure, thus expressing LFG volumetric or mass flows in normalized units.
Not based on measurements. Monitoring performed in the	-	p_{H2O,t,Sat} Saturation pressure of H ₂ O at temperature T _t in time interval t This parameter is solely a function of the LFG stream temperature T _t

Instrument or Source of data	Measurement option	Data monitored
context of operation/monitoring for the project activity (based on calculations)		and can be found at referenced literature.
Electricity meter(s)		EC_{BL,y} = Amount of electricity generated using LFG by the project activity in year y
Electricity meter(s)		EC_{PJ,grid,y} Amount of grid electricity consumed by the project activity in year y (in MWh)
Electricity meter(s)		EC_{PJ,captive,y} Amount of electricity generated in captive diesel backup generator during the year y (in MWh)
Not based on measurements. Monitoring performed in the context of operation/monitoring for the project activity (based on calculations)	-	EF_{grid,OM,y} = Operation margin CO ₂ emission factor in year y = Dispatch data analysis operating margin CO ₂ emission factor in year y. (in tCO ₂ /MWh). EF_{grid,OM-DD,y} 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".
Not based on measurements performed in the context of operation/monitoring for the project activity	-	Management of SWDS Management of SWDS The design and operational conditions of the landfill will be

Instrument or Source of data	Measurement option	Data monitored
		annually monitored on the basis of different sources, including: - Original design of the landfill; - Technical specifications for the management of the landfill; - Applicable local or national regulations
Meter or equipment electronics.	-	Op_{j,h} Operation of the equipment that consumes LFG (engines of the electricity generation facility). For each engine j using LFG, it will be continuously monitored whether the equipment is operating in hour h by monitoring any one the following sub-parameter/condition: - Amount of electricity generated in hour h. - Status of the engine during each hour h.
Measurements undertaken by a third-party accredited entity	B.1	F_{CH4,EG,t} Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t (kg) For each high temperature enclosed flare, it will be measured the mass flow of methane in the exhaust gas according to an appropriate national or international standard (e.g. UKs Technical Guidance LFTGN05). The time period t over which the mass flow is measured must be at least one hour. The average flow rate to the flare during the time period t must be greater than the average flow rate

Instrument or Source of data	Measurement option	Data monitored
		observed for the previous six months. Monitoring of this parameter is only required in the case the project participants select Option B.1 to determine the efficiency values for the high temperature enclosed flare(s).
Thermocouple(s)	A or B.1	$T_{EG,m}$ Temperature in the exhaust gas of the enclosed flare in minute m (°C) For each high temperature enclosed flare, it will be continuously measured the temperature of the exhaust gas through use of appropriate temperature measurement instrument (e.g. thermocouple(s)). Measurements outside the operational temperature specified by the flare manufacturer may indicate that the flare is not functioning correctly and may require maintenance or repair work. For each flare, the temperature of the exhaust gas in each flare has to be measured in a suitable monitoring port. In high temperature enclosed flare(s), monitoring ports are normally expected to be located within the middle third of the flare. In case more than one temperature port is fitted to the high temperature enclosed flare, the flare manufacturer must provide written instructions detailing the

Instrument or Source of data	Measurement option	Data monitored
		conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer's specifications for temperature of exhaust gas. The high temperature enclosed flare(s) to be installed as part of the project activity may only have one monitoring port for temperature of the exhaust gas. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met.
Optical flame detector (using ultraviolet or infra-red technology or both	A or B.1	Flame_m Flame detection of flare in the minute <i>m</i> (Flame "on" or Flame "off") For each high temperature enclosed flare, continuous monitoring of flame detection through use of appropriate installation (e.g. optical flame detector (using ultra violet or infra-red technology or both).
Records from the project participants gathered as part of the operation of the project activity.	B.1	Maintenance_y Maintenance events completed in year <i>y</i> (Calendar dates) for each one of the high temperature enclosed flare combusting LFG. For each installed high temperature enclosed flare, record the date when maintenance events are performed in year <i>y</i>. Records of maintenance logs will include all aspects of the maintenance including the details of the person(s) undertaking the work,

Instrument or Source of data	Measurement option	Data monitored
		parts replaced/repared, or needing to be replaced, source of replacement parts, serial numbers and related calibration certificates.
Not based on measurements	Calculated or application of default values	TDL_{grid,y} Average technical transmission and distribution losses for providing electricity to the grid and/or for grid-sourced electricity consumed by the project activity. Use of recent, accurate and reliable data available within the host country or selection of the applicable default value as per the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”
Project participants	-	Status of biogas destruction device Operational status of biogas destruction devices For the particular case of the flare(s), the same procedures as adopted for monitoring parameter Flame_m will be applied. Continuous monitoring of flame detection through use of appropriate installation (e.g. optical flame detector (using ultra violet or infrared technology or both).

All continuously measured LFG related parameters as well as measurements related to the exhaust gas of the flare(s) (temperature in the exhaust gas of the flare(s)) and parameters related to operational conditions of the flare(s) and engines (i.e. status of the methane destruction device(s)) will all be recorded electronically via an appropriate data logger / data acquisition system (to be located within the site boundary).

The data acquisition system will have the capability to record all data in a safe and reliable manner (thus ensuring the required data reliability and validity). Data recording and reporting frequency for these parameters will be at least every minute.

Records of electricity consumed by the project activity will also be recorded and reported appropriately. Data from invoices of commercialization of generated electricity and consumption of grid-sourced electricity (issued by local electricity transmission/commercialization company and/or electricity purchaser) may also be used as cross-checking.

Using appropriate software application, recorded monitoring data will be regularly retrieved, aggregated and reported to be considered in the context of calculations of emission reduction achieved by the GS project activity.

Monitoring records available in the data acquisition system might be regularly retrieved remotely by modem or directly on site. If automatic data logging by the data acquisition system fails, measurement data might be recorded manually (whenever it is possible). If data is not properly recorded or cannot be retrieved, no emissions reductions will be claimed for the period encompassing such data recording/reporting failure.

All monitoring data will be recorded and backed-up in a central database. As per the applicable monitoring procedure, data records will be summarized into emission reduction calculations prior to each periodic GS verification. All data recorded by the data acquisition system will be made available to the Designated Operational Entities (DOEs) responsible for each periodic verification. This will ensure data integrity and reliability for related monitoring data.

As per the monitoring procedure to be adopted by the project participant(s), access to monitoring data will be restricted and controlled. All monitoring records will be kept

archived until at least two years after the end of the crediting period or at least two years after the last issuance of VER's for the GS project activity, whichever occurs later.

It will be the responsibility of the appointed monitoring team manager to ensure that all monitoring data is properly measured and recorded as part of the operation of the GS project activity.

Technical specifications for monitoring instruments/equipment (e.g. manufacturer, model, serial numbers, accuracy, etc.) will be detailed in the Monitoring Reports for each periodic verification.

Maintenance and calibration for monitoring instruments/equipment and project's equipment/components in general:

All maintenance service and routines will include all preventive and corrective actions necessary for ensuring good functioning of all projects related equipment, such as:

- Visual control of the equipment state and real-time check of displayed parameters,
- Cleaning up the equipment and the sensors,
- Lubrication and greasing,
- Replacement or overhauling of defective parts (including regular welding service in the HDPE pipelines and manifolds).

Calibration events in monitoring instruments/equipment will be periodically and appropriately performed as per applicable frequency, procedures and methods established or recommended by instrument/ equipment manufacturer, applicable national/international standards and/or best practice, as available.

General malfunction of equipment: if monitoring equipment or project's components present failure or malfunction, applicable repair or replacement actions will be carried out. Spare units for some of the monitoring equipment may be kept on site.

Project's operational and management structure:

An appropriate project's operational and management structure will be made available as part of the operation of the GS project activity.

The project's operational and management structure will rely on trained staff with responsibilities clearly defined. All collaborators and employees involved with operation of project and monitoring will be trained internally and/or externally. Training efforts may include:

- a) General competence development about LFG generation and collection.
- b) Review of equipment operational principles and captors.
- c) Maintenance and calibration requirements for project's related equipment.
- d) Procedures for monitoring data gathering and handling.
- e) Emergency and safety procedures.
- f) General competence development about methane destruction through combustion of LFG in high temperature enclosed flare(s).
- g) General competence development about utilization of LFG as gaseous fuel for electricity generation.

The monitoring plan will be implemented and operationalized by reflecting the best practice in terms of monitoring efforts for LFG collection and destruction/utilization projects under the GS4GG.

Monitoring of the management of the landfill:

As required by ACM0001 (version 19.0), the design and operational conditions of the JP landfill will be monitored on the basis of different sources, including:

- Original design of the landfill;
- Technical specifications for the management of the JP landfill;
- Applicable local or national regulations

Original operational design of the landfill should be confirmed not to be modified to ensure that no practice to increase methane generation at the landfill have been occurring, when compared to the landfill management and operation condition prior to implementation of the GS project activity. As required by ACM0001 (version 19.0), any change in the management of the landfill after the implementation of the GS project activity should be justified by referring to technical or regulatory specifications and impacts of such changes in the determination of baseline emissions. Such monitoring requirement will be used for the confirmation of baseline emissions and confirmation of the project's implementation as described in the Transition Request Form + GS4GG PDD

(in terms of operation and management conditions of the landfill from which LFG is combusted).

SECTION C. DURATION AND CREDITING PERIOD

C.1. Duration of project

C.1.1 Start date of project

>>

The start date of the GS project activity was indicated in the CDM PDD valid for the currently expired 1st CDM crediting period as 20/01/2008. However, as also indicated in the Monitoring Report for the 1st monitoring period under the CDM, the project only started its operations on 26/11/2008.

C.1.2 Expected operational lifetime of project

>>

20 years and 0 month³⁵.

C.2. Crediting period of project

C.2.1 Start date of crediting period

>>

The 1st GS 5-year crediting period of the project activity starts on 01/01/2021.

C.2.2 Total length of crediting period

>>

5 years and 0 months.

³⁵ The expected operational lifetime for both the project's infrastructure is at least 20 years. However, the lifetime of equipment of such project components may exceed 20 years if required service and maintenance is appropriately performed (as per recommendation and requirements set by equipment manufacturers/suppliers).

SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

D.1 Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in [Appendix 1](#), ongoing monitoring is summarized below.

Principles	Mitigation Measures added to the Monitoring Plan
Principle 6.1 Labour Rights	Refer to the monitoring parameter "Total number of jobsNumber of employment" in Section B.7.1.

D.2. Assessment that project complies with GS4GG Gender Sensitive requirements

Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy.	As an LFG collection and utilization, the project does not adversely impact women or men. All the key gender issues and requirements of GS4GG are respected, as well as Brazilian laws, principles and guidelines which deal with gender equality. The project provides employment opportunities equally for men and women. As per Gold Standard Gender Policy (https://globalgoals.goldstandard.org/101-1-g-gold-standard-gender-policy/), p. 10 "Foundational gender-sensitive requirement - This strengthens Gold Standard's 'do no harm' approach and addresses safeguards to prevent or mitigate adverse impacts on women or men and girls and boys. Such action is mandatory for all projects seeking Gold Standard certification and includes compliance with the gender 'do no harm' safeguards, gender gap analysis and gender sensitive stakeholder consultations."
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	The project being a biogas project is not gender sensitive project. The project does not adversely impact women or men.
Question 2 - Explain how the project aligns with existing country policies, strategies and best practices.	The project complies with the requirements of gender equality, as it is under the jurisdiction of Brazilian legislation. Article 5 of the Brazilian Constitution³⁶ declares women equal to men in all legal respects, explicitly stating that “men and women have equal rights and duties under the terms of this Constitution.” The law Nº 7.35337 of 1985 established the National Council on Women’s Rights, which advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. Moreover, the Consolidation of Labour Laws (CLT)³⁸, which regulates labour relations in Brazil, prohibits gender-based wage discrimination (Article 461, §1º) and ensures equal rights for men and women in the workplace. The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis. Brazil is party to Convention on Discrimination since 1981 to prevent any form of discrimination. (https://www.mfa.gov.tr/convention-on-the-

³⁶ https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

³⁷ http://www.planalto.gov.br/ccivil_03/leis/1980-1988/L7353.htm

³⁸ https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

	elimination-of-all-forms-of-discrimination-against-women.en.mfa)
Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements?	No. The project is an LFG collection and utilization initiative, and it does not discriminate among gender nor reduce access to or control of resources for women. The Project beneficiaries in terms of employment and social upliftment of the area are common for both the gender and it does not involve any kind of discrimination in any form. The Project shall complete the following gender assessment questions (https://globalgoals.goldstandard.org/101-4-gold-standard-for-the-global-goals-safeguarding-principles-requirements/) below: 1. Is there a possibility that the Project might reduce or put at risk women's access to or control of resources, entitlements and benefits? No, the Project does not reduce access to or control of resources for women. 2. Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)? No, the Project beneficiaries in terms of employment and social upliftment of the area are common for both the gender. The project does not involve in any form discrimination in any kind of form. 3. Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate

in the decisions/designs of the project's activities (such as lack of time, childcare duties, low literacy or educational levels, or societal discrimination)? No, this project does not involve in any form discrimination in any kind of form.

4. Does the Project take into account gender roles and the abilities of women or men to benefit from the Project's activities (e.g., Does the project criteria ensure that it includes minority groups or landless peoples)? Yes the project takes into account gender roles and abilities of women/men. Job profile is allocated based on the type of work to be carried out.

5. Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities? No, on the contrary the project leads to increased availability of electricity in the regional grid thereby uplifting the living standards.

6. Would the Project potentially reproduce or further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits? No, since the project is a renewable electricity generation project, thus it will not have discriminated against women.

	7. Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and priorities of women and men in accessing and managing environmental goods and services? No, in fact, the project leads to improved electricity in the regional grid
Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	A Stakeholder's consultation was held in the year 2006 by following the applicable requirements for Gold Standard Projects valid at the time. Since the project complies with all the requirements of "Principle 2 – Gender Equality and Women's Rights" from the currently valid version of the GS4GG "Safeguarding Principles and Requirements", no Expert is required to assist with Gender issues at the Stakeholder Consultation. The project is applying for regular GS registration and the Stakeholder Consultation & Engagement Procedure Requirements has been done as explained below. The project owner has organized the local stakeholder consultation meeting according to related requirements of GS4GG for Orizon Valorização de Resíduos S.A. In developing a Project, "taking gender issues into account would require that local stakeholder consultation processes reach a wide range of community representatives in ways that ensure equal and effective participation of women and men in consultation, and that gender issues are fully factored into comprehensive social and environmental impact assessments."

	The general outcome of the stakeholder consultation interview was positive, the neighborhood in which JP landfill is, has given their comment with a letter. (This letter will be provided to the VVB and GS). The stakeholders stated that they are in favor of the project and underlined the significant contribution of the project to regions sustainable image and stressed the importance of renewable and clean energy every time.
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SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

Below is a summary of the 2 step GS4GG Consultation for monitoring purposes. Please refer to the separate Stakeholder Consultation Report for a complete report on the initial consultation and stakeholder feedback round.

E.1 Summary of stakeholder mitigation measures

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The project implementer sent the letters in September 2022, and obtained a receipt confirmation for all of them. On the letters, there was an invitation to see the project activity and to send any comments or questions to the project activity implementer. After the submission of the letters, the company received no comments from any of the stakeholders and the period for consultations was deemed closed at the end of the following month.

E.2 Final continuous input / grievance mechanism

Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	The process book has been located in the project activity as the stakeholder's chosen place. Project Participant will be checking the comments in the book on a regular basis, and record responses. They will be respectful to the views of stakeholders and suggest alternative solutions or compromises wherever possible. It is chosen as main mechanism.
GS Contact (mandatory)	help@goldstandard.org
Other	Orizon Valorização de Resíduos S.A. Av. das Nações Unidas, Torre Oeste, Cidade Monções, São Paulo-SP, Brazil Tel: + 55 (21) 99511-170 + 55 0800 512 6644 Website: www.orizonvr.com.br

E-mail: dalton.canelhas@orizonvr.com.br

APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

>> Fill this section

Complete the Assessment below and copy all Mitigation Measures for each Principle into [SECTION D](#) above. Please refer to the instructions in the [Guide to Completing](#) this Form.

Assessment Questions/ Requirements	Justification of Relevance (Yes/potentially/no)	How Project will achieve Requirements through design, management or risk mitigation.	Mitigation Measures added to the Monitoring Plan (if required)
Principle 1. Human Rights			
1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of	No	1. The project respects internationally proclaimed human rights. Brazil has its own legislation ³⁹ in place prohibiting the violation of the human rights principle and it actively enforces the	Not applicable

³⁹ https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l12986.htm

any kind as defined in the Universal Declaration of Human Rights 2. The Project shall not discriminate with regards to participation and inclusion		compliance of such principle. Brazil has ratified two UN human rights treaties: - the International Covenant on Civil and Political Rights⁴⁰ - the International Covenant on Economic, Social, and Cultural Rights⁴¹. 2. The project does not discriminate with regards to participation and inclusion. The project is in conformance with national and international rules of equality and does not	
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⁴⁰ https://treaties.un.org/Pages/ViewDetails.aspx?chapter=4&clang=_en&mtdsg_no=IV-4&src=IND

⁴¹ https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-3&chapter=4&clang=_en

		involve nor is complicitly in any form of discrimination.	
Principle 2. Gender Equality			
1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women 2. Projects shall apply the principles of non-discrimination, equal treatment, and equal pay for equal work 3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks	No	1. The project does not decrease women's access to or control of resources. The project developers do not discriminate against gender and support gender equality. 2 - The project offers equal opportunities for women and men to contribute both in volunteer and working positions. The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis.	Not applicable.

4. (where required) Summary of opinions and recommendations of an Expert Stakeholder(s)		The National Council on Women's Rights, formed in 1975, advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. 3 - The project complies with the requirements of gender equality, as it is under the jurisdiction of Brazilian legislation. Article 5 of the Brazilian Constitution⁴² declares women equal to men in all legal respects, explicitly stating that "men and women have equal rights and duties	
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⁴² https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

		under the terms of this Constitution.” The law Nº 7.353⁴³ of 1985 established the National Council on Women’s Rights, which advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. Moreover, the Consolidation of Labour Laws (CLT)⁴⁴, which regulates labour relations in Brazil, prohibits gender-based wage discrimination (Article 461, §1º) and ensures equal rights for men and women in the workplace.	
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⁴³ http://www.planalto.gov.br/ccivil_03/leis/1980-1988/L7353.htm

⁴⁴ https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

		4 – Not required for the project activity.	
Principle 3. Community Health, Safety and Working Conditions			
1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	No	There are no perceived health risks to the local communities due to the project activity. The project developers are committed to apply safe and healthy working conditions for all employees during all phases of the project.	Not applicable.
Principle 4.1 Sites of Cultural and Historical Heritage			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	No cultural heritage was observed on the project site prior to the implementation of the landfill (as confirmed in the EIA Report) or the project.	Not applicable.
>>			

Principle 4.2 Forced Eviction and Displacement			
Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	The project activity is within the area of an existing landfill, which obtained prior approval from the local environmental authority for its implementation. As demonstrated in the EIA Report, the construction of the landfill (and subsequently of the project) did not require or cause the physical or economic relocation of people (temporary or permanent, full or partial).	Not applicable.
>>			
Principle 4.3 Land Tenure and Other Rights			
a. Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or	No	The project does not require any change, or have any uncertainties related to land tenure arrangements and/or	Not applicable

access rights, usage rights or land ownership? b. For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership?		access rights, usage rights or land ownership.	
>>			
Principle 4.4 - Indigenous people			
Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	There are no indigenous people or group identified within the area of influence of the Project, as confirmed in the EIA Report for the Ecoparque João Pessoa landfill.	Not applicable.
>>			
Principle 5. Corruption			

1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	No	The project does not involve and is not complicit in any kind of corruption.	Not applicable.
Principle 6.1 Labour Rights			
1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions 2. Workers shall be able to establish and join labour organisations	Potentially	1 – The project developers are committed to apply safe and healthy working conditions for all employees during all phases of the project. All employees of the project are protected by the Brazilian Federal set of labour regulations denominated Consolidation of Labour Laws	Refer to parameter “Total number of jobs”.

3. Working agreements with all individual workers shall be documented and implemented and include: a) Working hours (must not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND		(CLT)⁴⁵, which represents the regulatory framework that regulates labour relations in Brazil, and the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Law compliance is subject to governments inspection and ruling. 2 - The rights to establish and join labour organizations or unions are protected by brazilian Labour Laws. The project fully respects the employees' rights in accordance with all labour	
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⁴⁵ https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave. 4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) 5. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and		related laws endorsed in Brazil. 3 - Working agreements between the company and individual workers are documented and implemented, including working hours, duties and tasks, remuneration, modalities on health insurance, modalities on termination of contract, provision for annual leave, etc., always under conformance with applicable regulations and best practice The employment model applied is locally, nationally and culturally appropriate.	
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reporting of accidents and incidents, and emergency preparedness and response measures		4. Brazil has published laws for the protection of children⁴⁶, which also includes employment regulations. The project requires skilled employees and it does not employ and is not complicit in any form of child labour. 5. The project is operated in accordance with the applied working procedures and safety regulation rules and best practice. The project organizes employee training with topics on technical, environmental/safety code, and operational/maintenance procedures. Thus, the project	
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⁴⁶ https://www.planalto.gov.br/ccivil_03/leis/l8069.htm

		developers ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures.	
Principle 6.2 Negative Economic Consequences			
1. Does the project cause negative economic consequences during and after project implementation?	No	The Project does not cause negative economic consequences.	Not applicable.
>>			
Principle 7.1 Emissions			
Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No	The project will reduce greenhouse gas emissions as it avoids methane from being freely emitted into the atmosphere and it also	Not applicable.
>>			

		displaces equivalent amount of electricity that would be otherwise generated from fossil fuel fired power plants.	
Principle 7.2 Energy Supply			
Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	No	The Project will supply electricity to the national electricity grid of Brazil. It may consume grid-sourced electricity whenever the power plant is temporarily out of operation. It therefore does not use energy source from a local grid or power supply or fuel resource that provides for other local users.	Not applicable.
>>			
Principle 8.1 Impact on Natural Water Patterns/Flows			
Will the Project affect the natural or pre-existing pattern	No	The Project will not affect the natural or pre-existing pattern	Not applicable.

of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?		of watercourses, groundwater and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity. Nonetheless, the parameters and conditions established in the operational license for the JP landfill (which include treatment of leachate generated at the landfill) are regularly inspected by the local environmental authority.	
>>			
Principle 8.2 Erosion and/or Water Body Instability			
a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	No	The impact of the project on erosion and/or in the water body is negligible. As also demonstrated in the EIA Report for the construction of	Not applicable.

b. Is the Project's area of influence susceptible to excessive erosion and/or water body instability?		the landfill, the project's area of influence isn't susceptible to excessive erosion and/or water body instability.	
>>			
Principle 9.1 Landscape Modification and Soil			
Does the Project involve the use of land and soil for production of crops or other products?	No	The project is an LFG recovery and utilization project and it does not involve the use of land and soil for production of crops or other products.	Not applicable.
>>			
Principle 9.2 Vulnerability to Natural Disaster			
Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	The Project is not susceptible to and does not lead to increased vulnerability to extreme climatic conditions.	Not applicable.

>>			
Principle 9.3 Genetic Resources			
Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)?	No	The project activity is an LFG utilization project with no involvement genetically modified organisms or GMOs.	Not applicable.
>>			
Principle 9.4 Release of pollutants			
Could the Project potentially result in the release of pollutants to the environment?	No	As an LFG recovery and destruction/utilization project, it actually reduces emissions of pollutants to the atmosphere.	Not applicable.
>>			
Principle 9.5 Hazardous and Non-hazardous Waste			

Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The project does not involve the manufacture, trade, release, and/or use of hazardous and non-hazardous chemicals and/or materials.	Not applicable.
>>			
Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers?	No	The Project does not involve the application of pesticides and/or fertilizers	Not applicable.
>>			
Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests?	No	Project does not involve the harvesting of forests	Not applicable.
>>			
Principle 9.8 Food			
Does the Project modify the quantity or nutritional quality of food available such as	No	The Project does not modify the quantity or nutritional quality of food available such	Not applicable.

through crop regime alteration or export or economic incentives?		as through crop regime alteration or export or economic incentives.	
>>			
Principle 9.9 Animal husbandry			
Will the Project involve animal husbandry?	No	The Project does not involve animal husbandry.	Not applicable.
>>			
Principle 9.10 High Conservation Value Areas and Critical Habitats			
Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	No	As demonstrated in the EIA Report for the construction of the Ecoparque João Pessoa landfill, this landfill (and consequently the project) does not physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified.	Not applicable.
>>			

Principle 9.11 Endangered Species			
a. Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)? b. Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	No	As demonstrated in the EIA Report for the construction of the Ecoparque João Pessoa landfill, there are no endangered species identified as potentially being present within the project boundary (including those that may route through the area of the landfill), and the project would not potentially impact other areas where endangered species may be present through transboundary affects.	Not applicable.
>>			

APPENDIX 2- CONTACT INFORMATION OF PROJECT PARTICIPANTS

>> Fill this section

Organization name	Orizon Valorização de Resíduos S.A.
Registration number with relevant authority	
Street/P.O. Box	Av. das Nações Unidas, Torre Oeste, Cidade Monções
Building	No: 12.901 – 8th Floor
City	São Paulo
State/Region	SP
Postcode	04578-000
Country	Brazil
Telephone	+55 (11) 5103 5300
E-mail	dalton.canelhas@orizonvr.com.br
Website	www.orizonvr.com.br
Contact person	Dalton Canelhas
Title	Project Specialist
Salutation	Mr.
Last name	Canelhas
Middle name	
First name	Dalton
Department	
Mobile	
Direct tel.	
Personal e-mail	dalton.canelhas@orizonvr.com.br

APPENDIX 3- LUF ADDITIONAL INFORMATION

>> Fill this section, if applicable

Not applicable as the proposed GS project activity is not a Land-use & Forest Activity (LUF) project.

APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

Please refer to [Design Change Requirements](#) for more information on procedures governing Design Changes.

Revision History

Version	Date	Remarks
1.0	10 July 2017	Initial adoption