



VERIFICATION REPORT

PICHACAY LANDFILL GAS RENEWABLE ENERGY PROJECT



Document Prepared By LGAI Technological Center, S.A. (Applus+ Certification)

Project Title	Pichacay Landfill Gas Renewable Energy Project
Version	02.0
Report ID	BELL_CDM_2022_ECU_Pichacay LFG _VCS_VER

Report Title	Pichacay Landfill Gas Renewable Energy Project
Client	EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM
Pages	73
Date of Issue	25-October-2022
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Summary:

LGA Technological Center, S.A. (hereafter referred to as “Applus+ Certification”) was commissioned by EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM to perform the 3rd periodic verification of greenhouse gas (GHG) emission reductions for the project-based initiative registered under VCS (VCS project activity) titled “Pichacay Landfill Gas Renewable Energy Project” (VCS Ref. No. 1883) (hereafter referred to as “the VCS project activity”). Applus+ Certification verification assessment and its verification opinion are based on information and data reported in the latest version of the Monitoring Report ^{/1/} for the monitoring period from 01/01/2021 to 25/08/2021 of the VCS project activity (hereby termed as “the considered monitoring period”). GHG emission reductions for the considered monitoring period are claimed as Verified Carbon Units (VCU) under guidelines, rules and procedures of the Verified Carbon Standard (VCS) version 4.3.

The VCS project activity was both previously validated and had its 1st periodic verification performed by the Validation and Verification Body (VVB) EPIC Sustainability Services Private Limited (EPIC). The 2nd periodic verification assessment for the project activity was previously performed by Applus+ Certification. Details for the VCS project activity are available online at the VERRA/VCS: registry (<https://registry.verra.org/app/projectDetail/VCS/1883>).

The VCS project activity encompasses the installation and operation of a landfill gas (LFG) collection and utilization initiative at the Pichacay landfill. The Pichacay landfill site is located in the district of Santa Ana, city of Cuenca, province of Azuay in Ecuador. As part of the VCS project activity collected LFG is utilized as gaseous fuel for electricity generation in the project’s electricity generation infrastructure encompassing engine-generator sets. As per the design of the VCS project activity, collected LFG may also be combusted in a high temperature flare (under circumstances when the engine-generator set(s) are not under operation). As per the project design, the total combined nameplate installed capacity of the VCS project activity is 3.4 MW (consisting of 4 sets with individual nameplate installed capacity of 0.85 MW each to be gradually installed). As confirmed by the Applus+ Certification’s verification team and as appropriately outlined in the Monitoring Report ^{/1/}, the engine-generator set installed and under normal operation during the considered monitoring period has its original power reduced from 1 MW to 0.85 MW under operational circumstances because of the high altitude of the site where the VCS project activity is implemented, as appropriately described in both latest version of the Monitoring Report ^{/1/} and VCS PD ^{/2/}.

By the end of the considered monitoring period, only one engine-generator set was installed and under operation since 2017, as part of the project’s electricity generation infrastructure. As outlined in the Monitoring Report ^{/1/}, during the last week of December 2020, the power transformer to which the project activity is connected, suffered damages that stopped its operations from 01/01/2021 to 19/04/2021, until a new equipment was installed and tested allowing the project to be operational again. Thus, no

electricity generation nor emission reductions are claimed for the period from 01/01/2021 to 19/04/2021.¹

The Pichacay landfill serves as permanent disposal site for Municipal Solid Waste (MSW) generated in the municipality of Cuenca in Ecuador. The VCS project activity promotes real and permanent GHG emission reductions both through destruction of methane (due to combustion of collected LFG in the engine-generator set(s) of the project's electricity generation infrastructure) and by displacing electricity that would otherwise be generated (in the same amount) in the absence of the VCS project activity (baseline scenario) by existent grid-connected electricity generation facilities (incl. fossil fuel fired power plants) and addition of new power generation sources within the National Electricity Grid of Ecuador.

The purpose and scope of the VCS verification assessment is to ensure that reported emission reductions for a VCS project activity within a considered monitoring period are deemed/sufficiently complete, accurate and determined based on appropriate monitoring and calculation approaches under conformance with applicable VCS standard regulatory documents ^{/5/} and applied baseline and monitoring methodology, in order to be certified. Extensive document desk review, interviews with representatives of the project proponents and additional complementary auditing measures were conducted by the verification team appointed by Applus+ Certification in order to verify and confirm the correctness and appropriateness of information and data included in the Monitoring Report ^{/1/}.

Applus+ Certification confirms the following documentation has been reviewed:

- Monitoring plan included in the registered VCS Project Description (VCS-PD) ^{/2/} (in the particular case of the VCS project activity "Joint VCS PD and Monitoring Report (monitoring period from 27/07/2017 to 31/12/2018) for the VCS project activity (version 3.2, dated 07/07/2019)");
- The Validation Report for the VCS project activity ^{/3/} (in the particular case of the VCS project activity: "Joint Validation Report and Verification Report (monitoring period from 27/07/2017 to 31/12/2018) (version 1, dated 27/08/2019)");
- Monitoring Report ^{/1/} for the monitoring period from 01/01/2021 to 25/08/2021 for the VCS project activity (version 5.0, dated 25/10/2022)");
- The applied CDM baseline and monitoring methodology:

¹ It is important to note that the Monitoring Report ^{/1/} includes the following disclaimer about the occurred installation of an additional engine-generator set as part of the VCS project activity:

"The second engine-genset was initially expected to start operation around July 2019 but has been delayed. The second engine was commissioned in from May to mid June 2021; synchronization and energy production tests were performed from mid June to mid July 2021, experimental operation was performed from mid July to the end of August. The second engine received its commercial operation declaration by 1 October 2021".

- AMS-III.G - Landfill methane recovery (version 10.0) ^{/6/ 2}
- VCS standard (version 4.3) ^{/5/} and VCS guidance Validation and Verification Manual (version 3.2) ^{/22/}, as well as relevant applicable UNFCCC CDM requirements.
- All information and references relevant to the VCS project activity resulting in emission reductions.

As part of the performed verification assessment, a set of ten (10) Corrective Action Requests (CARs) were identified/raised by the appointed Applus+ Certification's verification team. All of such CARs were confirmed as being appropriately addressed by the project proponents through the completion of a revised latest version of the Monitoring Report ^{/1/} for the considered monitoring period.

Applus+ Certification hereby confirms that in general the VCS project activity is implemented and has operated within the considered monitoring period from 01/01/2021 to 25/08/2021 under conformance with project design details established in its previously completed and registered VCS PD ^{/2/}.

As also confirmed by the Applus+ Certification's verification team, the design of the monitoring plan for the VCS project activity is under conformance with applicable requirements of the applied CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} + applied CDM methodological tools.

Furthermore, as also confirmed by the Applus+ Certification's verification team, monitoring related activities for the VCS project activity have been carried out during the considered monitoring period under full conformance with requirements and guidance of the monitoring plan as per the registered VCS PD ^{/2/}. The monitoring system for the VCS project activity is in place and has been operated in a way that emission reductions achieved are correctly determined based on available monitoring data without material misstatements and under a deemed reasonable level of assurance.

Based on assessed and reviewed information, Applus+ Certification hereby confirms that the implementation of the project and its operation resulted on achieved GHG emission reductions of 11,444 tCO₂e during the monitoring period from 01/01/2021 to 25/08/2021 (including both days)

² While the CDM baseline and monitoring methodology AMS-III.G ^{/6/} refers to the calculation approach of the CDM baseline and monitoring methodology AMS-I.D: «Grid connected renewable electricity generation» ^{/7/} for the determination of baseline emissions due to electricity generation by the project activity applying AMS-III.G, the VCS PD ^{/2/} for the project activity thus appropriately also refers to version 18.0 of AMS-I.D ^{/7/}.

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1 INTRODUCTION

1.1 Objective

LGA Technological Center, S.A. (Applus+ Certification) was commissioned by EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM to perform the 3rd periodic verification assessment of GHG emission reductions for the VCS project activity titled “Pichacay Landfill Gas Renewable Energy Project” (VCS Ref. No. 1883) for the monitoring period from 01/01/2021 to 25/08/2021 as reported in the Monitoring Report ^{/1/}.

LGA Technological Center, S.A. (Applus+ Certification) as the Validation and Verification Body (VVB) responsible for the verification assessment is accredited as a Designated Operational Entity (DOE) by UNFCCC for the technical scopes the VCS project activity falls into (Technical scopes 13 and 1) and also meets applicable competence requirements as established in Standard ISO 14065:2007. These aspects and status qualify Applus+ Certification to act as a Validation and Verification Body (VVB) responsible for performing periodic verifications for the VCS project activity.

The objective of the verification assessment is to have an independent review and ex post determination by a VVB of monitored reductions in GHG emissions that have occurred as a result of the registration of VCS project and its operation during a considered monitoring period. Certification is the written assurance by the VVB/DOE that, during a considered monitoring period, a VCS project activity achieved reductions in anthropogenic emissions by sources of GHGs under a reasonable level of assurance.

The objective of this verification/certification assessment is to verify and certify emission reductions, reported for the VCS project activity “Pichacay Landfill Gas Renewable Energy Project”, for the monitoring period from 01/01/2021 to 25/08/2021.

1.2 Scope and Criteria

The verification scope is defined as an independent and objective review of the content of the registered VCS PD ^{/2/} (incl. the project’s baseline study), Monitoring Report (MR) for the considered monitoring period and other relevant documents. The information in these documents is reviewed inter alia against VCS Standard Version 4.3 requirements, UNFCCC rules.

The verification assessment is not meant to provide any consulting towards the project proponents and/or any other Party. However, stated requests for forward actions and/or corrective actions may eventually provide input(s) for improvement of the project monitoring.

1.3 Level of Assurance

In line with applicable VCS requirements and under conformance with Standard ISO 14064-3:2006 /^{8/}, a reasonable level of assurance was defined and was followed for the performance of the verification assessment for the VCS project activity. Applus+ Certification has established an internal quality control process in order to ensure, as part of its technical assessment, that information and values provided in the Monitoring Report /^{1/} are materially correct and fairly represent the implementation status and operation of the VCS project activity within the considered monitoring period, is completed under conformance with applicable VCS requirements + specific requirements of the applied CDM methodology being also sufficiently met for the calculation and reporting of GHG quantification and monitoring activities within the considered monitoring period.

1.4 Summary Description of the Project

Project title	Pichacay Landfill Gas Renewable Energy Project
VCS reference number	1883
Project Proponent	EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM
Other entities involved in the project	EMAC EP (a main partnering company of project proponent) BGP Engineers B.V. (a main partnering company of project proponent) BTG Biomass Technology Group B.V. (consultancy service company)
Location of the project	The VCS project activity is located at Santa Ana, Cuenca, Azuay, Ecuador Geographic coordinates: Longitude: -78.9314400 Latitude: -2.9660411
Project start date	Construction date: constructed and commissioned between year 2014 and year 2017 Operation start date: 27/07/2017

Version of VCS PD	Version 3,2, dated 07/07/2019 ^{/2/}
Monitoring period	01/01/2021 to 25/08/2021
Initial version of the Monitoring Report	Version 4.0, dated 01/02/2022
Final version of the Monitoring Report	Version 5.0, dated 25/10/2022
Applied Methodology/Version	CDM baseline and monitoring methodology AMS-III.G - Landfill methane recovery (version 10.0) ^{/6/}
Scope/Technical Area	13/13.1 ³

The VCS project activity encompasses the installation and operation of a landfill gas (LFG) collection and utilization initiative at the Pichacay landfill, with collected LFG being prioritly used as gaseous fuel for electricity generation. The Pichacay landfill site is located in the district of Santa Ana, city of Cuenca, province of Azuay in Ecuador. The total combined installed capacity of the VCS project activity is 3.4 MW (consisting of 4 sets with each capacity of 0.85 MW of which only 1 was installed and under commercial operation until de end of the considered monitoring period) ⁴.

The Pichacay landfill serves as permanent disposal site for about 800 ton of Municipal Solid Waste (MSW) per day. During the considered monitoring period, the VCS project activity promoted real and permanent GHG emission reductions both by destruction of methane (through combustion of collected LFG in the engine-generator sets of the project's electricity generation infrastructure) and by displacing electricity that would otherwise be generated in the absence of the VCS project activity (baseline scenario) by existent grid-connected electricity generation facilities (incl. fossil fuel fired power plants) and addition of new power generation sources within the National Electricity Grid of Ecuador. No flaring of collected LFG occurred during the considered monitoring period.

³ While the registered VCS PD ^{/2/} also refers to the calculation approach of the CDM baseline and monitoring methodology AMS-I.D: «Grid connected renewable electricity generation» ^{/7/} for the determination of baseline emissions due to electricity generation by the VCS project activity, this particular small-scale CDM baseline and monitoring methodology fits under Technical Scope 1.1.

⁴ As confirmed by Applus+ Certification's verification by watching/visualizing (more than once) the content of the set of sequential live videos (movies) + photographs (pictures) ^{/9/} produced during the remote site visit on 21/02/2022, the Applus+ Certification's verification team was able to have a comprehensive and complete remote assessment of installed capacity status of the VCS project activity as if the team were on-site.

The VCS project activity was previously validated by a Validation and Verification Body (VVB) accredited under VERRA/VCS. Details and related documents are available online (<https://registry.verra.org/app/projectDetail/VCS/1883>).

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification assessment was performed by applying Applus+ Certification's procedures in line with the requirements specified in the VCS Standard (version 4.3) ^{/5/}, the latest version of the CDM Validation and Verification Standard (version 03.0) and relevant UNFCCC requirements (whenever applicable) as well as through the application of standard auditing techniques.

As part of performed verification assessment, Applus+ Certification completed a strategic review and risk assessment of the VCS project activity and processes in order to gain a full understanding of:

- Activities, aspects and circumstances associated with all the sources contributing to the project related GHG emissions (baseline and project emissions) and emission reductions.
- Protocols and methodological approaches used to measure and/or determine GHG emissions associated with these sources.
- Collection and handling of monitoring data.
- Controls on the gathering, processing, recording and reporting of monitoring data.
- Means of verifying reported monitoring data; and
- Compilation of the Monitoring Report ^{/1/}.

Applus+ Certification verified the implementation and operationalization of the monitoring plan for the VCS project activity and performed a detailed assessment of monitoring data reported in the Monitoring Report ^{/4/} for the considered monitoring period. This assessment work was fully based on a desk review of the content of the Monitoring Report, interviews with representatives of the project proponents and additional auditing measures.

The information of the assessment team is included in below:

Assessment team

According to the applicable sectoral scope / technical area and experience in the sectoral or national business environment, Applus+ Certification has composed an assessment team in compliance with the Contract Review and Assessment Team appointment rules in the internal Quality Management System of Applus+ Certification as well as in compliance with the applicable requirements in the Accreditation Standard.

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

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

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

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

Verification Team:

Name	Qualification	Coverage of scope	Coverage of technical Area	Host country experience	Attendance to the On-Site Assessment
Marco A. Ratton	LA/TE	Y	Y	Y	N

Technical Review and Approval Team:

Name	Qualification
Miguel A. Cortes Díaz	Technical Reviewer / Technical Expert
Agustín Calle de Miguel	Report Approver

The curricula vitae of the Applus+ Certification's verification team members are provided below:

Mr. Marco A. Ratton:

Marco A. Ratton is based in Brazil and has acted as a GHG auditor since 2007. He holds vast experience with independent assessments of GHG project activities within the area of renewable energies, solid waste management and effluent treatment implemented in Latin America and other regions. He also has previous working experience with planning of municipal waste management as well as educational background in mechanical fabrication and manufacturing technologies, economics and environmental management & policy. He has undergone extensive training on GHG validation and verification and is a qualified Expert for Sectoral Scope 13 under Technical Area “Waste management” and Sectoral Scope 1, among others and in accordance with procedures of Applus+. He also has years-long previous experience on conducting ISO 9001/14001 assessments.

Mr. Miguel Cortes Díaz:

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

2.2 Document Review

The initial version of the Monitoring Report ^{/1/} was submitted to Applus+ Certification. This document was initially assessed as part of the performed desk review of project documentation. The main objectives of the desk review step as part of the verification assessment are summarized as follows:

- Verifying the completeness of the data and the information presented in the initial version of the Monitoring Report ^{/1/}.
- Checking the compliance of the Monitoring Report ^{/1/} with respect to the monitoring plan described in the registered VCS PD for the VCS project activity ^{/2/}, inter alia by verifying that all applicable monitoring requirements (as established by the applied CDM baseline and monitoring methodology and as outlined in the VCS PD ^{/2/}) were sufficiently and reasonably met for the considered monitoring period. Particular attention to the frequency of measurements, specification requirements and functional aspects of monitoring equipment/instruments was paid by the Applus+ Certification's verification team (including compliance of applicable calibration and functional requirements of equipment/instruments, any eventually occurred deviations of requirements of the monitoring plan as per the VCS PD ^{/2/}, and the quality assurance and quality control procedures considered as part of the application of the monitoring plan of the VCS project activity;
- Evaluating data management and the quality assurance and quality control system in the context of their influence on fairly generation and appropriate reporting of the operation of the VCS project activity within the considered motoring period as well as reporting of achieved emission reductions.

A complete list of documents reviewed by the Applus+ Certification's verification team is available in Appendix 1 of this Verification Report.

2.3 Interviews

The key personnel interviewed by the Applus+ Certification's verification team on 21/02/2022 are summarized in the table below:

Interviewed personnel	Role / organization	Subject
Mr. Martijn Vis Mr. David González Hidalgo	Senior Consultant, BTG Biomass Technology Group B.V. Director, EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM	Interviews remotely performed using Skype application and encompassing the following topics (+ production/generation of set of sequential live videos (movies) + photographs (pictures) ^{/9/} to allow confirmation/assessment of the Applus + verification team for the topics): - General implementation and operational aspects of the VCS project activity. - Technical equipment and operational issues for installed equipment. - Specifications and operation of monitoring and measurement equipment/Instruments. - Calibration procedures for installed monitoring instruments/equipment. - Quality management system and related compliance with valid QA/QC procedures. - Implementation and operation of the project's monitoring plan. - Monitoring data handling and management (incl. data gathering, recording and reporting).

		- Data uncertainty and residual risks. - Performance of emission reduction calculations. - Procedural aspects of the verification. - Performance of related maintenance and repair events.
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2.4 Site Inspections

No on-site inspection (with physical presence of the Applus+ Certification's verification team) was conducted as part of the performed verification assessment.

As a result of raised travelling restrictions related to the COVID-19 pandemic, the Applus+ Certification's verification team proposed to the VCS project proponent EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM to, as an alternative, consider postponing such on-site visit by taking into account not only travelling restriction related official decisions and recommendations from local authorities (i.e. restrictions and recommendations from the Government of Ecuador), but also related travelling restriction policy announced by Applus+ Certification's central office due to the COVID-19 pandemic. As an answer to such proposal from Applus+ Certification, the representatives of the project proponents highlighted to the Applus+ Certification's verification team that they were not in a position to accept any postponing of on-site visit that would result on potential delay on issuance of VCUs for the considered monitoring period. Furthermore, the above summarized travelling restrictions were expected to indeterminately continue in light of the COVID-19 pandemic situation in South America. The content of the VCS Guidance titled "COVID-19 Travel Guidance for Projects issued by VERRA/VCS" (issued on 18/03/2020) ^{/14/} was also considered by the Applus+ Certification's verification team.

By acknowledging that the previously planned physical on-site inspection could not be performed as part of the verification assessment due to related travelling restrictions because of the COVID-19 pandemic, by also assuming that such on-site inspection could not be postponed, the Applus+ Certification's verification team thus performed its document review and interviews with representatives of the project proponents (of which details are included in Sections 2.2 and 2.3 respectively) by incorporating the following additional checking's/assessments (complementary auditing measures):

- *Remotely (online) watching by the Applus+ Certification's verification team of set of sequential live videos (movies) + photographs (pictures) produced/generated by member of project operational staff located on-site (allowing remote complete and comprehensive assessment and observations for the VCS project activity):*

Upon previous request from the Applus+ Certification's verification team, the representatives of the project proponent organized the production of a sufficiently complete set of sequential live videos (movies) + photographs (pictures) ^{/9/} produced/generated online in the project site with the goal of making it possible to the Applus+ Certification's verification team to remotely assess and confirm the implementation and operation of the VCS project activity (as if the verification team were on-site).

The set of sequential live videos (movies) + photographs (pictures) ^{/9/} were watched/visualized online by the Applus+ Certification's verification team while being produced/generated on 21/02/2022 and were later fully made available to Applus+ Certification for further assessment/watching and archiving as auditing evidence. By watching/visualizing (more than once) the content of the set of sequential live videos (movies) + photographs (pictures) ^{/9/}, the Applus+ Certification's verification team was able to have a comprehensive and complete remote assessment of the VCS project activity as if the team were on-site. The produced set of sequential live videos (movies) + photographs (pictures) ^{/9/} (recorded as .mp4 video format files and .jpg picture format) include/show the following:

- Details of the whole project's infrastructure promoting collection and utilization of of LFG for electricity generation (e.g. LFG pipeline, centrifugal blower, flare, engine-generator and other equipment of the project's electricity generation infrastructure, etc.);
- Details about all monitoring instruments/equipment (of which the latest version of the Monitoring Report ^{/1/} refers to),
- Details about the functioning of the process for gathering, recording and archiving of monitoring data (i.e. measurement records for electricity generated by the VCS project activity).

Watching and visualizing the set of sequential live videos (movies) + photographs (pictures) ^{/9/} sufficiently and successfully provided to the appointed Applus+ Certification's verification team the following assessment outcomes:

- The possibility of having a complete and transparent remote visualization of the current implementation and operation of the VCS project activity (as if the Applus+ Certification's verification team were on site), thus making it possible to the verification team to confirm the correctness of information included in the Monitoring Report ^{/1/} and VCS PD ^{/2/} regarding both the implementation of the VCS project activity (project design) and its operation.

- The possibility of having a complete and transparent remote visualization of the implementation and operation of available information and data flows/procedures for generating, gathering, aggregation, recording and reporting data for the ex-post determined monitoring parameters (as if the Applus+ Certification's verification team were on site), thus making it possible to the verification team to confirm the correctness and appropriateness of related data gathering, processing, recording and data recording by the available project's monitoring infrastructure as well as to confirm correctness of related information included in the Monitoring Report ^{/1/} and VCS PD for the VCS project activity ^{/2/}.
- The possibility of performing a remote (but comprehensive) checking of all project's monitoring instruments/equipment (including confirmation of occurred performance of appropriated related calibration events in such instruments/equipment) as well as checking of monitoring practices as part of the operation of the VCS project activity vis-à-vis related requirements of the registered VCS PD ^{/2/} as well as the applied CDM baseline and monitoring methodology. Such checking included confirmation of existence and archiving in the project site of original documents (e.g. certificates of calibration) in the project site + additional documentation used for cross-checking of calculation and information, with electronic format copies of such documents and evidences being also made available to the Applus+ Certification's verification team for its remote assessment (as part of the performed desk review assessment phase).
- The possibility of performing a comprehensive checking of the project's quality control and quality assurance (QA/QC) procedures in place to prevent and/or identify and/or correct errors or omissions in the reported monitoring parameters.

Based on its accumulated expertise and experience with assessments for other similar project-based initiatives, it is Applus+ Certification's opinion that objectives to be expected for a physical on-site inspection to the project site were sufficiently reached by the Applus+ Certification's verification team through watching online (and later re-watching for further assessment/review) of the set of sequential live videos (movies) ^{/9/}.

In summary, by taking all above-presented aspects into account vis-à-vis applicable VCS and by also taking into account existent travelling restrictions because of COVID-19 pandemic; the Applus+ Certification's verification team judged that performing the above-described additional checking's/assessments (complementary auditing measures) instead of performing the previously scheduled physical on-site inspection to the project site is deemed acceptable and sufficient to have the overall quality and completeness of the performed verification assessment not being negatively affected.

It is the opinion of Applus+ Certification that the decision made of not performing an on-site inspection as part of the verification assessment and applying the above-summarized additional checking's/assessments (complementary auditing measures) instead are under conformance with applicable guidelines added in the guidance titled "COVID-19 Travel Guidance for Projects issued by VERRA/VCS" (issued on 18/03/2020) which is made available at the VERRA/VCS website ^{/14/}.

2.5 Resolution of Findings

As an outcome of a VCS verification process, the appointed verification team may raise different types of findings for identified issues.

Where a non-conformance arises the verification team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- Non-compliance with applicable requirement from the monitoring plan and/or applied baseline and monitoring methodology is identified in applied monitoring and/or reported in the Monitoring Report ^{/1/} and/or reporting and has not been sufficiently documented by the VCS project proponents, or if the evidence provided to prove conformity is insufficient.
- Occurred modifications to the implementation, operation and monitoring of the VCS project activity occurred and were not sufficiently documented and/or reported in the Monitoring Report ^{/1/}.
- Errors, inconsistencies and/or mistakes in applying assumptions, data and/or calculations of emission reductions (that impact the quantity of emission reductions) are identified.
- Issues previously identified in Forward Action Request (FAR) as part of validation or previously performed verification assessment for the VCS project activity (which would be required to be considered/addressed for the monitoring period encompassed by the verification assessment) are not addressed by the project proponents.

The verification team shall raise a Clarification Request (CL) if information is insufficient or not sufficiently clear to determine whether the applicable CDM requirements have been met.

All CARs and CLs raised during verification shall be resolved prior to submitting a request for issuance.

As part of the performed verification assessment, the following 12 CARs were raised by the Applus+ Certification's verification Team. No CL and no FAR were raised as part of the performed verification assessment.

CAR 1: While Section 1.1 of the Monitoring Report states that an additional engine-generator set was installed as part of the project's electricity generation infrastructure in year 2021 (with related initial testing/commissioning activities being performed from May/2021 to mid June 2021 + synchronization and electricity generation testing being performed from mid June/2021 to mid July 2021 + experimental operation being performed from mid July/2021 to the end of August/2021), it is however incorrectly stated the operation of such additional engine-generator (resulting in electricity generation) did not generate emission reductions during the monitoring period. This statement demands appropriate and further clarifications/justification. Moreover, determination of emission reductions may be revised by taking into account the period the additional engine-generator set operated within the considered monitoring period.

CAR 2: Different Sections of the Monitoring Report includes grammar mistakes and typographical errors.

CAR 3: Monitoring details for the monitoring parameter "Average technical transmission and distribution losses for providing electricity to source j in year y " ($TDL_{j,y}$) are not sufficiently complete. References to justification of appropriateness and correctness of selected value are missing. Moreover, the value applied for parameter $TDL_{j,y}$ in Section 4.1 is not the same as the value presented in the emission reduction calculation spreadsheet. Also, the reported value of 6.49% is not confirmed as being the most recent available value.

CAR 4: Monitoring details and references to calculation spreadsheets valid/applicable for monitoring period other than the considered monitoring period are included in the Monitoring Report.

CAR 5: Electricity commercialization receipts/invoices valid for selected months of the considered monitoring period were not made available for the Applus+ Certification's verification team.

CAR 6: Unit indication is missing for reported values of electricity generation in sheet "Electricity generation 2021" of the spreadsheet "GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021.xlsx".

CAR 7: While the Monitoring Report indicates that "verification" of electricity meters Schneider electric ION 7650 serial numbers MJ-1401A358-04 (main meter) and MJ-1310A536-04 (backup meter) are to be done once., no reference to the source of such assumption is included and no evidence was provided to the verification team.

CAR 8: The Monitoring Report does not include sufficient details about the invitation letter (i.e. name of the file, date, issued by) and also about the invoices both issued by EBE proving the biannual calibration frequency of the ION7650 electricity meters.

CAR 9: The symbol for $BE_{CH4,PJ,y}$ in Monitoring Report is different from the one presented in emission reduction spreadsheet.

CAR 10: The formulae applied for $F_{CH4,PJ,y}$ in Monitoring Report is different than the one presented in figure-format in the emission reduction spreadsheet.

CAR 11: The monitoring report does not consider the applicable Global Warming Potential (GWP) value for the GHG Methane (CH_4) in the context of determination of emission reductions achieved by the project activity during the considered monitoring period.

CAR 12: The Monitoring Report does not include a comparison between the ex-ante estimated and ex-post achieved values of emission reductions according to the applicable guidance of VCS Monitoring Report Template version 4.1.

The Applus+ Certification's verification team was able to confirm that above-listed 12 raised CARs were sufficiently and appropriately addressed by the project proponent for the VCS project activity. List of raised CARs is summarized in Appendix 2. The summaries of responses of project proponent for the raised CAR and the related assessment by the Applus+ Certification's verification team are provided in Appendix 2.

2.5.1 Forward Action Requests

No Forward Action Request (FAR) was raised as part of the performed verification assessment. Furthermore, there are no FAR previously raised (as part of the previously performed validation or verification assessments for the VCS project activity) which would be required to be considered/addressed for the considered monitoring period encompassed by the verification assessment.

2.6 Eligibility for Validation Activities

This section is not applicable for present verification, as Applus+ Certification holds the accreditation for Validation of projects under this Sectoral Scope.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

Through reviewing the registered VCS PD ^{/2/} and validation report ^{/3/}, it was validated that the project has been registered as VCS project which is available at <https://registry.verra.org/app/projectDetail/VCS/1883>. The project does not participate in the other emissions trading program by checking public information on Internet, interviewing with project owner and statement issued by project owner.

As noted by the Applus+ Certification's verification team, the following disclaimer is added in the registered VCS PD ^{/2/} confirming that the VCS project activity has never participated in other GHG program:

"In 2012 the "Biogas project at the Municipal landfill of Pichacay, Cuenca" was submitted for comments between 01 May 12 – 30 May 12. However, the project never passed the validation stage and has not been registered as CDM project."

Therefore, Applus+ Certification considers the project is eligible to participate under the VCS Program as there is no double counting for the emission reduction during any period.

3.2 Methodology Deviations

Not applicable as no deviation from the application of the selected baseline and monitoring methodology and/or from the application of the monitoring plan (as per the registered VCS PD ^{/2/}) occurred within the considered monitoring period (encompassing the 3rd periodic verification of the VCS project activity) or within the previous monitoring period (encompassing the 1st and 2nd periodic verification of the VCS project activity).

3.3 Project Description Deviations

As confirmed by the Applus+ Certification's verification team the only deviation from existing project description (as per the registered VCS PD ^{/2/}) applicable for the considered monitoring period (encompassing the 3rd periodic verification of the VCS project activity) is the occurred relative delay on the gradual/phased implementation of the project's electricity generation infrastructure. As appropriately indicated in Sections 2.3.2 and 3.1 of the Monitoring Report ^{/1/}, the installation of the second engine-generator set of the project's electricity generation infrastructure was initially planned to occur in July/2019, although its commercial operation has started only on 01/10/2021 (thus after the considered 3rd monitoring period) ⁵.

⁵ VCS-VVM version 3.2 ^{/22/} states that deviation on the applicability of the methodology, additionality or the appropriateness of the baseline scenario should be approved by VCS, although the delay on engine 2's implementation

The testing phase of the second engine-generator sets took place prior 07/07/2021 (with no connection with the electricity grid nor the electricity meter), also from 07/07/2021 to 08/07/2021 several tests connected to the electricity grid and also, a rented electricity meter (with the main electricity meter being disconnected) generated 5 MWh. It is important to note that no emission reductions are claimed by the project participant during those testing phases from engine-generator set 2.

Furthermore, from 20/07/2021 to 02/08/2021 the engine 2 was fully operational, during this period the engine 1 was not operational as the LFG flow was not enough for keeping two engine-generator sets in operation, as checked in CENACE primary monitoring records ^{/16/}. All measured electricity generated by the project activity (engines 1 and 2) was measured by the main electricity meter.

As there is no exclusive electricity meter neither for engine-generator set 1 nor the engine-generator 2, is not possible for the project participant to measure separately each amount of electricity generated. As a conservative approach, all related calculations performed for the whole monitoring period adopt the highest engine-generator efficiency (36.1% in engine-generator set 2). This is deemed as a conservative and correct approach by Applus+ Certification's verification team.

This occurred relative delay in the gradual/phased implementation of the project's electricity generation infrastructure is confirmed by the Applus+ Certification's verification team as not adversely or negatively impacting the previously demonstrated and assessed (i) applicability of the applied CDM baseline and monitoring methodology, (ii) the baseline scenario for the VCS project activity or (iii) the additionality or the VCS project activity.

3.4 Grouped Project

Not applicable, The VCS project activity does not represent and is not part of Grouped Project under VCS and/or under any other GHG program.

does not affect neither of the 3 key points above mentioned since there is no over issuance of ERs, scope changing or not previously planned expansion of the project activity.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The Applus+ Certification's verification team was able to confirm as part of performed assessment through performed document desk review, interviews with representatives of the project proponent and additional complementary measures (summarized in Section 2.4) that all physical features of the VCS project activity as included in its project design description in the registered VCS PD ^{/2/} are in place, thus confirming the implementation status of the monitoring plan and the completeness of monitoring, including the suitability of the implemented monitoring system (i.e., process and schedule for obtaining, recording, compiling and analyzing the monitored data and parameters).

While the total planned installed capacity for the VCS project activity in terms of utilization of LFG as gaseous fuel for electricity generation is 3.4 MW (4 engine-generator set fuelled by LFG with individual nameplate installed capacity of 0.85 MW each), during the applicable monitoring period, only two engine-generator sets were installed and has operated within the considered monitoring period as part of the VCS project activity, even though the second engine has only started to operate commercially on 01/10/2021 (thus not in the considered monitoring period). Since the installed electricity meter is located after the power transformer and does not register whether the electricity is produced by the first or the second unit, it is not possible for the project participant to measure separately the electricity generation from engines 1 and 2. However, electricity generation by engine-generator 2 is not considered for the determination of achieved emission reductions during the considered monitoring period for sake of conservatives. As specified in section 4.2 "data and parameters monitored" of the Monitoring Report, as a conservative approach, the generation efficiency of the unit with the highest efficiency is used to calculate the methane emission reductions of the project activity during the whole monitoring period and this is deemed as conservative approach by the Applus+ Certification's verification team.

Electricity generated as part of the operation of the VCS project activity is transmitted to the National Electricity Grid of Ecuador through a power transformer and a power substation, apart of the delay on the phased/gradual implementation of the project's electricity generation infrastructure, there are no changes on the key equipment and technology considered at the time of validation of the VCS project activity.

No additional special event which would affect the monitoring of the VCS project activity during the time the VCS project activity was under regular operation within the considered monitoring period was observed or noted by the Applus+ Certification's verification team.

The purpose of the project is to utilize landfill gas (LFG), which consists mainly of methane, for electricity generation. It includes LFG collection system, LFG pre-treatment system, electricity generation infrastructure encompassing a single engine-generator set until the end of the considered monitoring period. While the project's LFG flaring system is designed to operate only when the project's electricity generation infrastructure is not under operation, no emission reductions due to eventual combustion of LFG in the flare is claimed during the considered monitoring period.

In the position of the verifying VVB for the VCS project activity, upon received request from VERRA/VCS, the Applus+ considered as part of its verification assessment the requisite from Paragraph 22 from AMS III.G (version 10.0) ^{/6/} ⁶ (which is related to confirmation by validating VVB that no fuel other LFG is to be utilized by the previously validated VCS project activity as part of its design and operation). In the context of performed verification assessment, the Applus+ Certification's verification team was able to confirm that only the existent single pipeline from the project's LFG collection infrastructure is connected to the engine-generator set under operation as part of the project activity during the considered monitoring period. No flanges or pipeline joints (that could be used to have alternative or additional gaseous fuels being supplied to the installed engine-generator set) were identified by the Applus+ Certification team as part of its assessment⁷. The Applus+ Certification's verification team has also confirmed that the valid environmental licence/permit ^{/17/} for the construction, operation and retirement of the VCS project activity explicitly refers to generation of electricity using LFG the only fuel to be combusted.

Furthermore, by also taking into account that, as per the design of the only engine-generator set installed as part of the project activity during the considered monitoring period, gaseous fuel such as natural gas and biogas (such as LFG) represent the only fuels that could be in theory used as fuel for such currently installed engine-generator set ⁸ (as acknowledged by the Applus+ Certification's verification team based on its sectoral expertise and experience). As verified by the Applus+ Certification's verification team through review of publication issued by the US Energy Information Administration (EIA) ^{/19/}, there is no regulated market for natural gas in Ecuador and consumption of this type of non-renewable energy is very limited in the whole country. The location where the VCS project activity is implemented is thus not served by pipeline of natural gas distribution network. Furthermore, regular commercial supply of natural gas by trucks equipped with large gas cylinders or any other type of non-pipeline-based gas supply is inexistent in the region⁹.

⁶ The following requisite is included in Paragraph 22 from AMS III.G (version 10.0) ^{/6/}:

«Project proponents shall provide evidence to a validating designated operational entity (DOE) that only the landfill gas recovered in the project is used for power generation; no other gas or fuels except a start-up fuel are used.»

The assessment team confirmed that there is no proposed or actual change to the project design during this monitoring period.

All required equipment and procedures are available and implemented in an appropriate manner.

The VCS project activity was confirmed as being operational during the considered monitoring period. The non-existence of any material discrepancies between project implementation and the project description was confirmed by the Applus+ Certification's verification team.

As assessed in Sections 3.1 and 3.4, the Applus+ Certification's verification team was able to confirm that the VCS project activity is not currently registered and was not previously rejected under any other GHG programs since validation or previous verification. It is also sufficiently confirmed that the VCS project activity has not previously received or sought any other form of environmental credit or has become eligible to do so since validation or previous verification. It is also confirmed that GHG emission reductions generated by the VCS project activity were not and have become included in an emissions trading program or any other mechanism that includes GHG allowance trading.

As outlined in the Validation Report "Pichacay Landfill Gas Renewable Energy Project (in the

⁷ As further explained in Section 2.4, no on-site inspection (with physical presence of the verification team) was performed by the Applus+ Certification's verification team as part of the performed verification assessment. Upon previous request from the Applus+ Certification's verification team, representatives of the project proponent organized the production of a sufficiently complete set of sequential live videos (movies) + photographs (pictures) ^{/9/} produced/generated online in the project site with the goal of making it possible to the Applus+ Certification's verification team to remotely assess and confirm the implementation and operation of the VCS project activity (as if the verification team were on-site).

The set of sequential live videos (movies) + photographs (pictures) ^{/9/} were watched/visualized online by the Applus+ Certification's verification team while being produced/generated on 21/02/2022 and were later fully made available to Applus+ Certification for further assessment/watching and archiving as auditing evidence. By watching/visualizing (more than once) the content of the set of sequential live videos (movies) + photographs (pictures) ^{/9/}, the Applus+ Certification's verification team thus was able to have a comprehensive and complete remote assessment of the VCS project activity as if the team were on-site.

⁸ The Applus+ Certification's verification team is aware that for alternatively using natural gas as gaseous fuel for the installed Guascor type SFGM560 engine-generator set, modifications in the air inlet valve mechanism of the equipment would be required to be implemented. The utilization of other gaseous fuels such as Liquefied Petroleum Gas (LPG) would require significantly more complex (and of not easy reversion) modifications in the engine-generator set in the view of the Applus+ Certification's verification team. The licensing for the project activity does not allow any modification in the engine-generator set installed and under operation during the considered monitoring period.

⁹ In the province of Azuay in Ecuador, natural gas is used exclusively in the ceramic, plastic, metallurgy and painting industries. The gas is transported and distributed in cylinder trucks that deliver the gas to an storage point in each factory. There are no natural gas distribution pipeline network serving the region and there is no commerce of natural gas supplied in trucks that could be used by the project proponents for the operation of the project activity. This was confirmed by the Applus+ Certification's verification team through review of the publication "*Balance Energético Nacional- 2019*" (National Energy Outlook – year 2019) issued by Ecuador's Ministry of Energy (*Ministerio de Energía y Recursos Naturales no Renovables*) ^{/18/}.

particular case of the VCS project activity: Joint Validation Report and Verification Report (monitoring period from 27/07/2017 to 31/12/2018) (version 1, dated 27/08/2019) ^{/3/}; it was previously assumed and confirmed that the VCS project activity contributes towards sustainable development.

As assessed in Sections 3.2 and 3.3, there are no methodology deviations or project description deviations applicable for the VCS project activity.

In summary, the Applus+ Certification's verification team was able to confirm that the VCS project activity has been implemented and has been under operation until the end of the considered monitoring period as described in its VCS PD ^{/2/}.

4.2 Safeguards

4.2.1 No Net Harm

The following assessment detail related to no net harm is confirmed by the Applus+ Certification's verification team as being outlined in the Verification Report for the previous and initial monitoring period of the VCS project activity (in the particular case of the VCS project activity: Joint VCS PD and Monitoring Report (monitoring period from 27/07/2017 to 31/12/2018) for the VCS project activity (version 3.2, dated 07/07/2019) ^{/2/}):

"The verification team has reviewed the EIA^{/6/}, Environmental management Plan^{/6/} etc and accepted that there is no net harm from the project. The EIA was approved by CONELEC, by Official Letter No. CONELEC-CNRSE-2014-0067-OF of 9 February 2014^{/6/}. Hence accepted."

No additional assessment of impact caused by the previously occurred installation and starting of operation of the VCS project activity was made as part of the performed verification assessment for the 3rd periodic verification assessment for the VCS project activity (monitoring period from 01/01/2021 to 25/08/2021). This is under conformance with applicable VCS rules.

4.2.2 Local Stakeholder Consultation

The following assessment detail relate to local stakeholder consultation is confirmed by the Applus+ Certification's verification team as being outlined in the Verification Report for the previous and initial monitoring period of the VCS project activity (in the particular case of the VCS project activity: Joint VCS PD and Monitoring Report (monitoring period from 27/07/2017 to 31/12/2018) for the VCS project activity (version 3.2, dated 07/07/2019) ^{/2/}):

"A formal consultation process with the local stakeholders was carried out on 25th to 27th November 2013 at the project site. The identified stakeholders included villagers, officers from the Municipal Corporation, farmers around the project area, and representatives of project developers, relevant citizens, such as the governor, fire chief, major, community development representatives, parish priest etc. All the identified stakeholders were communicated by written invitation before the meeting on 21st November 2013. There was no negative comments. The verification team has reviewed the local stakeholder consultation report^{/17/} as well. The verification team has interviewed the local stakeholders during the onsite visit and received the positive opinion."

No additional local stakeholder consultation was held as part of the performed verification assessment for the 3rd periodic verification assessment for the VCS project activity (monitoring period from 01/01/2021 to 25/08/2021). This is under conformance with applicable VCS rules.

As also confirmed by the Applus+ Certification's verification team, the Monitoring Report includes in its Section 2.2 sufficient details about the local stakeholder consultation previously conducted as part of the development of the Environmental Impact Assessment (EIA) for the project activity. It is the opinion of the Applus+ Certification's verification team that related details included in Section 2.2 of the Monitoring Report ^{/4/} includes inter alia sufficient information about procedures and methods used for documenting of outcomes of performed local stakeholder consultation as well as details for the applied mechanism for on-going communication with local stakeholders.

4.3 AFOLU-Specific Safeguards

Not applicable. The VCS project activity is a non-AFOLU project.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

As per the applied monitoring procedure and in accordance with the requirements of the CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} and related provisions of the registered VCS PD ^{/2/}, GHG emission reductions are calculated based on measurement records and selected values of the *ex-post* monitored parameters (of which monitoring details are presented in the tables below) and also correctly considering values for *ex-ante* determined parameters.

Assessment of ex-ante determined parameters:

Values for the following *ex-ante* selected parameters are correctly reported in the Monitoring Report ^{/1/} and considered in GHG calculations for the considered monitoring period:

Ex-ante determined parameter	Applied value
Global Warming Potential of methane (GWP_{CH_4})	28 tCO_2e/tCH_4 ¹⁰
NCV of methane (NCV_{CH_4})	35.9 MJ/Nm ³
Density of methane at the temperature and pressure of the landfill (D_{CH_4})	0.0007168 $tCH_4/Nm^3 CH_4$
CO ₂ emission factor of the grid electricity in year y ($EF_{grid,y}$)	0.3349 tCO_2/MWh

¹⁰ According to the registered VCS PD ^{/2/} the applied value of GWP_{CH_4} for *ex-ante* estimations of emission reductions is 25 tCO_2e/tCH_4 , however VCS-Standard version 4.3 defines the following:

"Projects that complete validation on or before 31 July 2021 may use GWP values from AR4 for ex-ante emission reduction estimates, though such projects shall use GWP values from AR5 for ex-post calculations",

Therefore, the applied value for *ex-post* calculations (28 tCO_2e/tCH_4) is deemed as correct and in accordance with VCS rules, procedures and also with information made available at <https://archive.ipcc.ch/report/ar5/syr/>.

It is noteworthy that values of the fixed parameters indicated in the table above were selected ex-ante in the registered VCS PD ^{/2/}. Assessment for the previously occurred selection of values for the above-summarized ex-ante determined parameters are included in the Validation Report ^{/3/} for the VCS project activity.

As also confirmed by the Applus+ Certification's verification team, the Monitoring Report ^{/1/} also includes references to the following additional ex-ante determined parameters of which determined values were previously considered only in the particular context of determination of ex-ante estimates of emission reductions to be achieved by the VCS project activity within its crediting period:

- Efficiency of the LFG capture system that will be installed in the project activity. It is used for ex ante estimation only. A default value of 50 percent is used (η_{PJ})
- Default value for the model correction factor to account for model uncertainties (ϕ_{default})
- 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)
- Fraction of methane in the SWDS gas (volume fraction) (F)
- Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y ($\text{DOC}_{f,\text{default}}$)
- Methane correction factor ($\text{MCF}_{\text{default}}$)
- Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x ($W_{j,x}$)
- Fraction of degradable organic carbon in the waste type j (weight fraction) (DOC_j)
- Decay rate for the waste type j (k_j)
- Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year y ($F_{CH4,BL,y}$)
- Average technical transmission and distribution losses for providing electricity to source j in year y ($\text{TDL}_{j,y}$)
- Quantity of net electricity generation supplied by the project plant/unit to the grid in 2017-2018 ($\text{EG}_{PJ,\text{facility},2017-2018}$)
- Quantity of net electricity generation supplied by the project plant/unit to the grid in year y ($\text{EG}_{PJ,\text{facility},2019 - 2027,\text{estimated}}$)

Assessment of parameters monitored ex-post:

The Applus+ Certification's verification team has assessed whether all monitoring parameters of which monitoring ex-post is required as per the monitoring plan of the VCS PD ^{/2/} were correctly monitored during the considered monitoring period.

As confirmed by the Applus+ Certification's verification team, monitoring activities for the VCS project activity were performed for the considered monitoring period under full conformance with related requirements as established in the monitoring plan of the registered VCS PD ^{/2/} for the project activity ^{/2/}. Assessment details for monitoring for the 4 parameters monitored ex-post for the considered monitoring period are summarized below in the following tables:

Assessment details for the monitoring parameter “Quantity of net electricity generation supplied by the project plant/unit to the grid in year y” ($EG_{PJ, facility}$):

Data / Parameter: (as per the monitoring plan of the VCS PD):	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y ($EG_{PJ, facility}$)
Measuring, recording and reporting frequencies:	During the considered monitoring period, accumulated values of continuously measurements of the monitoring parameter $EG_{PJ, facility}$ were aggregated and recorded/reported hourly by the SIMEC application of the entity <i>Operador Nacional de Electricidad</i> (CENACE) with related records being made available and utilized by the project proponents as part of the application of the monitoring plan of the VCS project activity. CENACE is the technical and economical managing and operating entity for the National Electricity Grid of Ecuador. As confirmed by the Applus+ Certification’s verification team, based on measurements performed by installed monitoring instruments (electricity meters), SIMEC application generates a report with hourly values for generated electricity which delivered to the grid daily with records being record in a data plataform from which historical records can be retrieved online. Monthly reports with accumulated measurement values for electricity generated by the VCS project activity are generated by using SIMEC application data. All net electricity generated by the VCS project activity is exported. Monthly sales receipts of generated electricity ^{/20/} were made available and were assessed by the Applus+ Certification’s verification team. As confirmed by the Applus+ Certification’s verification team, the following checking procedure (which is outlined in the VCS PD ^{/2/}) has been systematically applied during the considered monitoring period: <i>“The daily report is double-checked by the Technical Manager of the power plant as well as by CENACE technical specialists. Once the file is approved, it is stored on an online platform – SIMEM. The platform allows viewing and downloading of the stored files, named CON_MED_EXE_20YY-MM-DD.xls. At EBE, the Project Manager groups the data of the respective monitoring period into one excel sheet. All daily reports</i>

	<i>remain available and can be double checked by the project advisor and verification body."</i>										
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and applied baseline and monitoring methodology? (Yes / No)	As per the registered VCS PD ^{/2/} continuous measurements of EG_{PJ,facility} are to be recorded and reported under an at least every month frequency. The applied CDM methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) ^{/10/} and the CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} do not clearly indicate recording and reporting frequencies for continuous measurements for the parameter EG_{PJ,facility}. Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the registered VCS PD ^{/2/} as well as with applicable guidance of the CDM baseline and monitoring methodology AMS-I.D: "Grid connected renewable electricity generation" (version 18.0) ^{/6/} and the CDM methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) ^{/10/}.										
Type of monitoring equipment/instrument:	Net electricity generated by the VCS project activity during the considered monitoring period was measured by electricity meters (main meter and backup unit) which are installed, maintained, and calibrated by CENACE. The specifications of the installed electricity meters are as follows: <table border="1"> <thead> <tr> <th colspan="2">Specifications of installed electricity meter</th></tr> </thead> <tbody> <tr> <td>Manufacturer</td><td>Schneider Electric</td></tr> <tr> <td>Model</td><td>ION 7650</td></tr> <tr> <td>Serial Numbers</td><td>MJ-1401A358-04 (main meter) and MJ-1310A536-04 (backup meter).</td></tr> <tr> <td>Accuracy</td><td>±0.2%</td></tr> </tbody> </table> Source: ^{/15/}	Specifications of installed electricity meter		Manufacturer	Schneider Electric	Model	ION 7650	Serial Numbers	MJ-1401A358-04 (main meter) and MJ-1310A536-04 (backup meter).	Accuracy	±0.2%
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Accuracy	±0.2%										

	Month/Year	EG _{PJ, facility} (MWh)
	January 2021	0
	February 2021	0
	March 2021	0
	April 2021	162.05
	May 2021	536.37
	June 2021	536.10
	July 2021	541.24
	August 2021	368.14
Is the accuracy of the monitoring equipment/instrument as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	The registered VCS PD ^{/2/} , the applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/} and the CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} do not specify any accuracy requirement for the electricity meter installed. The accuracy range for the installed instruments is confirmed as being $\pm 0.2\%$ through assessment of its specification sheet ^{/15/} . Based on its sectoral expertise and experience with other similar project-based initiative under VCS and other GHG programs (such as the CDM) (initiatives promoting collection and destruction and/or utilization of LFG), it is the opinion of Applus+ Certification that the use of the installed instrument represents good practice for monitoring generation of electricity and is under sufficient conformance with the monitoring plan as per the registered VCS PD ^{/2/} for the project activity.	
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Yes. By comparing reported values against values indicated in monthly electricity commercialization receipts ^{/16/} valid for the project’s electricity generation infrastructure during the considered monitoring period, the Applus+ Certification’s verification team was able to confirm the correctness of monthly	

	reported values for $EG_{PJ, facility}$ which are considered in the determination of baseline emissions for the VCS project activity.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The Applus+ Certification's verification team has confirmed that accumulated monthly values for the monitoring parameter $EG_{PJ, facility}$ as reported in the emission reduction calculation spreadsheet and Monitoring Report ^{/1/} are in accordance with both primary monitoring records for electricity generation from CENACE (which are reported every hour) and with monthly electricity commercialization receipts ^{/16/} valid for the project's electricity generation infrastructure during the considered monitoring period,
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transferring and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Details for monitoring management and quality assurance related aspects for the VCS project activity are also included in the end of this Section.

Assessment details for the monitoring parameter “Energy Conversion Efficiency of the project equipment, i.e. Guascor Power Genset type SFGM560” (EE_y)

Data / Parameter: (as per the monitoring plan of the VCS PD):	Energy Conversion Efficiency of the project equipment, i.e. Guascor Power Genset type SFGM560. (EE_y)
Measuring, recording and reporting frequencies:	The determination of parameter EE_y is not based on measurements. The equipment manufacturer has provided the following values for the engines: Engine-generator set 1: 36.0% Engine-generator set 2: 36.1% The highest value of both engine-generator sets (36.1%) is selected and confirmed by the Applus+ Certification’s verification team as representing value as per specification fact sheets for the installed engine-generator sets issued by the equipment manufacturer GUASCOR POWER S.A.U., ^{/4/} which were made available and assessed.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and applied baseline and monitoring methodology? (Yes / No)	Not applicable. The determination of parameter EE_y is not based on measurements.
Type of monitoring equipment/instrument:	Not applicable. The determination of parameter EE_y is not based on measurements and thus there is no related monitoring equipment/instrument.
Is the accuracy of the monitoring equipment/instrument as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the	Not applicable. The determination of parameter EE_y is not based on measurements and thus there is no related monitoring equipment/instrument. Based on its sectoral expertise and experience with other similar project-based initiative under VCS and other GHG programs (such as the CDM) (initiatives promoting collection and destruction and/or utilization of LFG), it is the opinion of Applus+ Certification that the determination based on information as per specification fact sheet issued by the manufacturer of the engine-generator sets represents good

monitoring equipment/instrument represents good monitoring practice?	practice for determining energy conversion efficiency of the project's engine-generator sets.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Not applicable.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transferring and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Details for monitoring management and quality assurance related aspects for the VCS project activity are also included in the end of this Section.

Assessment details for the monitoring parameter “The quantity of electricity used for the operation of the installed facilities in the year y” ($EC_{project,y}$):

Data / Parameter: (as per the monitoring plan of the VCS PD):	The quantity of electricity used for the operation of the installed facilities in the year y ($EC_{project,y}$)
Measuring, recording and reporting frequencies:	During the considered monitoring period, records of accumulated values of continuously measurements of the monitoring parameter $EC_{project,y}$ (based on measurements performed by electricity meter which is installed and maintained by the local electricity distribution company Empresa Eléctrica Regional Centro Sur C.A. (CENTROSUR)) as reported in monthly invoices for purchasing of grid-sourced electricity issued by CENTROSUR /^{20/ 11} were aggregated and recorded/reported on a monthly basis for the determination of accumulated value of $EC_{project,y}$ valid for the considered monitoring period. As confirmed by the Applus+ Certification’s verification team, the electricity demand of the VCS project activity was met by electricity generated by the project’s electricity generation infrastructure whenever such infrastructure has been under operation within the considered monitoring period. During the time periods within the considered monitoring period when the project’s electricity generation component was not under operation (temporary interruptions of the component), the

¹¹ As confirmed by the Applus+ Certification’s verification team, the following related disclaimer is appropriately included in the emission reduction calculation spreadsheet:

“**The bills of these months did not arrive. EBE could download an electronic bill stored in the Internal Rent Service of Ecuador (SRI) system. These bills do only contain the costs in USD. In order to calculate the electricity consumption, the costs (ZEHORA, ZEHORB and ZEHORC) have to be divided by the electricity price being 0.071 USD/kWh for ZEHORA (08h00 - 18h00). 0.071 USD/kWh for ZEHOR B (18h00 - 22h00) and 0.059 USD/kWh for ZEHORC (22h00 - 08h00). The tariff per kWh can be verified by checking the normal bills that contain both kWh and USD”.

Applus+ Certification’s verification team confirmed the authenticity of electricity bills and electronic bill stored in the Internal Rent Service of Ecuador (SRI) and it is Applus+ Certification’s verification team’s opinion that the alternative approach adopted by the project participant to properly estimate the electricity consumption for these periods with no information available, are deemed as correct and acceptable.

	electricity demand of the VCS project activity was confirmed as being met by imports of grid-sourced electricity. Since 25/10/2019, the monthly electricity bills are split in two files as follows: - Energy consumed from the grid in low voltage (220-110V: auxiliary services) /20/ - Energy consumed by the genset in mid voltage (22,000 V: substation and 480V equipment) /20/ <table border="1" data-bbox="641 705 1391 1433"> <thead> <tr> <th>Month/Year</th><th>EC_{project,y} (MWh)</th></tr> </thead> <tbody> <tr> <td>January 2021</td><td>1.69</td></tr> <tr> <td>February 2021</td><td>1.84</td></tr> <tr> <td>March 2021</td><td>1.98</td></tr> <tr> <td>April 2021</td><td>7.59</td></tr> <tr> <td>May 2021</td><td>17.31</td></tr> <tr> <td>June 2021</td><td>17.75</td></tr> <tr> <td>July 2021</td><td>17.82</td></tr> <tr> <td>August 2021</td><td>18.35</td></tr> </tbody> </table>	Month/Year	EC _{project,y} (MWh)	January 2021	1.69	February 2021	1.84	March 2021	1.98	April 2021	7.59	May 2021	17.31	June 2021	17.75	July 2021	17.82	August 2021	18.35
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Are measuring, recording and reporting frequencies in accordance with the monitoring plan and applied baseline and monitoring methodology? (Yes / No)	As per the registered VCS PD /2/ continuous measurements of EC_{project,y} (as reported in as reported in monthly invoices for purchasing of grid-sourced electricity issued by CENTROSUR) are to be recorded and reported under an at least every month frequency. The applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) /10/ and the CDM baseline and monitoring methodology AMS-III.G (version 10.0) /6/ do not clearly indicate recording and reporting frequencies for continuous measurements for the parameter EC_{project,y}.																		

	Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the registered VCS PD ^{/2/} as well as with the applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/} and the CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/}.								
Type of monitoring equipment/instrument:	Consumption of grid-sourced electricity by the VCS project activity during the considered monitoring period was measured by an electricity meter which is installed and maintained by the local electricity distribution company Empresa Eléctrica Regional Centro Sur C.A. (CENTROSUR). The specifications of the installed electricity meter are as follows: <table border="1"> <thead> <tr> <th colspan="2">Specifications of installed electricity meter</th></tr> </thead> <tbody> <tr> <td>Manufacturer</td><td>ELSTER</td></tr> <tr> <td>Model</td><td>type A3R, model ZE3300000L0, class CL200</td></tr> <tr> <td>Accuracy</td><td>±0.2%</td></tr> </tbody> </table> Source: ^{/15/}	Specifications of installed electricity meter		Manufacturer	ELSTER	Model	type A3R, model ZE3300000L0, class CL200	Accuracy	±0.2%
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Is the accuracy of the monitoring equipment/instrument as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	The registered VCS PD ^{/2/} the applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/} and the CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} do not specify any accuracy requirement for the electricity meter installed. The accuracy range for the installed instruments is ±0.2%. Based on its sectoral expertise and experience with other similar project-based initiative under VCS and other GHG programs (such as the CDM) (initiatives promoting collection and destruction and/or utilization of LFG), it is the opinion of Applus+ Certification that the use of the installed instrument represents good practice for monitoring consumption of grid-sourced electricity by the VCS project activity and is under sufficient								

	conformance with the monitoring plan as per the registered VCS PD /2/ for the project activity.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Yes. By comparing reported values against values indicated in monthly electricity purchasing invoices, the Applus+ Certification's verification team was able to confirm the correctness of monthly reported values for $EC_{project,y}$ which are considered in the determination of baseline emissions for the VCS project activity.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Not applicable.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transferring and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Details for monitoring management and quality assurance related aspects for the VCS project activity are also included in the end of this Section.

Assessment details for the monitoring parameter “Average technical transmission and distribution losses for providing electricity to source j in year y ” ($TDL_{j,y}$)

Data / Parameter: (as per the monitoring plan of the VCS PD):	Average technical transmission and distribution losses for providing electricity to source j in year y ($TDL_{j,y}$)
Measuring, recording and reporting frequencies:	The ex-post determination of the monitoring parameter $TDL_{j,y}$ is not based on direct measurements performed as part of the operation and monitoring of the VCS project activity. As correctly outlined in the Monitoring Report ^{/1/}, the value for the monitoring parameter $TDL_{j,y}$ valid for the considered monitoring period is correctly selected as follows: The project participant initially clarifies that, under conformance with the CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0), option 1 (“use annual average value based on the most recent data available within the host country”) was applied. The monitoring frequency for $TDL_{j,y}$ is annual. In the absence of related data from the relevant year, the most recent figures for the latest 5-years should be used. The project proponent has initially applied available records for the distribution losses of regional electricity distribution company Empresa Eléctrica Regional Centro Sur C.A. (Centrosur). However, by acknowledging that national figure should be applied, data from the Annual and Multiannual Statistics of the Ecuadorian Electricity Sector 2020^{/21/}. Table 7, page 14 of this technical report presents the technical distribution losses of Ecuador as a whole as being 6.87% in year 2020. Table 100, page 107 of the technical report presents the transmission losses of the SNT (Systema Nacional de Transmission” as being 3.32% in year 2020 (where year 2020 is the most recent year for which this information is available). The technical distribution losses and the transmission losses are reported separately and need to be multiplied to obtain the combined technical transmission and distribution losses.

	Thus, $TDL_{j,y}$ is calculated as follows: $TDL_{j,y} = 1 - (DL_{j,y} - 1) * (TL_{j,y} - 1)$ Where: $TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source j in year y $DL_{j,y}$ = Average technical distribution losses of the distribution electricity system of Ecuador (%) to the project in year y (6.87%) $TL_{j,y}$ = Average transport losses of the national electricity transport system (SNT) of Ecuador (%) to the project in year y (3.32%) $TDL_{j,y} = 9.96\%$ Selected value for $TDL_{j,y}$ is confirmed by the Applus+ Certification's verification team as correctly representing technical transmission and distribution losses for the National Electricity Grid of Ecuador as per official statistics from Empresa Eléctrica Regional Centro Sur C.A, (CENTROSUR) ^{/21/}. Selected value was officially issued is year 2020, which is confirmed to be the latest year for which data is available. Thus, the use of selected value for the whole considered monitoring period is deemed reasonable and acceptable.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Not applicable. There are no measurements or measurement instruments/equipment involved for the determination of the annual values for parameter $TDL_{j,y}$.
Type of monitoring equipment/instrument:	Not applicable. There are no measurements or measurement instruments/equipment involved for the determination of the set of annual values for parameter $TDL_{j,y}$.

Is the accuracy of the monitoring equipment/instrument as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represents good monitoring practice?	Not applicable. There are no measurements or measurement instruments/equipment involved for the determination of the set of annual values for parameter TDL_{j,y} .
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Not applicable.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transferring and reporting of data to be used for the emission reductions calculations? Are necessary/applicable	Details for monitoring management and quality assurance related aspects for the VCS project activity are also included in the end of this Section.

QA/QC processes in place?	
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Assessment of meeting of calibration requirements of applied monitoring instruments/equipment:

The Applus+ Certification's verification team has assessed whether all monitoring instruments/equipment installed at the project site have operated during the monitoring period from 01/01/2021 to 25/08/2021 under full compliance with calibration requirements as per both related provisions from the registered VCS PD ^{/2/} and recommendations/guidance from the instrument/equipment manufacturers. The following tables include assessment details for calibration events performed on the monitoring instruments/equipment used for performance of measurements monitoring the ex-post determined parameters during the considered monitoring period:

Assessment of performed calibration events for equipment/instruments used for monitoring the parameter "Quantity of net electricity generation supplied by the project plant/unit to the grid in year y" (EG_{PJ,facility}):

Data / Parameter: (as per the monitoring plan of the VCS PD):	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (EG _{PJ,facility})
Calibration frequency /interval for the monitoring equipment/instrument:	As per the recommendations from the equipment's manufacturer, the installed electricity meters are to be calibrated at least every 5 years. According to the registered VCS PD ^{/2/} every two year. As confirmed by the Applus+ Certification's verification team through assessment of the specification sheet for the installed electricity meters, the selected calibration frequency is as per the recommendations of the instrument manufacturer. Valid calibration events were performed in September/2019 in both the main and backup electricity meters.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency	The applied CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} does not explicitly specify any calibration frequency requirements for the installed electricity meters. The registered VCS PD ^{/2/} states the following regarding calibration of monitoring instrument for the monitoring parameter EG _{PJ,facility} : <i>"To achieve the permit that allows EBE to deliver energy to the grid, the two ION meters were calibrated. The company</i>

represent good monitoring practice?	<i>that performed the calibration was the National Center for Energy Control – CENACE, institution that controls and regulate the Ecuadorian Electrical Power System. The meters need to be calibrated every 2 years.”</i> As per the also applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/}, the following requirement is established regarding maintenance and calibration for electricity meters: <i>“(…) meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO)”.</i> <i>“In cases where electricity meters are regulated (e.g. the electricity is supplied to the electric grid), the electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.”</i> It is important to note that the installed electricity meters are approved/certified by the entity <i>Operador Nacional de Electricidad</i> (CENACE). CENACE is the technical and economical managing and operating entity for the National Electricity Grid of Ecuador. The electricity meters are thus in conformance with CENACE’s requirements for maintenance, testing and calibration of electricity meters. Furthermore, the applied calibration frequency of every 2 years for the electricity meters is confirmed to be in accordance with related requirements/recommendations as established by the meters manufacturer. While, as confirmed by the Applus+ Certification’s verification team, the entity <i>Operador Nacional de Electricidad</i> (CENACE). CENACE is the technical and economical managing and operating entity for the National Electricity Grid of Ecuador, the installed electricity meter is to be calibrated every 5 years as
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	per recommendation of its manufacturer, a calibration frequency of every 2 years is applied for the installed electricity meters.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events in both the main and backup electricity meters confirm appropriate functioning of these electricity meters (at the time the calibration events were performed).
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration events as correctly outlined in the Monitoring Report ^{/1/} are valid for the whole considered monitoring period. Applus+ Certification was able to confirm the validity of the performed calibration event for the installed electricity meters as follows: - Calibration events performed in September/2019, valid until September 2021 (2 years) ^{/12/}

Assessment of performed calibration events for equipment/instruments used for monitoring the parameter “The quantity of electricity used for the operation of the installed facilities in the year y” ($EC_{project,y}$):

Data / Parameter: (as per the monitoring plan of the VCS PD):	The quantity of electricity used for the operation of the installed facilities in the year y ($EC_{project,y}$)
Calibration frequency /interval for the monitoring equipment/instrument:	The following statements are confirmed by the Applus+ Certification’s verification team as being included in the technical manual ^{/13/} for the installed electricity used to perform electricity consumption measures as part of monitoring of the parameter $EC_{project,y}$: <i>“no user calibration required (factory calibrated)”</i> <i>“A3 ALPHA meters are factory calibrated and tested to provide years of trouble-free service. No field calibrations or adjustments are required to ensure accurate operation of the meter.”</i> <i>“The A3 ALPHA meter is calibrated and tested at the factory, and it is ready for installation.”</i> Furthermore, as also confirmed by the Applus+ Certification’s verification team, the responsibility for testing and maintenance of the installed electricity meter is of the local electricity distribution company Empresa Elèctrica Regional Centro Sur C.A. (CENTROSUR).
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable. There is no calibration interval valid for the installed monitoring instrument. The registered VCS PD ^{/2/} and the applied CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} do not explicitly specify any calibration frequency requirements for the installed electricity meter. As per the also applied CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/}, the following requirement is established regarding maintenance and calibration for electricity meters: <i>“(…) In cases where electricity meters are regulated (e.g. the electricity is supplied by the electric grid – scenario A),</i>

	<i>the electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. In cases where electricity meters are not regulated (e.g. the electricity is supplied by captive power plants – Scenario B), the electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier or national requirements. If these standards are not available, and meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted)."</i> It is important to note that the responsibility for installation and operation of the electricity meter in the project site is of the local electricity distribution company Empresa Elèctrica Regional Centro Sur C.A. (CENTROSUR).
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. There is no calibration event in the monitoring instrument valid for the considered monitoring period.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. There is no calibration event in the monitoring instrument valid for the considered monitoring period.

While there are no measurements or measurement instruments/equipment involved for the determination of reported values for the monitoring parameters “*Energy Conversion Efficiency of the project equipment, i.e. Guascor Power Genset type SFGM560*” (EE_y) and “*Average technical transmission and distribution losses for providing electricity to source j in year y*” ($TDL_{j,y}$), there are no calibration requirements for monitoring instruments of which related assessment is required or applicable.

As a conclusion, the Applus+ Certification’s verification team was able to confirm that calibration events performed for monitoring instruments/equipment of the VCS project activity were conducted in accordance with the monitoring plan from the VCS PD ^{/2/}, the applied CDM baseline and monitoring methodology during the considered monitoring period. Documented evidences for performed calibration events allowed the Applus+ Certification’s verification team to confirm that applied monitoring instruments/equipped operated under appropriate manner during the considered monitoring period.

Assessment of GHG calculations:

A calculation spreadsheet correctly and sufficiently summarizes the achieved baseline emissions due to destruction of methane by the VCS project activity during the considered monitoring period vis-à-vis applicable GHG calculation approach as per the registered VCS PD ^{/2/}. Moreover, such summarized spreadsheet also calculates baseline emissions from the displacement of the equivalent amount of electricity generated by the VCS project activity (which would otherwise be generated by existing grid-connected power plants, including fossil-fuel fired power plants (and addition of new power generation units) within the National Electricity Grid of Ecuador) vis-à-vis applicable GHG calculation approach as per the registered VCS PD ^{/2/}. Project emissions due to consumption of grid-sourced electricity by the VCS project activity are also correctly and sufficiently calculated in the emission reduction calculation spreadsheet vis-à-vis applicable GHG calculation approach as per the registered VCS PD ^{/2/}.

The determination of achieved emission reductions by the VCS project activity during the considered monitoring period is confirmed by the Applus+ Certification’s verification team as being correctly and appropriately calculated as the difference between achieved baseline emissions and achieved project emissions as follows:

Assessment of determination of baseline emissions:

The Applus+ Certification’s verification team assessed whether the methods and formulae used to determine baseline emissions for the considered monitoring period are correct and appropriate. The performed assessment encompassed checking whether applied methods and formulae as described in the monitoring plan of the registered VCS PD ^{/2/} and applicable CDM baseline and monitoring methodology + methodological tools were correctly applied, including confirmation whether the Monitoring Report ^{/1/} includes all parameters and monitored data at

the intervals required by the applied CDM baseline and monitoring methodology + methodological tools as per the registered VCS PD /2/.

The correctness of application of emission factors and default values (ex-ante determined/fixed parameters) as per the registered VCS PD /2/ was also verified.

Through assessment of the Monitoring Report /1/, the Applus+ Certification's verification team was able to verify that baseline emissions (BE_y) for the considered monitoring period are correctly calculated as follows:

$$BE_y = BE_{CH_4,PJ,y} + BE_{electricity,y}$$

Where:

$BE_{electricity,y}$ Baseline emissions associated with electricity generation in year y (termed in the Monitoring Report /1/ as "*Baseline emission from electricity displacement that otherwise would be provided by grid in year y*") $BE_{electricity,y}$ is confirmed to be correctly determined for the considered monitoring period as follows:

$$BE_{electricity,y} = EG_{PJ,y} * EF_{grid,y}$$

Where:

$EG_{PJ,y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y. Monthly accumulated records of net electricity generated by the VCS project activity (using collected LFG as gaseous fuel) during the considered monitoring period are confirmed by the Applus+ Certification's verification team as being correctly reported in the Monitoring Report /1/ and considered in the determination of baseline emissions as follows:

Month	Amount of electricity generated using LFG as gaseous fuel ($EG_{PJ,y}$) (MWh)
January/2021	0.00
February/2021	0.00
March/2021	0.00
April/2021	162.05

May/2021	536.37
June/2021	536.10
July/2021	541.24
August/2021	368.14

Further monitoring details for $EG_{PJ,y}$ are summarized above. These values were crosschecked with monthly electricity commercialization receipts /16/.

$EF_{grid,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y was calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” As defined in the VCS PD /2/, $EF_{grid,y}$ is ex-ante determined as 0.3349 tCO_2/MWh .

As confirmed by the Applus+ Certification’s verification team, the calculated accumulated value for $BE_{Electricity,y}$ for the considered monitoring period is correctly determined and reported as 718 tCO_2 .

$BE_{CH_4,PJ,y}$ Baseline emission from LFG avoidance that otherwise would be emitted to the atmosphere in absence of the Project in year y . $BE_{CH_4,y}$ is confirmed to be correctly determined for the considered monitoring period as follows:

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

Where:

OX Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste). As outlined in the registered VCS PD /2/, OX is ex-ante determined as 0.1.

GWP_{CH_4} Global warming potential of CH_4 . As outlined in the registered VCS PD /2/, GWP_{CH_4} is ex-ante determined as 28¹².

¹² According to the registered VCS PD /2/ the applied value of GWP_{CH_4} for ex-ante estimations of emission reductions is 25 tCO_2e/tCH_4 , however VCS-Standard version 4.3 defines the following:

$F_{CH4,PJ,y}$ Methane captured and destroyed/gainfully used by the project activity in the year y . While no baseline emissions associated with combustion of collected in the installed flare is accounted (due to lack of installed related monitoring instrument/equipment), $F_{CH4,PJ,y}$ is thus confirmed to be appropriately determined as follows:

$$F_{CH4,PJ,y} = (EG_y * 3,600) / (NCV_{CH4} * EE_y) / D_{CH4}$$

Where:

$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (in MWh). Assessment details of $EG_{PJ,y}$ for the considered monitoring period are summarized above.
NCV_{CH4}	Net calorific value for methane. As outlined in the registered VCS PD ^{/2/} , NCV_{CH4} is <i>ex-ante</i> determined as 35.9 MJ/Nm ³ .
EE_y	Energy Conversion Efficiency of the project equipment. For the considered monitoring period, EE_y is determined as 36.1% which represents the higher conversion efficiency of the installed engine-generator sets of the project's electricity generation infrastructure. As a conservative approach, the conversion efficiency of engine-generator set 2 (36.1%) is chosen over the conversion efficiency of engine-generator set 1 (36.0%), as the installed electricity meter is located after the power transformer and is not able to identify whether the electricity is generated by the first or second engine-generator sets. Further assessment details for EE_y are summarized above.

"Projects that complete validation on or before 31 July 2021 may use GWP values from AR4 for ex-ante emission reduction estimates, though such projects shall use GWP values from AR5 for ex-post calculations",

Therefore, the applied value for ex-post calculations (28 tCO₂e/tCH₄) is deemed as correct and in accordance with VCS rules and procedures.

D_{CH_4} Density of methane. As outlined in the registered VCS PD ^{/2/}, D_{CH_4} is *ex-ante determined* as $0.0007168 \text{ tCH}_4/\text{Nm}^3 \text{CH}_4$.

The calculated accumulated annual values for $F_{CH_4,PJ,y}$ are confirmed by the Applus+ Certification's verification team as being correctly determined as 427 tCH_4 for the considered monitoring period from 01/01/2021 to 25/08/2021.

As confirmed by the Applus+ Certification's verification team, the calculated accumulated value for $BE_{CH_4,PJ,y}$ for the considered monitoring period from 01/01/2021 to 25/08/2021 is correctly determined as $10,757 \text{ tCO}_2\text{e}$.

The calculated value for total baseline emissions ($BE_{CH_4,PJ,y} + BE_{\text{electricity},y}$) for the considered monitoring period from 01/01/2021 to 25/08/2021 is correctly determined as $11,475 \text{ tCO}_2\text{e}$.

Assessment of determination of project emissions:

The Applus+ Certification's verification team assessed whether the methods and formulae used to determine project emissions for the considered monitoring period are correct and appropriate. The performed assessment encompassed checking whether applied methods and formulae as described in the monitoring plan of the registered VCS PD ^{/2/} and applicable CDM baseline and monitoring methodology + methodological tools were correctly applied, including confirmation whether the Monitoring Report ^{/1/} includes all parameters and monitored data at the intervals required by the applied CDM baseline and monitoring methodology + methodological tools as per the registered VCS PD ^{/2/}.

The correctness of application of emission factors and default values (ex-ante determined/fixed parameters) as per the registered VCS PD ^{/2/} was also verified.

The Applus+ Certification's verification team was able to verify that, as correctly indicated in the Monitoring Report ^{/1/}, project emissions (PE_y) for the considered monitoring period are calculated as follows:

$$PE_y = PE_{CH_4,y} + PE_{\text{Electricity},y}$$

Where:

$PE_{CH_4,y}$ Project emissions landfill methane recovery. As established in the VCS PD ^{/2/}, $PE_{CH_4,y}$ is determined as follows:

$$PE_{CH_4,y} = PE_{\text{power},y} + PE_{\text{flare},y}$$

Where:

$PE_{flare,y}$ Emissions from flaring or combustion of the landfill gas stream in the year y. While no baseline emissions associated with combustion of collected in the installed flare is accounted (due to lack of installed related monitoring instrument/equipment), it is deemed reasonable and acceptable the decision of the project proponent to account $PE_{flare,y}$ as null (zero) tCO₂e ¹³.

$PE_{power,y}$ Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y. $PE_{power,y}$ is confirmed to be correctly determined for the considered monitoring period by correctly following applicable guidance of the CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) ^{/10/} as follows:

$$PE_{power,y} = EC_{project,y} * EF_{grid,y} * (1 + TDJ_{j,y})$$

Where:

	Amount of grid-sourced electricity consumed by the VCS project activity ($EC_{project,y}$) (MWh)
January/2021	1.69
February/2021	1.60
March/2021	1.98
April/2021	7.16
May/2021	17.10

¹³ As confirmed by the Applus+ Certification's verification team, the following related disclaimer is appropriately included in Section 5.2 of the Monitoring Report ^{/1/}:

“At the project site a flare has been installed that is operational in case the engine is not operational. The emission reduction achieved by the flare is not counted in this project, since no measurement equipment is installed that meets the requirements of TOOL06 and TOOL08. Therefore, during monitoring, the baseline and project emissions of the use of the flare also will not be taken into account. ($ER_{flare} = BE_{flare} - PE_{flare} = 0$). Consequently, the project emissions of the flare have not been taken into account. This is a conservative approach since in reality the flare has destroyed methane part of the year.”

June/2021	17.53
July/2021	17.28
August/2021	18.06

As also appropriately outlined in the emission reduction calculation spreadsheet, monthly consumption of grid-sourced electricity in the amount of 1.84 MWh and 17.31 MWh are estimated as being valid/applicable for the periods encompassing February/2021 and May/2021 respectively ¹⁴. This is deemed reasonable and acceptable in the opinion of the Applus+ Certification's verification team.

Accumulated annual value of consumption of grid-sourced electricity by the VCS project activity during the considered monitored are confirmed by the Applus+ Certification's verification team as being correctly determined as 84.36 MWh during the considered monitoring period. Further monitoring details for $EC_{project,y}$ are summarized above.

 $TDL_{j,y}$

Average technical transmission and distribution losses for providing electricity to source j in year y . For the considered monitoring period, $TDL_{j,y}$ is determined as

¹⁴ As confirmed by the Applus+ Certification's verification team, the following related disclaimer is appropriately included in the emission reduction calculation spreadsheet:

*“**The bills of these months did not arrive. EBE could download an electronic bill stored in the Internal Rent Service of Ecuador (SRI) system. These bills do only contain the costs in USD. In order to calculate the electricity consumption, the costs (ZEHORA, ZEHORB and ZEHORC) have to be divided by the electricity price being 0.071 USD/kWh for ZEHORA (08h00 - 18h00). 0.071 USD/kWh for ZEHOR B (18h00 - 22h00) and 0.059 USD/kWh for ZEHORC (22h00 - 08h00). The tariff per kWh can be verified by checking the normal bills that contain both kWh and USD”.*

Applus+ Certification's verification team confirmed the authenticity of electricity bills and electronic bill stored in the Internal Rent Service of Ecuador (SRI) and it is Applus+ Certification's verification team's opinion that the alternative approach adopted by the project participant to properly estimate the electricity consumption for these periods with no information available, are deemed as correct and acceptable.

9.96%. Further assessment details for $TDL_{i,y}$ are summarized above.

$EF_{grid,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y was calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” As defined in the VC PD, $EF_{grid,y}$ is ex-ante determined as 0.3349 tCO_2/MWh .

The calculated value for $PE_{CH_4,y} = PE_{power,y}$ for the considered monitoring period from 01/01/2021 to 25/08/2021 is correctly determined as 31 tCO_2 .

In summary, the Applus+ Certification’s verification team was able to confirm that calculations of baseline emissions and project emissions were correctly performed as per the formulae and methods stated in the registered VCS PD ^{/2/} and under conformance with applicable requirements of the applied CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/}.

As also confirmed by the Applus+ Certification’s verification team, reported achieved emission reductions for monitoring period from 01/01/2021 to 25/08/2021 are correctly calculated and reported as the difference between determined accumulated values for baseline emissions and project emissions for the period and are equal to 11,444 tCO_{2e} .

Reported achieved emission reductions are in accordance with all applicable measurement, reporting and calculation requirements as per the monitoring plan of the registered VCS PD^{/2/}, CDM monitoring and baseline methodology AMS-III.G (version 10.0) ^{/6/} and applicable CDM methodological tools.

Assessment of related monitoring management and quality assurance procedures for the VCS project activity:

The Applus+ Certification’s verification team was able to confirm that robust quality control and quality assurance (QA/QC) procedures are implemented by the project proponent and project operator for preventing or identifying and correct eventual errors or omissions in the reported monitoring parameters.

As verified by the Applus+ Certification’s verification team, competent and sufficiently trained staff are recruited for operating the VCS project activity and handling related monitoring data. Such employees are found with knowledge not only about the operation of the VCS project activity, but also with sufficient knowledge and competence to ensure the application of all related QA/QC procedures for data recording and storage.

As also assessed by the Applus+ Certification's verification team, the VCS project activity has been operated by sufficiently trained staff by correctly following guidance and instructions of internal documented working procedures.

As confirmed by the Applus+ Certification's verification team, the applied procedures for data collection, data reporting, performance of calibration events and other aspects related to the applied procedures for determining the emission reductions are systematically implemented and have been appropriately followed by the project proponents. While watching (and later further assessing/reviewing (re-watching)) the produced set of live videos (movies) and pictures ^{/9/}, the Applus+ Certification's verification team was also able to verify that the operational structure of the VCS project activity is also in line with the information made available in the registered VCS PD ^{/2/} and in the Monitoring Report ^{/1/}.

In summary, Applus+ Certification was also able to verify that detailed management and operational work procedures are in place and confirmed that an operational structure for the VCS project activity is established with responsibilities clearly identified. Moreover, trained staff is employed to ensure data quality.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Monitoring related activities for the VCS project activity were confirmed by the Applus+ Certification's verification team as being carried out under sufficient conformance with the monitoring plan as per the registered VCS PD ^{/2/} for the project activity (version 3,2, dated 07/07/2019).

As a result of performed verification assessment for the considered monitoring period, Applus+ Certification's verification team was able to confirm that relevant details for all parameters required for the ex-post determination of emission reductions are sufficiently included in the Monitoring Report ^{/1/} and emission reduction calculation spreadsheet ^{/2/} with all figures, assumptions and calculations being consistent and under conformance with applicable requirements and/or guidance of the applied CDM baseline and monitoring methodology AMS-III.G (version 10.0) ^{/6/} and the monitoring plan contained in the registered PD.

After verifying the reported figures with the raw data sources, it's confirmed that the values of the parameters from the raw data sources are consistent with those quoted in the ER Calculation Spreadsheet and the MR Report. The verification process for the same has been clearly described above in section 4.4 of the report.

4.6 Non-Permanence Risk Analysis

Not applicable.

5 VERIFICATION CONCLUSION

Applus+ Certification has been commissioned by EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM to perform the 3rd periodic verification of greenhouse gas emission reductions of the VCS project activity titled “Pichacay Landfill Gas Renewable Energy Project” (VCS Ref. No. 1883) for the monitoring period from 01/01/2021 to 25/08/2021.

Operation project staff of the project proponents EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM is responsible for the previously occurred implementation of the VCS project activity and monitoring related activities since its starting of operations, including measurement, recording and reporting of monitoring data and determination of GHG emission reductions achieved by the VCS project activity within the considered monitoring period on the basis applicable monitoring procedures and requirements which are established in the project’s monitoring plan as per the registered VCS Project Description (VCS-PD) (in the particular case of the VCS project activity: Joint VCS PD and Monitoring Report (monitoring period from 27/07/2017 to 31/12/2018) for the VCS project activity (version 3.2, dated 07/07/2019) ^{/2/}).

The verification assessment performed by Applus+ Certification is based on approach defined as per applicable guidance and requirements of VCS rules and/or relevant UNFCCC requirements (whenever applicable). The performed verification assessment applied a risk-based approach, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. As part of the performed verification assessment, Applus+ Certification was able to confirm the following:

- The VCS project activity is implemented and has operated during the considered monitoring period under conformance with its previously defined design and with monitoring related activities/tasks being performed under sufficient compliance with monitoring requirements defined in the monitoring plan as per registered VCS PD for the project activity ^{/2/}.
- The monitoring plan for the VCS project activity as previously defined in the registered VCS PD was designed and has been operated under full conformance with the applied CDM baseline and monitoring methodology AMS-III.G: Landfill methane recovery (version 10.0) ^{/6/}.
- The Monitoring Report ^{/1/} and other supporting documents provided are confirmed as being sufficiently complete, verifiable and with texts, assumptions, descriptions and calculation under full conformance with the applicable VCS requirements.
- Monitoring instruments required for measurements which are instrumental for the determination ex-post of GHG emission reductions achieved by the VCS project activity during the considered monitoring period were confirmed to be under correct and reliable operation with related maintenance and calibration being appropriately and timely performed.

- GHG emission reductions achieved by the VCS project activity during the considered monitoring period are confirmed as being calculated without material misstatements.

In summary, Applus+ Certification was able to confirm that information included in the Monitoring Report ^{/1/} is deemed complete and correct and that the emission reductions achieved by the VCS project activity during the monitoring period from 01/01/2021 to 25/08/2021 are correctly determined and fairly stated and were calculated without material misstatements. Applus+ Certification hereby confirms and certifies that GHG emission reductions achieved by the VCS project activity “Pichacay Landfill Gas Renewable Energy Project” during the monitoring period from 01/01/2021 to 25/08/2021 as reported in Monitoring Report (version 5.0, dated 25/10/2022) represents the figures summarized below:

Monitoring Period	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/01/2021 to 25/08/2021	11,475	31	0	11,444

As part of the performed verification assessment, reported and verified emission reductions achieved by the project activity during the monitoring period (from 01/01/2021 to 25/08/2021) were compared against the equivalent related ex-ante estimation of emission reductions for the same period as per the registered VCS PD ^{/2/}.

The results of such comparisons are summarized and assessed below:

Ex-ante estimation of emission reductions from 01/01/2021 to 25/08/2021 as per the registered VCS PD (in tCO₂e) is calculated as follows:

From 01/01/2021 to 31/12/2021 = 30,072 tCO₂e (365 days)

From 01/01/2021 to 25/08/2021 = 19,526 tCO₂e (237 days)

Achieved emission reductions (in tCO₂e) for the considered monitoring period (from 01/01/2021 to 25/08/2021) = 11,444 tCO₂e

As confirmed by the Applus+ Certification’s verification team, for the monitoring period from 01/01/2021 to 25/08/2021, achieved emission reductions are correctly indicated in the latest version of the Monitoring Report ^{/1/} as ~41% lower than the comparable value of ex-ante estimation of emission reductions as per the registered VCS PD ^{/2/} valid for such period.

The latest version of the Monitoring Report states that the main explanations for the identified difference between the estimated and achieved amount of emission reductions by the project activity are: (1) maintenance, repair and replacement period for the power transformer and (2) the delay on installation of the second engine generator set during the monitoring period.

APPENDIX 1: REFERENCE LIST

1	EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM: Monitoring report for the VCS project activity “Pichacay Landfill Gas Renewable Energy Project” / monitoring period from 01/01/2021 to 25/08/2021, version 5.0, dated 25/10/2022 (including emission reduction calculation spreadsheet)
2	EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM: Registered VCS PD the VCS project activity “Pichacay Landfill Gas Renewable Energy Project” (in the particular case of the VCS project activity: Joint VCS PD and Monitoring Report (monitoring period from 27/07/2017 to 31/12/2018) for the VCS project activity (version 3.2, dated 07/07/2019)
3	EPIC Sustainability Services Pvt Ltd.: Validation report “Pichacay Landfill Gas Renewable Energy Project (in the particular case of the VCS project activity: Joint Validation Report and Verification Report (monitoring period from 27/07/2017 to 31/12/2018) (version 1, dated 27/08/2019);
4	GUASCOR POWER S.A.U.: Specification fact sheet for engine-generator sets installed as part of the VCS project activity “Pichacay Landfill Gas Renewable Energy Project”
5	VCS/VERRA: VCS standard version 4.3 (dated 22/06/2022.
6	UNFCCC / CDM: Baseline and monitoring methodology AMS-III.G.: Landfill methane recovery (version 10.0). Available online: https://cdm.unfccc.int/methodologies/DB/OKHNES8D09H134V3TZDQ47C3LQL3H2
7	UNFCCC / CDM: Baseline and monitoring methodology AMS-I.D: «Grid connected renewable electricity generation» (version 18.0). Available online: https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQOOFOQH4SBK
8	International Organization for Standardization (ISO) Standard ISO 14064-3:2006

9	EMAC-BGP ENERGY COMPAÑÍA DE ECONOMÍA MIXTA CEM: Set of sequential live videos (movies) + photographs (pictures) of the VCS project activity “Pichacay Landfill Gas Renewable Energy Project” produced/generated on 21/02/2022
10	UNFCCC/CDM: Methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0). Available online: https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-05-v3.0.pdf/history_view
11	Empresa Eléctrica Regional Centro Sur C.A, (CENTROSUR). Technical transmission and distribution losses for the National Electricity Grid of Ecuador as per official statistics). Available online: https://www.centrosur.gob.ec/principales-indicadores/ (under “Péridas de Energía”)
12	CENACE: Calibration events performed on electricity meter Schneider Electric ION 7650 of serial numbers MJ-1401A358-04 and MJ-1310A536-04 in September/2019
13	Elster: Technical specification sheet for electricity meter A3 ALPHA meter. Available online: http://literature.puertoricosupplier.com/033/VU32758.pdf
14	VCS/VERRA: COVID-19 Travel Guidance for Projects (18/03/2020) Available online: https://verra.org/covid-19-travel-guidance/
15	Schneider Electric: ION7550/7650 series Technical Data Sheet. Available online: https://download.schneider-electric.com/files?p_enDocType=Technical+leaflet&p_File_Name=PLSED306011EN_%28web%29.pdf&p_Doc_Ref=PLSED306011EN_Web
16	CENACE: Primary monitoring records for electricity generation and with monthly electricity commercialization receipts (period from January 2021 to August 2021) for the electricity generation infrastructure implemented as part of the VCS project activity “Pichacay Landfill Gas Renewable Energy Project”

17	Environmental licence/permit for the construction and operation of electricity generation infrastructure to be implemented as part of the VCS project activity “Pichacay Landfill Gas Renewable Energy Project”.
18	Ecuador’s Ministry of Energy (<i>Ministerio de Energía y Recursos Naturales no Renovables</i>): “ <i>Balance Energético Nacional- 2020</i> ” (National Energy Outlook – year 2020). Available online: https://www.controlrecursosyenergia.gob.ec/estadisticas-del-sector-electrico-ecuatoriano-buscar/ .
19	U.S. Energy Information Administration: Country Analysis Executive Summary: Ecuador. Available online: https://www.eia.gov/international/content/analysis/countries_long/Ecuador/ecuador.pdf
20	Empresa Eléctrica Regional Centro Sur C.A. (CENTROSUR): Monthly invoices for purchasing of grid-sourced electricity issued by the electricity distribution company CENTROSUR
21	Annual and Multiannual Statistics of the Ecuadorian Electricity Sector 2020 (in Spanish language : “ <i>Estadística del sector eléctrico Ecuatoriano, 2020, Agencia de Regulación y Control de Energía y Recursos naturales No Renovables</i>): https://www.controlrecursosyenergia.gob.ec/wp-content/plugins/download-monitor/download.php?id=1855&force=1 ”).
22	VCS/VERRA: Validation and verification manual, version 3.2 dated 19/10/2016 https://verra.org/wp-content/uploads/2018/03/VCS_Validation_Verification_Manual_v3.2.pdf
23	IPCC: Fifth Assessment Report AR5 https://archive.ipcc.ch/report/ar5/syr/

APPENDIX 2: LIST OF RAISED CORRECTIVE ACTION REQUESTS (CAR)

The descriptions of Correction Action Requests (CARs) issued by the Applus+ Certification's verification team as part of the performed verification assessment are summarized in the tables below, which also includes the summary of the actions and responses from the project proponents for successfully addressing and closing the raised CARs.

CAR ID	01	Date: 23/02/2022
Description of CAR		
While Section 1.1 of the Monitoring Report states that an additional engine-generator set was installed as part of the project's electricity generation infrastructure in year 2021 (with related initial testing/commissioning activities being performed from May/2021 to mid June 2021 + synchronization and electricity generation testing being performed from mid June/2021 to mid July 2021 + experimental operation being performed from mid July/2021 to the end of August/2021), it is however incorrectly stated the operation of such additional engine-generator (resulting in electricity generation) did not generate emission reductions during the monitoring period. This statement demands appropriate and further clarifications/justification. Moreover, determination of emission reductions may be revised by taking into account the period the additional engine-generator set operated within the considered monitoring period		
Project proponent response		Date: 17/03/2022

As a response to the raised CAR, the project proponents clarifies that prior to 07/07/2021 operational tests were performed in the additional engine-generator (further referred to as “second unit”) without such power generation equipment being connected to the electricity grid. Methane destruction due to combustion of LFG as part of such test sessions was not measured by flow meter and no useful electricity was generated. During the period from 07/07/2021 to 08/07/2021 an additional test session was carried out, thus time with the new engine-generator set connected to the electricity grid. Generated electricity was measured by a rented electricity meter while the main meter for the whole project activity was disconnected (since, as per applicable rules and regulations, CENACE does not pay for exports of generated electricity during this test period, and thus the main electricity meter of the project activity should be disconnected). The operation of the additional engine-generator set during such testing period resulted in generation and export of about 5 MWh of electricity. No emission reductions are claimed for such amount of generated electricity (which was measured by the rented electricity meter). On 08/07/2021, EBE has sent a communication letter to CENACE (reference: No. EBE-049-21) informing that the project’s second power generation unit has successfully passed the stage of operational tests and requesting approval of the entrance of this unit to the stage/phase of Experimental Operation. On the 15/07/2021, CENACE responded with a letter (reference: Nro. CENACE-CENACE-2021-0433-0) informing that this second power generation unit entered the Stage of Experimental Operation. Between 20/07/2021 and 02/08/2021, this second power generation unit has been fully operational. During this period the other and previously installed engine-generator set of the project’s electricity generation infrastructure was under non-operational status, as the project activity was not yet collecting LFG under a sufficiently high volume (in order to have both engine-generator sets simultaneously fuelled). During the period from 20/07/2021 and 02/08/2021, all electricity generated by the whole project activity (engine-generator sets 1 and 2) was measured by the main electricity meter. This meter is located after the power transformer and does not register whether the electricity is produced by the first or the second unit. However, electricity generation by engine-generator 2 is not considered for the determination of achieved emission reductions during the considered monitoring period for sake of conservatives. As specified in section 4.2 “data and parameters monitored” of the Monitoring Report, as a conservative approach, the generation efficiency of the unit with the highest efficiency will be used to calculate the methane emission reductions of the project activity. The conversion efficiency of engine-generator 2 is 36.1% (See “SGE-56M POWER RATING.pdf”). Engine-generator 2 entered commercial operation on 1 October 2021, thus after the end of the considered monitoring period.

These findings have been processed in the updated documentation:

“GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021 v2.xlsx”,

“VCS-Monitoring-Report Pichacay LFG project 1 Jan_25 Aug 2021 v2.doc” and for your convenience

“VCS-Monitoring-Report Pichacay LFG project 1 Jan_25 Aug 2021 v2_track changes.doc”.

Supporting documents:

“OF CENACE-CENACE-2021-0433-O - DECLARATORIA OPERACION EXPERIMENTAL.pdf”

“OF CENACE-CENACE-2021-0433-O - DECLARATORIA OPERACION EXPERIMENTAL.pdf”

Can be accessed via: Sent to Applus 17 March 2022

DOE assessment

Date: 17/03/2022

As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.

CAR ID	02	Date: 23/02/2022
Description of CAR		
Different Sections of the Monitoring Report includes grammar mistakes and typographical errors.		
Project proponent response		Date: 17/03/2022
As a response to the raised CAR, corrections of existent grammar mistakes and typographical errors were made in the revised version of the Monitoring Report.		
DOE assessment		Date: 17/03/2022
As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.		

CAR ID	03	Date: 23/02/2022
Description of CAR		
Monitoring details for the monitoring parameter “Average technical transmission and distribution losses for providing electricity to source j in year y” (TDL_{j,y}) are not sufficiently complete. References to justification of appropriateness and correctness of selected value are missing. Moreover, the value applied for parameter TDL_{j,y} in Section 4.1 is not the same as the value presented in the emission reduction calculation spreadsheet. Also, the reported value of 6.49% is not confirmed as being the most recent available value.		
Project proponent response		Date: 17/03/2022

As a response to the raised CAR, the project proponent initially clarifies that, under conformance with the CDM methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0), option 1 (use annual average value based on the most recent data available within the host country) was applied. The monitoring frequency for TDL_{j,y} is annually. In the absence of related data from the relevant year, the most recent figures for the latest 5-years should be used.

The project proponent has initially applied available records for the distribution losses of regional electricity distribution company Empresa Eléctrica Regional Centro Sur C.A. (Centrosur). However, by acknowledging that national figure should be applied, data from the Annual and Multiannual Statistics of the Ecuadorian Electricity Sector 2020 was applied (in Spanish language : “Estadística del sector eléctrico Ecuatoriano, 2020, Agencia de Regulación y Control de Energía y Recursos naturales No Renovables <https://www.controlrecursosyenergia.gob.ec/wp-content/plugins/download-monitor/download.php?id=1855&force=1>”). Table 7, page 14 of this technical report presents the technical distribution losses of Ecuador as a whole as being 6.87% in year 2020. Table 100, page 107 of the technical report presents the transmission losses of the SNT (Systema National de Transmission” as being 3.32% in year 2020 (where year 2020 is the most recent year for which this information is available). The technical distribution losses and the transmission losses are reported separately and need to be multiplied to obtain the combined technical transmission and distribution losses.

We calculated TDL_{j,y} in the following way:

$$TDL_{j,y} = 1 - (DL_{j,y} - 1) * (TL_{j,y} - 1)$$

Where,

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

DL_{j,y} = Average technical distribution losses of the distribution electricity system of Ecuador (%) to the project in year y

TL_{j,y} = Average transport losses of the national electricity transport system (SNT) of Ecuador (%) to the project in year y

DOE assessment

Date: 17/03/2022

As confirmed by the Applus+ Certification’s verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.

CAR ID	04	Date: 23/02/2022
Description of CAR		
Monitoring details and references to calculation spreadsheets valid/applicable for monitoring period other than the considered monitoring period are included in the Monitoring Report.		
Project proponent response		Date: 17/03/2022
As a response to the raised CAR, related corrections were made in the revised version of the Monitoring Report.		
DOE assessment		Date: 17/03/2022
As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.		

CAR ID	05	Date: 23/02/2022
Description of CAR		
Electricity commercialization receipts/invoices valid for selected months of the considered monitoring period were not made available for the Applus+ Certification's verification team.		
Project proponent response		Date: 17/03/2022

As a response to the raised CAR, electricity commercialization receipts/invoices valid for selected months of the considered monitoring period were made available for the Applus+ Certification's verification team.

Links to the monthly electricity bills and daily electricity production were provided to Agustin Carlos calle de Miguel by email on the 1st of February. Agustin has forwarded this email to Marco Ratton on the 2nd of February. For your convenience please find the links here: 2021 electricity production and 2021 electricity consumption. As described in the "GHG Calculation Pichacay LFG project 1 Jan_25 Aug 2021.xlsx", the normal CENACE bills of February and May 2021 of electricity consumed from the grid, and the normal CENACE bills of February, May, June, July and August of electricity consumed by the genset in mid voltage from CentroSur did not arrive. After the online verification visit, David Gonzalez of EBE has made substantial effort to obtain the missing normal bills and received the bills of June and July 2021 of the electricity consumed by the gensets in mid voltage. We have added these bills "06-jun-2021-M2 R.pdf" and "07-jul-2021-M2 R.pdf" to the filing, accessible through the links above and we have updated the monitoring calculations spreadsheet. See "GHG Calculation Pichacay LFG project 1 Jan_25 Aug 2021 v2.xlsx".

Regarding the normal CENACE bills that still did not arrive, alternative bills could be downloaded from the Internal Rent Service of Ecuador (SRI) system. These bills only contain the costs in USD. As described in "GHG Calculation Pichacay LFG project 1 Jan_25 Aug 2021 v2.xlsx", in order to calculate the electricity consumption, the costs (ZEHORA, ZEHORB and ZEHORC) have to be divided by the electricity price being 0.071 USD/kWh for ZEHORA (08h00 - 18h00); 0.071 USD/kWh for ZEHOR B (18h00 - 22h00); and 0.059 USD/kWh for ZEHORC (22h00 - 08h00). The tariff per kWh can be verified by checking the normal bills that contain both kWh and USD. In case of electricity consumed by the genset in mid voltage, the cost (ZENERG) has to be divided by the electricity price being 0.071 USD/kWh. The tariff per kWh can be verified by checking the normal bills that contain both kWh and USD. These alternative bills are reliable and used by EBE to pay the electricity bills in case the normal Cenace bills do not arrive.

We have described this updated procedure in section 4.3 of the monitoring report

DOE assessment

Date: 17/03/2022

As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.

CAR ID	06	Date: 17/03/2022
Description of CAR		
Unit indication is missing for reported values of electricity generation in sheet “Electricity generation 2021” of the spreadsheet "GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021.xlsx".		
Project proponent response		Date: 22/04/2022
We have added the unit indication (kWh) in sheet “Electricity generation 2021” of the emission reduction calculation spreadsheet "GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021 v3.xlsx".		
DOE assessment		Date: 22/04/2022
As confirmed by the Applus+ Certification’s verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.		

CAR ID	07	Date: 17/03/2022
Description of CAR		
While the Monitoring Report indicates that “verification” of electricity meters Schneider electric ION 7650 serial numbers MJ-1401A358-04 (main meter) and MJ-1310A536-04 (backup meter) are to be done once, no reference to the source of such assumption is included and no evidence was provided to the verification team.		
Project proponent response		Date: 22/04/2022
No yearly verification (accuracy testing) of the electricity meters manufactured by Schneider electric (model ION 7650 and serial numbers MJ-1401A358-04 (main meter) and MJ-1310A536-04 (backup meter)) is needed. The Monitoring Report indicates that Digital meters require ‘accuracy’ testing, or verification, once after installation to ensure the meter meets required accuracy specifications. This test has taken place on the 5th of October 2017.		
DOE assessment		Date: 22/04/2022

As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.

CAR ID	08	Date: 17/03/2022
Description of CAR		
The Monitoring Report does not include sufficient details about the invitation letter (i.e. name of the file, date, issued by) and also about the invoices both issued by EBE proving the biannual calibration frequency of the ION7650 electricity meters.		
Project proponent response		Date: 22/04/2022
As stated in the Monitoring Report, in addition, not for technical reasons but to meet a legal obligation, CENACE performs a calibration test every two years. EBE does not have access to the biannual calibration reports, but can show: (1) the letter with the request of EBE to CENACE to perform the bi-annual calibration test of the electricity meters (Letter with reference EBE-036-21, of 20 May 2021, see "Oficio Referencia EBE-036-21 - CENACE SOLICITUD PRUEBAS MEDIDORES.pdf"); (2) the letter in which CENACE accepts the invitation and proposes the data for the calibration test (Letter with reference CENACE-GDT-2021-0104-O of 26 May 2021, see "CENACE-GDT-2021-0104-O.pdf") and (3) the invoice to prove that this calibration has taken place. (CENACE invoice No. 001-002-000002585 of 8 June 2021, see "CENACE CALIBRATION BILL 2021.pdf"). We have updated the Monitoring report. See "VCS-Monitoring-Report Pichacay LFG project 1 Jan_25 Aug 2021 v3.pdf"		
DOE assessment		Date: 22/04/2022
As confirmed by the Applus+ Certification's verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.		

CAR ID	09	Date: 17/03/2022
Description of CAR		
The symbol for BECH ₄ ,PJ,y in Monitoring Report is different from the one presented in emission reduction spreadsheet.		
Project proponent response		Date: 22/04/2022
We have corrected the symbol for BECH ₄ ,PJ,y in the emission calculation spreadsheet (replacing BECH ₄ ,y with BECH ₄ ,PJ,y). See “GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021 v3.xlsx”		
DOE assessment		Date: 22/04/2022
As confirmed by the Applus+ Certification’s verification team, related amendments/corrections made in the revised version of the Monitoring Report sufficiently address the raised CAR. This CAR is thus closed.		

CAR ID	10	Date: 17/03/2022
Description of CAR		
The formulae applied for F _{CH₄,PJ,y} in Monitoring Report is different than the one presented in figure-format in the emission reduction spreadsheet.		
Project proponent response		Date: 22/04/2022
The formulae applied for F _{CH₄,PJ,y} in Monitoring Report is correct and was applied in the emission reduction calculation spreadsheet. The figure-format formulae of F _{CH₄,PJ,y} presented in the calculation spreadsheet was incorrect and has been replaced by the formulae actually used. See “GHG calculation Pichacay LFG project 1 Jan_25 Aug 2021 v3.xlsx”.		
DOE assessment		Date: 22/04/2022
The Applus+ Certification’s verification team confirmed that related corrections made in the revised version of the Monitoring Report sufficiently addresses the raised CAR. This CAR is thus closed.		

CAR ID	11	Date: 10/10/2022
Description of CAR		
The monitoring report does not consider the applicable Global Warming Potential (GWP) value for the GHG Methane (CH ₄) in the context of determination of emission reductions achieved by the project activity during the considered monitoring period.		
Project proponent response		Date: 25/10/2022
The latest version of the Monitoring Report along the emission reduction calculation spreadsheet are updated with the correct value of formulae applied for GWP _{CH₄} value from AR5 (IPCC Fifth Assessment Report).		
DOE assessment		Date: 25/10/2022
The Applus+ Certification's verification team confirmed that related corrections made in the revised version of the Monitoring Report sufficiently addresses the raised CAR. This CAR is thus closed.		

CAR ID	12	Date: 10/10/2022
Description of CAR		
The Monitoring Report does not include a comparison between the ex-ante estimated and ex-post achieved values of emission reductions according to the applicable guidance of VCS Monitoring Report Template version 4.1.		
Project proponent response		Date: 25/10/2022
The latest version of the Monitoring Report is updated with the requested information regarding the comparison between the ex-ante estimation and the achieved amount of emission reductions for the considered monitoring period.		
DOE assessment		Date: 25/10/2022
The Applus+ Certification's verification team confirmed that related corrections made in the revised version of the Monitoring Report sufficiently addresses the raised CAR. This CAR is thus closed.		