



BIOGAS TO ELECTRICITY GENERATION GROUP PROJECT IN INDIA



South Asia

Document Prepared by TÜV SÜD South Asia Private Limited

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Report Title	Validation report of “Biogas to electricity generation group project in India”
Client	EKI Energy Services Limited
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Prepared By	TÜV SÜD South Asia Private Limited
Contact	Gulmohar Plaza, Plot No. 1A, 4th Floor, Gulmohar Park, ITI Road, Aundh. Pune 411007, India Tel: +91-20-66848484, Shruti.Kudtarkar@tuvsud.com http://www.tuvsud.com
Approved by	 Deepankar Chowdhury, Head Quality Assurance, Certification Body, TUV SUD South Asia Pvt. Ltd.
Work carried out by	Shruti Kudtarkar (Team Leader, Validator, Technical Expert, Country Expert), Pratiksha Patil (Trainee Validator), Sudheendra K (Technical Reviewer)

Summary:

- A brief description of the validation and the project

Biogas to electricity generation group project in India is implemented by EKI Energy Services Limited and the primary objective of the project is to effectively demonstrate the use of anaerobic biogas digesters to generate biogas-based renewable energy connected with off grid. Thus, project will achieve an environment friendly way of managing wastes and renewable power generation by utilizing the wastes.

M/s Bhagyalaxmi Dairy Farms Pvt. Ltd, is project proponent and operates a large dairy farm at Sultanpur, Mancha, Taluka- Ambegaon, District- Pune, India and desires to generate off-grid electricity by using biogas generated from cattle dung and use the electricity for captive purpose, while EKI Energy Services Limited is the consultant and VCU's are owned by EKI Energy Services Limited. The farm is one of the leading integrated dairy farms in India. The farm has approx. 3000 cattle. Total quantity of dung generated in the farm are used to generate biogas-based power generation project.

This project has installed 250 kW (100 kW x2 & 50 kW x1) generator which generate approx. 2,500 kWh per day by utilizing 2100 m³ (3 × 700 m³) of biogas per day. The biogas project shall run 350 days per year using anaerobic digester consisting of Khadi and Village Industries Commission (KVIC) Floating Dome Type Technology. The plant converts cattle dung into biogas and fertilizer. The biogas is utilised for power generation

for the captive purpose of the dairy farm. This project tends to reduce dairy farm bill by generating approximately 903 MWh of electricity per year and by displacing grid electricity.

The output from digester undergoes de-watering treatment. The separated water is recycled and used for making 50% slurry along with cow dung to produce 19,008 MT/year of organic fertilizer.

The project is expected to avoid GHG emission of methane through recovery and destruction of biogas. The project is expected to achieve an annual emission reduction of 20,862 tCO₂e and a total emission reduction of 146,040 tCO₂e during the first 7-years crediting period.

- The purpose and scope of validation

The purpose of a validation is to have an independent third-party assessment of the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant VCS criteria are validated to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of Verified Carbon Units (VCUs).

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

- The method and criteria used for Validation

The validation consists of the following three phases:

- I) A desk review of the PD
- II) Follow-up interviews with project stakeholders
- III) The resolution of outstanding issues and the issuance of the final validation report and opinion.

Validation is conducted using TÜV SUD South Asia Private Limited procedures in line with the requirements specified in the latest version of the VCS Validation and Verification Manual and applying auditing techniques. The Validation team assessed the project activity's compliance against the VCS Standard Version 4.4, the selected methodology, tools and the project design. The project is eligible under Project Scope 1: Energy industries (renewable-/ non-renewable sources) and Scope 13: Waste Handling and Disposal.

The validation criteria followed the guidance documents provided by VCS included the following: VCS Standard Version 4.4, VCS Program Guide Version 4.3, Tool 14: Project and leakage emissions from anaerobic digesters; version 2.0, Tool 7: Tool to calculate the emission factor for an electricity System version 7.0 and the applied CDM methodology AMS III D Version 21: Methane recovery in animal manure management systems and

AMS I.F. Version 5.0: Renewable electricity generation for captive use and mini-grid.

- The number of findings raised during validation

During the Validation of the project, 11 (CAR), 5 Clarification Requests (CLs) were raised. 1 FAR was raised. The assessment is included in the report.

- Any uncertainties associated with the validation

There are no restriction of uncertainty.

Summary of the validation conclusion TÜV SÜD South Asia Private Limited carried out the Verified Carbon Standard (VCS) validation of the project, “Biogas to electricity generation group project in India” with regard to the relevant requirements of VCS Standard Version 4.4. TÜV SÜD confirms all validation activities including objectives, scope and criteria, Reasonableness of Assumptions, and Project design adhere to VCS Standard Version 4.4 and all associated updated as documented in this report, are complete. TÜV SÜD concludes that the project activity “Biogas to electricity generation group project in India” as described in the final Project design version no. 4.0 dated 21/6/2023 meets all relevant requirements for VCS and CCB validation activity and correctly applied the methodology AMS III D Version 21: Methane recovery in animal manure management systems and AMS I.F. Version 5.0: Renewable electricity generation for captive use and mini-grid. Hence TÜV SÜD is able to recommends the proposed project named Biogas to electricity generation group project in India, implemented by Bhagyalaxmi Dairy Farms Private Limited to be registered as a VCS project activity.

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1 INTRODUCTION

1.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant VCS criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of Verified Carbon Units (VCUs).

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the Project Description (PD). The PD is reviewed against the relevant criteria (see below) and decisions by the VCS Board, including the approved baseline and monitoring methodology. The validation team has, based on the recommendations in the validation employed a rules-based approach, focusing on the identification of significant risks for project implementation and the generation of VCUs. The validation is not meant to provide any consulting towards the project proponents. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

The items covered in the validation are described below:

- VCS Standard version 4.4
- VCS Project Description
- Project design
- Project boundaries and predicted VCS project GHG emissions
- Project baseline, Baseline methodology, Baseline GHG emissions
- Monitoring Plan, Monitoring methodology, Indicators/data to be monitored and reported
- Project additionality
- Local Stakeholder Consultation
- Draft validation reporting with CARs, CLs & FARs, if any
- Final validation reporting

The information included in the VCS PD and the supporting documents were reviewed against the requirements and criteria mentioned above. The validation is based on the information made available to TUV SUD and on the contract conditions.

1.3 Reasonableness of Assumptions

The validation team assessed the complete monitoring data for the monitoring parameter of the monitoring plan against the PD and ER Calculation sheet and confirms that the estimated annual emission reductions are free from any types of material errors. On-site audit was also conducted to assess the implementation and monitoring plan of the project activity. The implementation of the project activity (i.e., major equipment and the metering arrangement) was assessed during the interview and found in accordance with the PD. Validation team has also assessed the technical details of the project equipment and metering arrangement with the supportive documents and found correct, resembling with the PD and ER Sheet.

1.4 Summary Description of the Project

Bhagyalaxmi Dairy Farms Private Limited is in the process of implementing the project based on biogas from cattle manure at different locations across various States and Union Territories in India. The primary objective of the project is to effectively demonstrate the use of anaerobic biogas digesters to generate biogas-based renewable energy connected with off grid. Thus, project will achieve an environment friendly way of managing wastes and renewable power generation by utilizing the wastes.

M/s Bhagyalaxmi Dairy Farms Pvt Ltd, operates a large dairy farm at Sultanpur, Mancha, Taluka-Ambegaon, District- Pune, India and desires to generate off-grid electricity by using biogas generated from cattle dung and use the electricity for captive purpose. The farm is one of the leading integrated dairy farms in India. The farm has approx. 3000 cattle. Total quantity of dung generated in the farm are used to generate biogas-based power generation project.

This project has installed 250 kW (100 kW ×2 & 50 kW ×1) generator which tends to generate approx. 2,500 kWh per day by utilizing 2100 m³ (3 × 700 m³) of biogas per day. The biogas project shall run 350 days per year using anaerobic digester consisting of Khadi and Village Industries Commission (KVIC) Floating Dome Type Technology. The plant converts cattle dung into biogas and fertilizer. The biogas is utilized for power generation for the captive purpose of the dairy farm. This project tends to reduce dairy farm bill by generating approximately 903 MWh of electricity per year and by displacing grid electricity.

The output from digester undergoes de-watering treatment. The separated water is recycled and used for making 50% slurry along with cow dung to produce 19,008 MT/year of organic fertilizer.

The project is expected to avoid GHG emission of methane through recovery and destruction of biogas. The project is expected to achieve an annual emission reduction of 20,862 tCO₂e and a total emission reduction of 146,040 tCO₂e during the first 7-years crediting period.

2 VALIDATION PROCESS

2.1 Method and Criteria

The validation process involves the following:

- The desk review of documents and evidence submitted by the project proponent in context of the reference VCS rules and guidelines,
- Undertaking on-site audit, interview or interactions with the representative of the project proponent,
- Reporting audit findings with respect to clarifications and non-conformities and the closure of the findings, as appropriate and
- Preparing a draft validation report
- Resolution of outstanding issues and the issuance of final validation report and opinion

The prepared validation report and other supporting documents then undergo an internal quality control before being submitted to the Verra Secretariat for registration & issuance of credits as per VCS standard version 4.4.

In order to ensure transparency, a validation protocol was prepared for the project validation requirements and VCS Standard version 4.4. The Clarification Requests (CL) were issued where additional information was needed to clarify issues, and Forward Action Requests (FAR) for issues relating to project implementation that required review during the next verification of the project activity.

TUV SUD assessed and determined whether the proposed implementation and operation of the project activity, and the steps taken to report emission reductions comply with the criteria and relevant guidance provided by the VCS Board.

Table No. 1: Schedule of validation

Validation Contract	16/3/2023
Desk Assessment	22/4/2023 – 30/4/2023
On Site Audit	11/5/20223
Draft Validation Report and Issue of corrective action requests (CARs) and clarification requests (CLs) and the draft validation report	22/5/2023 (DVR and First Round of findings) 29/5/2023 (Second Round of findings)
Review of response provided by PP on corrective action requests (CARs) and clarification requests (CLs) raised by validation team	6/6/2023 – 8/6/2023

Issue of the final validation report and protocol	8/6/2023
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The validation team member and technical reviewer composition are listed in the below table:

Table No: 2 Validation team compositionSr.	Role	Type of Resources	Last Name	First Name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement In			
						Desk Review	On Site Inspection	Interviews	Verification
1	Team Leader, Validator, Technical Expert, Country Expert	IR	Kudtarkar	Shruti	TUV SUD South Asia Pvt. Ltd.	√	√	√	√
2	Trainee Validator	IR	Patil	Pratiksha	TUV SUD South Asia Pvt. Ltd.	√	√	√	√
Table No : 3 Reviewer Team compositionSr. No.	Role		First Name		Affiliation (e.g. name of central or other office of DOE or outsourced entity)				
1	Technical Reviewer		Sudheendra K		TUV SUD South Asia Pvt. Ltd.				
2	Approver		Deepankar Chowdhury		TUV SUD South Asia Pvt. Ltd.				

2.2 Document Review

The PD and supporting background documents related to the project implementation were reviewed. Documents review was conducted to ensure consistency with and identify any deviation from VCS program requirements. Desk review included an examination of the project design details, baseline scenario, additionality, ex ante and monitoring data and parameters, and ex ante quantification of GHG emission reductions. The assessment team also used additional documentation by third parties like host party legislation, technical reports referring to the project design details, baseline scenario, additionality, monitoring or to the basic conditions and technical data.

Furthermore, the PD and emission reduction calculation spreadsheet, relevant decisions, clarifications and guidance from the Verra, other information and references relevant to the project activity have also been assessed during the desk review.

TUV SUD has applied standard auditing techniques to assess the quality of information provided, including a review of the data and information presented to assess their completeness; a review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and an evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

The documents reviewed are summarized in Appendix 2 The validation was performed basing on the documents check and site inspection/measurements, refer to the section 3 of this report for the validation process detail.]

2.3 Interviews

As a part of validation, the on-site assessment was performed by assessment team on 11th May 2023. During site visit, the validation team interviewed representative of PP and CME team who is responsible for monitoring of the project activity. Kindly find below names of the persons interviewed.

Table No. 4: Name of persons interviewed.

Sr. No.	Name of the interviewee	Affiliation	Date	Subject
1	Aniket Thorat	Head Production and Maintenance	11/5/2023	Project design and operation of the project activity; Status of the project (including PPs); Project proponent and ownership; Applicability of selected methodology; Applicable laws, statutes and other regulatory frameworks and any change; Baseline of the
2	Dipak Dhule	Biogas In charge	11/5/2023	
3	Rohidas Thorat	Operator	11/5/2023	
4	Raju Lokhande	Helper	11/5/2023	
5	Vaibhav Bhor	Biogas Operator	11/5/2023	
6	Bhavesh Mansukh	Operator	11/5/2023	
7	Rahul Borse	Consultant (CME)	11/5/2023	

				project; Emission factors of the project; Monitoring plan; Stakeholder consultation process and its outcomes; Sustainable development contributions.
8	Nitin Shinde	Farmer	11/5/2023	Project design and operation of the project activity; Status of the project (including PPs); Project proponent and ownership; Stakeholder consultation process and its outcomes; Sustainable development contributions.
9	Suresh Wagh	Farmer	11/5/2023	
10	Rushikesh Wagh	Farmer	11/5/2023	
11	Akshay Chikhale	Farmer	11/5/2023	
12	Shubham Shinde	Farmer	11/5/2023	

2.4 Site Visits

On 11/5/2023, validation team of TUV SUD visited the Bhagyalaxmi Dairy Farm located at Manchar and performed the onsite validation for project - Biogas to electricity generation group project in India. The interviewed personnel and objective are listed in above table.

During the on-site validation, TUV SUD has applied standard auditing techniques to assess the quality of information provided, the implementation and current situation of the project activity, evaluate data management, QA/QC system, project technology and equipment, training provided, and monitoring etc.

2.5 Resolution of Findings

As an outcome of the validation process, the team can raise CL, CAR and FAR in the findings:

A Clarification Request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met

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

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The VCS requirements have not been met.
- There is a risk that emission reductions cannot be monitored or calculated.
- The validation process may be halted until this information has been made available to the team leader's satisfaction. Failure to address a CL may result in a CAR. Information or clarifications provided because of a CL may also lead to a CAR.

During the validation process, total 11 CAR, 5 CL and 1 FAR were raised and resolved satisfactorily. The list of CARs/CLs/FARs raised and the response provided, the mean of validation, reasons for their closure and references to correction in the relevant documents are provided in Appendix 2 of this report.

2.5.1 Forward Action Requests

1 FAR is raised during the validation. During verification, VVB need to check if there is capacity addition in the existing plant. If there is addition of capacity, Applicability conditions of AMS-III.D will not be satisfied.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project

The project is a grouped project. The proposed project activity consists of KVIC Floating Dome Type Technology which tends to convert cattle dung into biogas and fertilizer. The project produces 903 MWh of electricity and mitigates approximately 20,862 tCO₂e annually. The final output from the digester is digested slurry which undergoes de-watering treatment. The separated water is recycled and is used for making 50% slurry along with cow-dung. The project activity is estimated to produce 19008 MT/year of organic fertilizer.

1. Applicability conditions: The project activity instances shall meet applicability conditions for applicable methodology (AMS-III.D version 21.0 / AMS-I.F version 5) whichever is applicable. Instance can apply either single methodology or any combination of the above methodologies considered in this group project activity.
2. Geographical Area: All project activity instances shall be installed in India.
3. Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective methodology.
4. Technology type: The project activity instances to be included in the grouped project activity will be biogas based captive power generation.
5. Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology.
6. For the Grouped Project, the applicability of VCS program as required in para 2.1.1 of VCS Standard (version 4.4) is justified as below:

Criteria	Justification
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The scope of the VCS Program includes: 1) The six Kyoto Protocol greenhouse gases.	The Grouped Project avoids the emission of methane that would be emitted to the atmosphere directly without any methane recovery and energy generation. Therefore, the project activity includes CH₄ and CO₂.
2) Ozone-depleting substances.	This criteria is not applicable for the project activity, as no ODS is involved in the project activity.
3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process.	This criteria is not applicable for the project activity.
4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions).	The project activity applies methodology AMS-III.D (Version 21.0) and AMS-I.F (Version 5) methodology applicable for the VCS program.
5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	This criteria is not applicable for the project activity.
The scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction. The VCS Program also excludes the following project activities under the circumstances indicated in Table 1 of VCS Standard (version 4.4).	This is group project activity which handles animal manure and treat under anerobic conditions and recovers the biogas for electricity generation. In absence of the project activity the methane was release into the atmosphere. In addition this project activity is not excluded as per section 2.1.3 of VCS Standard 4.4.

Initially, the 3 numbers of KVIC dome type digester are provided for the treatment of animal manure, These digester are equipped with water jacket to provide high solid retention without chocking, better settling characteristics of the suspended matter, faster release of the “blanket” at the gas liquid interface, better interaction between the microbes and the organic matter. The higher gas yield is partly attributable of these structures. These digesters originally operate on Anaerobic digestion process. High degree of BOD & COD reduction takes place in anaerobic digesters. Organic waste breaks into three parts viz. Biogas, Organic sludge and liquid organic overflow. Biogas generated from the anaerobic digesters will be collected in a unique dry membrane type made out of fabric reinforced with Neoprene (balloon type) biogas holder (raw). Biogas holder balloons are tensile & high tear resistant and have high bursting pressure, UV protected, rodent proof & very safe.

The generated biogas is stored in two membrane constant pressure gasholders which are designed to store biogas made from anaerobic digestion of organic waste and sludge. They are manufactured with biogas resistant polyester reinforced PVC membranes seam welded by high frequency electronic machines. The system is made with a single upper membrane, pressurized

by an air fan 24 hours a day to give a pneumatic push on the inner biogas chamber, keeping the biogas chamber at a prefixed and constant positive pressure.

Each day, a portion of the digested sludge will send to slurry tank from where it is pumped to a Solid/ Liquid separator where the solids are separated out and the solid matter is further processed as Organic Fertilizer; otherwise, use of the liquid slurry can also be used directly to the fields. The separated liquid is stored in lagoon from where it is recycled into the system.

M/s Bhagyalaxmi Dairy Farms Pvt Ltd, operates a large dairy farm at Sultanpur, Manchar, Taluka-Ambegaon, District- Pune, India and desires to generate off-grid electricity by using biogas generated from cattle dung and use the electricity for captive purpose. The farm is one of the leading integrated dairy farms in India. The farm has approx. 3000 cattle. Total quantity of dung generated in the farm are used to generate biogas-based power generation project.

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The output from digester undergoes de-watering treatment. The separated water is recycled and used for making 50% slurry along with cow dung to produce 19,008 MT/year of organic fertilizer.

The verified details of key equipment implemented under the project activity are illustrated below and confirmed through document review of manufacturer's technical specification document and purchase order.

Table No. 5: Technical specification

KVIC Floating Drum	3 numbers, 16 m diameter and 7 m height
Biogas Scrubbing System	1. Water scrubbing column 2. MS absorption column 3. 50m³ /hr 4. H₂S level: 2000 ppm to 150 ppm
Biogas Storage	1. PVC rubber made 2. Capacity: 250 m³ x 2 3. Diameter: 16.00 m 4. Working Pressure: 5 mbar 5. Expected gas flow: 300 m³/hr
Biogas Pressure Vessel	Fabricated in mild Steel of size Ø2.5m × 3 m height.
Biogas Compressor (Blower)	Blower for handling corrosive gases like H ₂ S, with capacity of 50 m ³ /Hr and 3000 to 4000 mm water column pressure.
Biogas Engine	100kW × 2 No's & 50 kW x 1

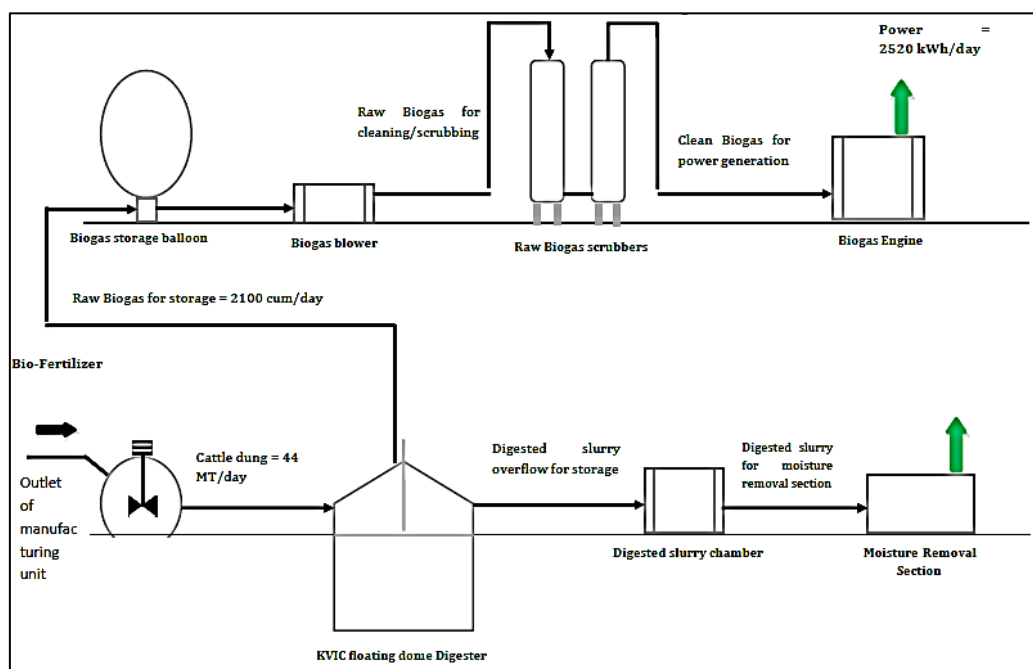


Figure 1: Process flow diagram

The grouped project activity has included all project activity instances currently implemented on the issue date of the project description. As per 3.6.16 of VCS Standard, version 4.4, grouped projects shall include one or more sets of eligibility criteria for the inclusion of new project activity instances. At least one set of eligibility criteria for the inclusion of new project activity instances shall be provided for each combination of project activity and geographic area specified in the project description. A set of eligibility criteria shall ensure that new project activity instances:

Eligibility Criteria	Justification
1) Meet the applicability conditions set out in the methodology applied to the project.	New project activity instances will meet the applicability conditions set out in AMS-III.D (version 21.0) and AMS-I.F (version 5).
2) Use the technologies or measures specified in the project description.	The technology measure for the new project activity instances will be as per description provided in section 1.1 of PD.
3) Apply the technologies or measures in the same manner as specified in the project description.	New project activity instances will apply the technologies or measures in the same manner as specified in the project description, i.e., the project activity instance is a biogas recovery and utilization biogas for energy generation.

4) Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	New project activity instances will be located in the geographic boundary for the Grouped Project. New project activity instances are subject to the baseline scenario determined in section 3.4 of the PD.
5) Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological and/or other barriers as the initial instances.	New project activity instances will have characteristics with same technology respect to new instances which have been added are specified in section 3.5 of the PD.
Further as per 3.6.17 of VCS Standard 4.4 group projects provide for the inclusion of new project activity instances subsequent to the initial validation of the project. New project activity instances shall: Eligibility Criteria	Justification
1. Occur within one of the designated geographic areas specified in the project description.	This is group project activity and new instances will be implemented within the defined geographic area mentioned in the section 1.1 of PD.
2. Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance with multiple sets of eligibility criteria is insufficient.	New project activity instances will comply with a complete set of eligibility criteria as per 3.6.16 of VCS standard 4.4.
3. Be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate conformance with the applicable set of eligibility criteria and enable evidence gathering by the validation/verification body.	New project activity instances information will be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate compliance with the applicable set of eligibility criteria.
4. Be included in an updated project description, with updated project location information (as set out in Section 3.11), which shall be validated at the time of verification against the applicable set of eligibility criteria.	New project activity instances project description and its location will be included in the project description of the subsequent monitoring report and shall be validated at the time of verification against the applicable set of eligibility criteria.

5. Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	As per section 1.7 of PD, the project ownership will lie with the M/s Bhagyalaxmi Dairy Farms Private Limited. In addition new project activity instances will be included in the project activity where M/s Bhagyalaxmi Dairy Farms Private Limited is the project owner.
6. Have a start date that is the same as or later than the grouped project start date.	New project activity instances start date will be after the start date of grouped project activity.
7. Only be eligible for crediting from the start date of the project activity instance through to the end of the total project crediting period.	New project activity instances are eligible to claim credits from the start date of the project activity instance through to the end of the project crediting period.
8. Only eligible for crediting from the start of the verification period in which they were added to the grouped project.	New project activity instances are eligible to claim credits from the start of the verification period in which they were added to the grouped project.
9. Not be or have been enrolled in another VCS project.	New project activity instances will not be previously registered or currently enrolled in any another VCS projects.
10. Adhere to the clustering and capacity limit requirements for multiple project activity instances set out in 3.6.8 – 3.6.9.	The project proponent will include new project activity instances as a singular project if project activity instances within ten kilometers of another instance with same project activity and same PP. No project activity instances or no single cluster of project activity will exceed the capacity limits as per AMS III.D version 21.0 and AMS-I.F version 5.

Project proponent and other entities involved in the project.

Organization name	Bhagyalaxmi Dairy Farms Private Limited
Contact person	Aniket C. Thorat
Title	Manager
Address	Sultanpur, AT-Post Manchar, Taluka- Ambegaon, District – Pune, Pin code- 410503, India
Telephone	+91 7972977448
Email	aniket.thorat@prideofcows.com

Bhagyalaxmi Dairy Farms Private limited is legal owner and PP. Ownership of the plant has been verified from commissioning certificate.

Other Entities Involved

Organization name	EKI Energy Service Limited
Role in the project	Project Consultant
Contact person	Ankit Sethiya
Title	Manager - operations
Address	Office No. 201, Plot 48, Scheme 78, Part 2, Vijay Nagar, Indore- 452010 Madhya Pradesh, India
Telephone	+91 731 428 9086
Email	ankit@enkingint.org , registry@enkingint.org

Other entity involved is EKI Energy Services Limited which is consultant. There is ERPA (emission reduction purchase agreement between PP and consultant where ER from this project activity is transferred to the consultant which is verified by the validation team and found to be appropriate.

Project start date

The project was commissioned on 22 June 2021 and PP has submitted the commissioning certificate for the same and found correct.

Project crediting period

This project adopts a 7-year renewable crediting period. The first crediting period is from 22-June-2021 to 21-June-2028 (both days included).

Project scale and estimated GHG emission reductions or removals

The project is expected to avoid GHG emission of methane through recovery and destruction of biogas. The project is expected to achieve an annual emission reduction of 20,862 tCO₂e and a total emission reduction of 146,040 tCO₂e during the first 7-year crediting period.

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	20,862
Year 2	20,862
Year 3	20,862
Year 4	20,862
Year 5	20,862
Year 6	20,862
Year 7	20,862
Total estimated ERs	146,040
Total number of crediting years	7
Average annual ERs	20,862

The GHG emission reductions of this project activity is 20,862 tCO₂e per year hence comes under “Small Scale Projects” scale as per version 4.4 of VCS standard. So, it is verified and found correct.

Project location

Instance 1: M/s Bhagyalaxmi Dairy Farms Pvt. Ltd.

The project is located at Sultanpur, Mancha, Taluka- Ambegaon, District- Pune, Pin code – 410503.

Coordinates of the dairy farm:

Latitude: 19°01'23" N Longitude: 73°56'18" E

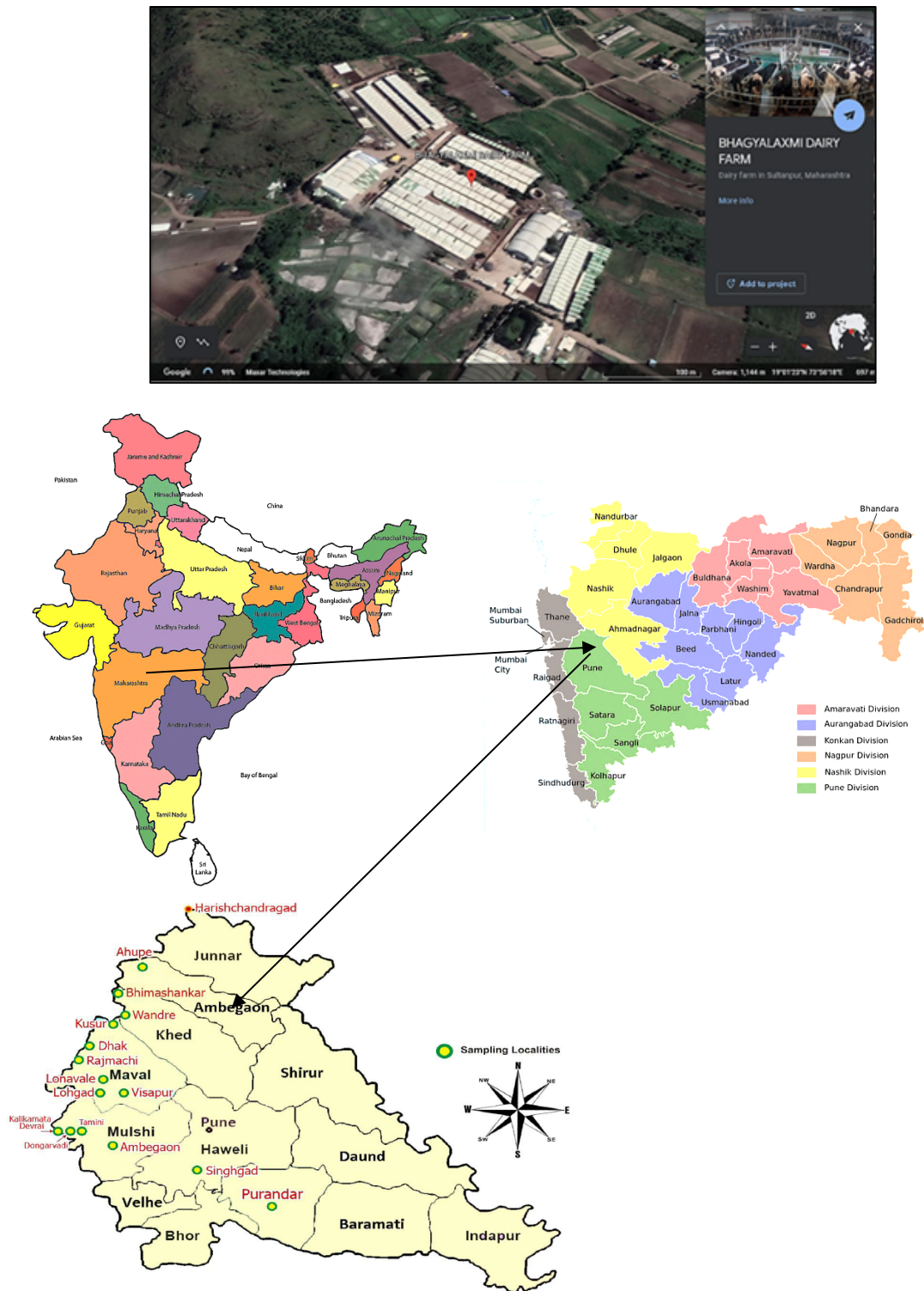


Figure 3 – Location of project activity

The latitude and longitude of the project activity areas mentioned in the VCS PD, and this was cross-checked from Google earth during the onsite visit and found correct.

Conditions prior to project initiation

In the absence of this Bio-methanation and Bio-fertilizer project activity, the pre-project scenario would be the same as the baseline scenario.

Project compliance with applicable laws, statutes and other regulatory framework

There is no such compliance with laws, statutes and other regulatory frameworks for animal manure handling and treatment in India. Biogas plants are not prohibited by any statute law or regulations in India. The Ministry of New and Renewable Energy (MNRE), Government of India promotes installation of biogas plants in rural region of the country by launching various schemes and incentives. From government websites, VVB is verified that project is not compliance with Indian Laws, Statutes and regulatory framework.

Participation under other GHG programs:

The Project has not participated in any other GHG programs. The project neither has nor intended to generate any other form of GHG related environmental credit for the GHG emission reduction or removal claimed under the VCS program. Declaration for double counting has been checked and found OK. No commercially sensitive information has been excluded from the public version of the project description as verified during the on-site audit. Validation team confirms that the description in the project description is accurate, complete, and provides an understanding of the nature of the project and the project has been implemented as described in the project description. VVB has cross checked the GHG registries like CDM, GCC, GS, Climate Action Reserve and American Carbon Registry etc, to verify that the project is not registered with same location and technical specifications and verified that project has not participated in any other GHG programs. The project activity instances are not participating at moment in any other emission trading program and other binding limits. The GHG emission reductions generated during the current crediting period have not been used for compliance of other mechanism. However Bhagyalaxmi dairy farms private limited who has legal ownership of project activity has submitted the declaration on double counting and found appropriate.

Other forms of credit and supply chain (Scope 3) emissions:

No transportation is used for delivering the manure which is produced within the dairy farm as the KVIL digester is placed within the dairy farm itself. Further during the onsite visit it is verified that the project activity is not generating any product or item which can lead to any GHG emission outside the project boundary. Hence this section is not applicable.

Sustainable development contributions:

Table No. 6: Sustainable development contributions activity description

	Description Anaerobic digestion is a prominent technology for treatment of organic waste materials. The project will contribute towards mitigation of 20,862 tCO₂e annually. So, the project will contribute to the sustainable development, and it is fulfilling SDG 13.
	Description This project activity contributes total generation of 903 MWh electricity annually by utilizing bio-methane gas generated from animal manure.

Sustainable development contributions from the project activity have been mentioned in the VCS PD and found OK. It is further verified from the supportive document and interview with stakeholder. Project contribute positively to the sustainable development of the area.

Refer CAR 1, CAR 2, CAR 3.

3.2 Safeguards

3.2.1 No Net Harm

There was no harm identified from the project and hence no mitigations measures are applicable. As project is a methane avoidance project, hence there is no negative environmental and socio impact effect and the same can be summarized in the below table:

Table 7: Environment and socio impact effect

Sr. No.	Indicator	Project Owner Opinion
1	Air Quality	Due to this project activity the open decomposition of animal waste will be mitigated, hence it will reduce the odour, which will make air quality much better.
2	Water Quality	The project has no effect on water quality and quantity because it does not generate any wastewater as the water is recycled to make slurry and put into digester again.
3	Biodiversity	The condition of ground vegetation will be gradually improved; No rare species has been found in the around area. The project does not create any obstruction on route of migratory bird (if any). With the implementation of project, the greenery increases due to application of organic fertilizer in land; the biodiversity in the vicinity improves with the vegetation improvement and the variety of life in the world or in a particular habitat or ecosystem. No negative impact envisaged.
4	Employment	The project activity employed local population as skilled and

	Generation	unskilled workers. The personnel employed by the project activity are also provided trainings and exposed to various awareness programs therefore a positive indicator has been accepted.
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There are no negative socio-economic impacts from the project which is also discussed during the stakeholder interview. Validation team has interviewed the local stakeholder and confirmed that project has positive impact on the environment and proper compensation was given to people.

The high-quality organic manure produced from solid waste shall be used for agricultural purposes, hence there is no negative impact of waste generated from biogas plant operation. PP has confirmed that the noise level is in the range of 40 to 65 dB which is safe as per the Maharashtra State Noise Pollution Regulation and Control Rule 2000 amendment dated 21/3/2009.

3.2.2 Local Stakeholder Consultation

The local stake-holder consultation was held at conference hall of Bhagyalaxmi Dairy farm.

Table no. 8: Details of local stakeholder Consultation Details

Organiser	Venue	Date	Start Time	End Time
Bhagyalaxmi Dairy farms Pvt. Ltd	Conference hall	24-December-2022	11:00 am	11:45 am

The local villagers invited for the project activity stakeholder meeting.

The Minutes of Local Stakeholder meeting along with List of Attendees and other supporting's has been submitted to the VVB.

The organizer explained about the project activity and also make them understand on how it leads to reduction of GHG gases emission. The agenda were as follows:

- Opening of the meeting
- Explanation of the project
- Question for clarification about project explanation
- Closure of meeting

The stakeholders raised their concern on environmental and social impact of the project, its financial viability and marketability of compost. These concerns were appropriately addressed by the project proponent, and following table briefs the concerns raised by stakeholders and their corresponding response.

Table No. 9: Participants Questions and Responses of PP

Participants Questions	Responses
1. Will the project provide improved health in our village?	Yes, the project will result in improved health reducing health hazards from indoor & outdoor air pollution
2. Will the project release any harmful pollute, hazardous toxic, or notorious substances in the air?	No, not from what we know there is no project emissions associated to project and does not have any negative impacts.
3. Will there be employment generation due to project activity for youth from adjoining area?	Responding about the increased possibilities for employment of local youth due to project activity, it was pointed out that the preference would be given to the locals in the employment at project site.
4. Will the project lead to water pollution?	No, the project does not lead to any kind of water pollution.

PP has submitted the list of participants, picture and the invitation letter of the local stakeholder meeting arranged. Validation team found it correct, team also discussed and verified this with local stakeholders during site visit and checking the grievances register finding no negative comments. PP has also submitted the grievances register and it is found ok.

Refer CAR 4

3.2.3 Environmental Impact

The project activity is Waste Management which is free from any kind of anthropogenic emission. Project activity is not having any negative environmental impacts. This project rather helps having a positive impact on the environment as it leads to efficient management waste. The project activity has no significant impact on the environment. VVB has verified that as per Ministry of Environment and Forests, Government of India, waste management projects having zero project emissions are not mandated by environmental impact assessment report.

3.2.4 Public Comments

In accordance with the requirement of the VCS standard version 4.4 "All VCS projects are subject to a 30-day public comment period. The date on which the project is listed on the project pipeline marks the beginning of the project's 30-day public comment period". The PP listed their project activity in the VCS pipeline for 30 days from 31/03/2023 to 30/04/2023(<https://registry.terra.org/app/projectDetail/VCS/4245>) for public comments. VVB has verified that, no public comments were received during the public comment period from VCS website.

Refer CL2

3.2.5 AFOLU-Specific Safeguards

NA

3.3 Application of Methodology

3.3.1 Title and Reference

Table No. 10: Applicability of the Methodology and Tools

Sr. No.	Title and description	Reference
Methodology applied		
1	AMS-III.D.: Methane recovery in animal manure management systems, version 21.0	CDM Website
2	AMS-I.F.: Renewable electricity generation for captive use and mini-grid, version 5.0	CDM Website
The methodology refers to following CDM Tools		
3	Tool 14: Project and leakage emissions from anaerobic digesters, version 2	CDM Website
4	Tool 07: Tool to calculate the emission factor for an electricity System, Version 07.0	CDM Website

3.3.2 Applicability

Applicable criteria for the selected baseline methodology AMS-III.D version 21.0 and AMS-I.F version 5.0 are assessed by the validation team by means of document review & on-site audit. The project applicability was confirmed against each condition in the approved methodology by the following methods.

Table no. 11: Applicability of methodology and tools

Applicability of AMS III.D			
Sr. No.	Applicability Conditions	Project Activity Applicability	Validation Remark
1	This methodology is applicable under the following conditions. a) The livestock population in the farm is managed under confined conditions;	Applicable All the livestock population in the farms within the project boundary is managed under confined conditions	Through on-site visit, validation team confirmed that all the live stocks population in the farm is managed under the confined conditions.
	b) Manure or the streams obtained after treatment are not discharged into natural water resources (e.g., river or estuaries), otherwise "AMS-III.H Methane recovery in	Applicable As per the DPR, manure or the streams obtained after treatment are not discharged into natural water resources (e.g., river or estuaries)	Through on-site visit, validation team confirmed that Manure or the streams obtained after treatment are not discharged into

	wastewater treatment" shall be applied;		natural water resources. The liquid digestate is dewatered and used for making organic fertilizer.
	c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C. The annual average temperature at the project site is 24.3°C.	PP submitted the supporting documents sourced from meteorological department of India and it verified that the average annual temperature for the site is higher than 5°C.
	d) In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m;	In the baseline scenario the manure was dumped in the pit of greater than 1 m depth and the retention time was more than one month. Hence this condition is applicable.	This information is verified as per the Detailed Project Report and physical audit. It is found that the manure is dumped into pit and retention period is more than one month. Hence, it is applicable.
	e) No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	Applicable As no methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	As per DPR submitted by PP, validation team confirms that no methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario

2	a) The residual waste from the animal manure management system shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of "AMS-III.AO Methane recovery through controlled anaerobic digestion". In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured;	Applicable The residual waste from the biogas plant is which comes out from the digester, using the dewatering machine we are separating the solid and liquid parts and the separated liquid slurry we are selling to nearby farms in the solid manure we are doing the value addition of micro-nutrition in it and converting them into organic fertilizer in powder form, granulate form, etc. The project will also produce 19008 MT/year of organic fertilizer which is used aerobically in farms. Hence there is no project emissions from the project activity. In addition, the project does not involve anaerobic soil application, therefore this will not result in methane emissions.	As per submitted DPR and site visit, validation team confirms that the residual waste is treated through dewatering and used to produce organic fertilizer for the farming application and handled aerobically.
	b) Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;	Applicable All the biogas which is produced in the biogas digester is used to generate electricity for captive purpose.	During the site visit, validation team confirmed that required technical measures are taken and all biogas produced by the digester is used for energy generation.
	c) The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	Applicable PP has not stored the manure before feeding. PP has fed the manure on a daily basis with water in a 1:1 ratio, where we have 3 nos of digesters which has a volume of 700 cum each, having dia of 14 m and 7 ft. ht., and a manure storing process for 45 days which is a Hydraulic Retention Period (HRT), in which proportion we are feeding the manure into the	During the site visit, validation team confirmed that the storage time of the manure after removal is less than 45 days before it is being fed into the anaerobic digester.

		digester into that proportion manure will get us from outlet slurry tank.	
3	Projects that recover methane from landfills shall use "AMS-III.G Landfill methane recovery" and projects for wastewater treatment shall use AMS-III.H. Projects for composting of animal manure shall use "AMS-III.F Avoidance of methane emissions through composting". Project activities involving co-digestion of animal manure and other organic matters shall use the methodology "AMS-III.AO Methane recovery through controlled anaerobic digestion".	Not Applicable As the project activity is using AMS-III.D. "Methane recovery in animal manure management systems"	During site visit and detailed project report submitted by PP, validation team verified that there is no landfills are used, so this condition is not applicable in this case.
4	Utilization of the recovered biogas in one of the options detailed in AMS-III.H is also eligible under this methodology. The respective procedures in AMS-III.H shall be followed in this regard. If the recovered biogas is used to power auxiliary equipment of the project activity, it should be taken into account accordingly, using zero as its emission factor; however, energy used for such purposes is not eligible as an SSC CDM Type I project component.	Not Applicable The biogas recovered from the project activity is used to generate electricity which is used to meet captive consumption of dairy plant, hence this condition is not applicable.	During site visit and detailed project report submitted by PP, validation team verified that is the biogas recovered from the project activity is utilized to generate electricity and it is used to meet captive consumption of dairy plant, so this condition is not applicable in this case.
5	New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General guidelines for SSC CDM methodologies".	Not Applicable As there is not any capacity being added.	As per submitted DPR and commissioning certificate, validation team confirmed that there is no capacity is added in existing plant. Hence the project is greenfield project and this criteria is not applicable.

6	The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General guidelines for SSC CDM methodologies".	Not Applicable As no equipment has been replaced so there is no requirement for "General guidelines for SSC CDM methodologies".	Validation team verified the purchase orders of the equipment and found no new requirements has been replaced. Hence, this criteria is not applicable.
7	Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO ₂ equivalent annually from all Type III components of the project activity.	Applicable The project activity is estimated to generate 20,862 tCO ₂ .	Validation team verified the Estimated ER sheet and found that the project activity is estimated to generate 20,862 tCO ₂ which is less than the 60 kt CO ₂ . Hence, this criteria is fulfilled.
Applicability of AMS I.F.			
8	This methodology is applicable for project activities that: a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); b) Involve a capacity addition, c) Involve a retrofit of (an) existing plant(s); or d) Involve a replacement of (an) existing plant(s).	Applicable As it is a biogas captive power plant and there was no renewable power plant prior to that project activity.	During site visit it is confirmed that the recovered biogas is used for electricity generation and prior to the project activity there was no renewable power plant operating in the project boundary. Hence, the clause is applicable.
9	I. Project supplies electricity to a national/regional grid II. Project displaces grid electricity consumption (e.g., grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid) III. Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual	I. Not Applicable, as the project is captive power project, hence the generated power is not supplied to the national grid. II. Applicable, as the project is displacing grid electricity. III. Not Applicable, as the project is a captive power project hence it is not connected with national	As per DPR and the on-site visit, validation team confirms that the the project is captive power project, hence the generated power is not supplied to the national grid. Hence, option II is applicable and methodology AMS I F, V5.0 is applicable

	arrangement such as wheeling) IV. Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel V. Project supplies electricity to household users (included in the project boundary) located in off grid areas	grid. So, the project activity is not selling electricity via national grid to any identified customer. IV. Not Applicable, as the project activity is not supplying electricity to a mini-grid also the baseline of this project activity is grid connected electricity and not fuel oil of diesel oil. V. Not Applicable, as the project activity is not supplying electricity to household users located in off-grid areas. As the project activity is solely using electricity generated by using bio-methane gas for captive purpose only hence this section is not applicable.	for th project activity.
10.	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Not Applicable No capacity addition is taking place in the project activity.	As per submitted DPR and commissioning certificate, validation team confirmed that there is no capacity is added in existing plant. Hence the project is greenfield project and this criteria is not applicable.
11	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not Applicable As no retrofit is taking place, hence this section is not applicable.	As per submitted DPR, validation team confirms that there is no retrofit is taking place, hence this section is not applicable.
12	If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility	Not Applicable As the project activity does not have any non-renewable component.	As per submitted DPR and site visit, validation team confirms that the

	limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.		project activity does not have any non-Renewable component.
13	Combined heat and power (co-generation) systems are not eligible under this category.	Not Applicable As this project activity is using anaerobic digester to produce methane gas and then utilizing that biogas solely for generating Electricity for captive purpose, hence this section is not applicable.	Validation team confirms that the project activity is using anaerobic digester to produce methane gas and then utilizing that biogas solely for generating Electricity for captive purpose, hence this section is not applicable as per the submitted DPR and on-site visit.
14	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: The project activity is implemented in an existing reservoir with no change in the volume of reservoir; The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m ² ; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m ²	Not Applicable As this project is not a hydro Power Project.	As per submitted DPR and on-site visit, Validation team confirms that the project is not a hydro Power Project.
15	If electricity and/or steam/heat produced by the project	Not Applicable As the electricity generated is	As per submitted DPR and on-site

	activity is delivered to a third party, i.e., another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	utilized in dairy premises only.	visit, Validation team confirms that the electricity generated is utilized in dairy premises only.
16	In the case the project activities utilize biomass, the "TOOL16: Project and leakage emissions from biomass" shall be applied to determine the relevant project emissions from the cultivation of biomass and the utilization of biomass or biomass residues.	Not Applicable The project activity instances do not involve with biomass usage.	As the project activity involves the biogas recovery and no biomass is utilized hence this condition is not applicable..
Applicability conditions of "Tool to calculate the emission factor for an electricity system", Tool 07, version 7.0.			
1	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g., demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool under section 4.1 for calculating baseline emissions.	
2	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the	Since the project activity is not a grid connected, this condition is not applicable.	

	electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
3	In case of projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, a non-Annex I country. Therefore, this criterion is not applicable for the project activity.
4	Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	The project activity is a Biogas project. Therefore, this criterion is not applicable for the project activity.

Applicability conditions of project and leakage emissions from anaerobic digester, Tool 14, Version 02.0.		
1	Para 3- The following sources of project emissions are accounted for in this tool: (a) CO ₂ emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) CO ₂ emissions from consumption of fossil fuels associated with the operation of the anaerobic digester; (c) CH ₄ emissions from the digester (emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester); and (d) CH ₄ emissions from flaring of biogas.	This is applied in project activity. So, this condition is applicable.
2	Para 4- The following sources of leakage emissions are accounted for in this tool: (a) CH ₄ and N ₂ O emission from composting of digestate; (b) CH ₄ emissions from the anaerobic decay of digestate disposed in a SWDS or subjected to anaerobic storage, such as in a stabilization pond.	This is applied in project activity. So, this condition is applicable.
3	Para 5- Emission sources associated with N ₂ O emissions from physical leakages from the digester, transportation of feed material	This condition is applicable.

	and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources or because they are accounted in the methodologies referring to this tool.	
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TUV SUD confirms that the application of the baseline methodology is transparent and conservative and confirms that the chosen baseline, monitoring methodologies and tools are applicable to the project activity.

Refer CL1, CL3, CAR 4, CAR 5 in this regarding.

3.3.3 Project Boundary

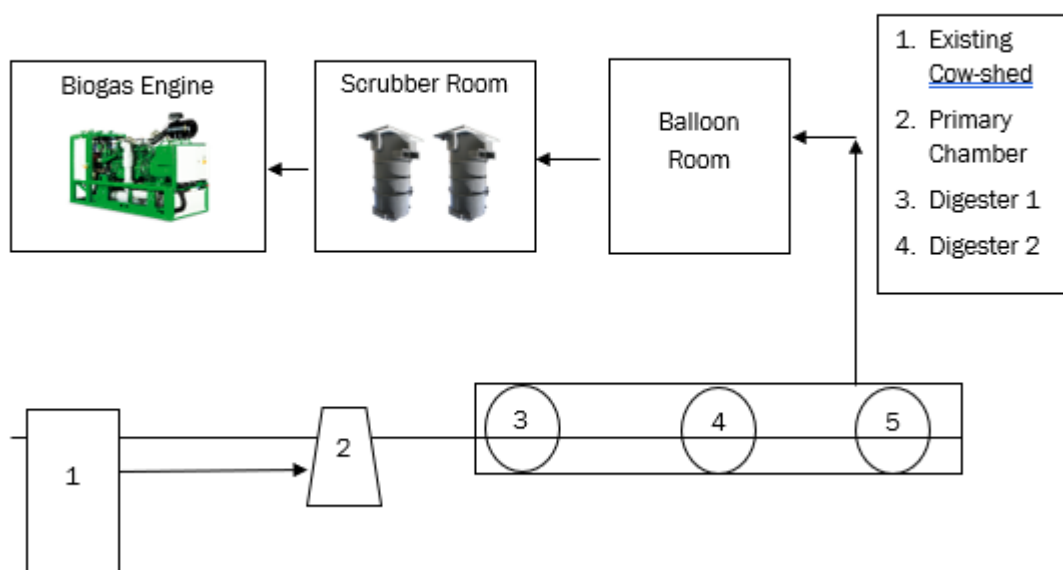


Figure No. 4: Project Boundary

The boundary for the project is as follows:

Source	Gas	Included?	Justification/Explanation
Baseline	CO ₂	No	CO ₂ emission is not accounted from decomposition
	CH ₄	Yes	The major source of emissions in the baseline

Source	Gas	Included?	Justification/Explanation
Emission from Electricity consumption/Generation	N ₂ O	No	N ₂ O emission are less than compare to CH ₄
	CO ₂	Yes	The main source of emission due to grid emission factor
	CH ₄	No	CH ₄ emission are not accounted from decomposition
	N ₂ O	No	N ₂ O emission are not accounted from decomposition
Project	CO ₂	No	Excluded for simplification
	CH ₄	Yes	Main emission source
	N ₂ O	No	Excluded for simplification

By checking the information and the project site, TUV SUD can confirm that the project boundary and emission sources described in the PDD are accurate and complete, and also that the selected sources and gases are justified for the proposed project activity.

Refer CAR6 regarding this.

3.3.4 Baseline Scenario

As per para. 17 of AMS-III.D, the baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay aerobically within the project boundary and methane is emitted to the atmosphere.

As per as para. 20 of AMS.I.F, the baseline scenario is the situation where, in the absence of the project activity, the facility would draw electricity from grid which have grid emission factor.

Hence, the baseline scenario of the project is the animal manure waste was left to decay in anaerobic manure management system (lagoon) at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility; equivalent amount of electricity was drawn from the grid connected fossil fuel fired power plants.

The assessment team confirms:

- The identified baseline scenario is justified.
- The approved baseline methodology has been correctly applied to identify the most plausible.

Baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the project activity.

Based on on-site audit and details mentioned in page number 13 of detail project report dated 27th February 2019 found justifiable, hence assessment team found baseline scenario appropriate.

3.3.5 Additionality

As per para 15-16 of applied methodology AMS III.D, project activities may demonstrate the additionality by showing that there is no regulation in the host country, applicable to the project site, that requires the collection and destruction of methane from livestock manure. If so, it is not required to apply the “Guidelines on the demonstration of additionality of small-scale project activities”. This additionality condition also applies to Greenfield project activities. Furthermore, for project activities applying this methodology in combination with a Type I methodology, that has an energy component whose installed capacity is less than 5 MW, this procedure for additionality demonstration also applies to that component.

In line with AMS-III.D, the project recovers biogas to generate electricity with a total installed capacity of 250 KW, which is lower than 5MW.

Validation team verified that there is no such regulation in India regarding collection and destruction of methane and as per para. 15-16 of applied methodology AMS-III.D, project activities may demonstrate the additionality by showing that there is no regulation in the host country. Hence, in this case, PP are demonstrating the additionality.

The additionality of new project activity instances also be demonstrated in line with the methodology AMS III.D version 21.0, as per para 15 and 16, this additionality condition also applies to greenfield project activities. Furthermore, for the project activity applying this methodology in combination with a type I methodology, that has an energy component whose installed capacity is less than 5 MW. These procedure for additionality demonstration also applied to that component.

As per Central Pollution Control Board, Ministry of Environment, Forest and climate change Government of India, animal manure is not defined as the waste for which compliance is needed. It is verified from the compliance list from Central Pollution Control Board.

3.3.6 Quantification of GHG Emission Reductions and Removals

TUV SUD Validation team checked the baseline, project and leakage calculation and confirm that the evaluation of baseline, project and leakage is as per the approved methodology and formula used to calculate the same is correct. The details analysis is as below:

Baseline Emission:

According to the methodology AMS III.D and AMS I.F, baseline emissions are determined according to equation and comprise the following sources:

Equation (1)

$$BE_y = GWP_{CH_4} \times D_{CH_4} \times UF_B \times \sum_{j,LT} MCF_j \times B_{O,L,T} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{BL,j}$$

Where:

BE_y = Baseline emissions in year y (t CO₂e)

GWP_{CH_4} = Global warming potential of CH₄ applicable to the crediting period (t CO₂e/t CH₄)

D_{CH_4} = CH₄ density (0.67kg/m³ at room temperature (20°C) and 1 atm pressure)

UF_b = Model correction factor to account for model uncertainties (0.94)

LT = Index for all types of livestock

J = Index for animal manure management system

MCF_j = Annual methane conversion factor (MCF) for the baseline animal manure management system j

$B_{o,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT (m³CH₄/kg-dm)

$N_{LT,y}$ = Annual average number of animals of type LT in year y (numbers)

$VS_{LT,y}$ = Volatile solids production/excretion per animal of livestock LT in year y (on a dry matter weight basis, kg-dm/animal/year)

$MS\%_{BI,j}$ = Fraction of manure handled in baseline animal manure management system j

- a. The maximum methane-producing capacity of the manure ($B_{o,LT}$) varies by species and diet. The preferred method to obtain $B_{o,LT}$ measurement values is to use data from country-specific published sources, measured with a standardised method ($B_{o,LT}$ shall be based on total as-excreted VS). These values shall be compared to IPCC default values and any significant differences shall be explained. If country specific B_o values are not available, default values from tables 10 A-4 to 10 A-9 of 2019 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10¹ can be used, provided that the project participants assess the suitability of those data to the specific situation of the treatment site.
- b. VS are the organic material in livestock manure and consist of both biodegradable and non-biodegradable fractions. For the calculations the total VS excreted by each animal species is required.

$$VS_{LT,y} = (W_{site} / W_{default}) \times VS_{default} \times nd_y$$

Where:

W_{site} = Average animal weight of a defined livestock population at the project site (kg)

$W_{default}$ = Default average animal weight of a defined population, this data is sourced from IPCC 2006 (kg)

$VS_{default}$ = Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg-dm/animal/day)

nd_y = number of days treatment plant was operational in year y

If country specific VS values are not available IPCC default values from 2019 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 table 10 A-4 to 10 A-9 can be used provided that the project participants assess the suitability of those data to the specific situation of the treatment site particularly with reference to feed intake levels;

- c. Bo_{LT} values or VS values applicable to developed countries can be used provided the following four conditions are satisfied:
 - i. The genetic source of the livestock originates from an Annex I Party;
 - ii. The farm uses formulated feed rations (FFR) which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics;
 - iii. The use of FFR can be validated (through on-farm record keeping, feed supplier, etc.);
 - iv. The project specific animal weights are more similar to developed country IPCC default values.
- d. Methane Conversion Factors (MCF) values are determined for a specific manure management system and represent the degree to which Bo is achieved. Where available country-specific MCF values that reflect the specific management systems used in particular countries or regions shall be used. Alternatively, the IPCC default values provided in table 10.17 of 2019 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used. The site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on-site observations.
- e. The annual average number of animals ($N_{LT,y}$) is determined as follows:

$$N_{LT,y} = N_{da,y} \times \frac{N_{p,y}}{365}$$

Where:

$N_{da,y}$ = Number of days animal is alive in the farm in the year y (numbers)

$N_{p,y}$ = Number of animals produced annually of type LT for the year y (numbers)

Baseline emissions from the manure treatment processes in year y (tCO₂e/yr)

As per paragraph 20 of AMS-I.F. version 05.0, the baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor.

$$BE_y = EG_{BL,y} \times EF_{CO_2,y}$$

Where:

BE_y = Baseline emissions in year y (t CO₂/yr)

$EG_{BL,y}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO_2,y}$ = Emission factor (t CO₂/MWh)

As per methodology, combined grid emission factor as per the “Tool 07: Tool to calculate the emission factor for an electricity system” version 07 is calculated as below.

CO₂ Baseline Database for the Indian Power Sector, Version 18, December, 2022 published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool 07 - Tool to calculate the emission factor for an electricity system (Version 7.0, EB 100, Annex 4), following six steps have been followed:

Step 1: Identify the relevant electricity systems;

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional);

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

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

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

Step 6: Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool “For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems”. It also states that “If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used”. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India have Indian grid.

However, since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e., at same frequency. Consequently, the

Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The project proponent may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The project proponent has chosen only grid power plants in the calculation.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

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

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, solar, low-cost biomass, nuclear and solar generation.

Share of must-run (Hydro/Nuclear) (% of net generation)

2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
14.6%	14.3%	14.5%	17.0%	16.5%	15.8%

Data Source: Central Electricity Authority (CEA) database Version 18, December 2022

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50% of the total generation. Thus, the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation. For off-grid power plants, a single calendar year within the five years prior to the time of submission of the PD for validation.

The simple OM emission factor is calculated as the single calendar year CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- (a) Ex-ante option: if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

- (b) Ex-post option: if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Project Proponent has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the VVB for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor and recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid, omsimple,y}$) according to the selected method

The operating margin emission factor has been calculated using a single calendar year data vintage:

Net Generation in Operating Margin (GWH) (incl. Imports)	
2020-21	
958,218	
Simple Operating Margin	
2020-21	
0.9402	
Weighted Generation operating Margin	
2021-22	0.9402

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid, BM,y}$)

As per Methodological tool: "Tool 07: Tool to calculate the emission factor for an electricity system" (Version 7.0, EB 100, Annex 4) para 72:

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

- (a) Option 1 - For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the VVB for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the VVB. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- (b) Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by Project proponent to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period.

Build Margin	
2021-22	0.8687

Step 6: Calculated the combined margin (CM) emission factor ($EF_{grid, CM, y}$)

As per Methodological tool: "Tool 07: Tool to calculate the emission factor for an electricity system" (Version 7.0, EB 100, Annex 4) para 81:

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

- (a) Weighted average CM; or
- (b) Simplified CM.

Project proponent has chosen option (a) i.e., weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times W_{OM} + EF_{grid, BM, y} \times W_{BM}$$

Where:

$EF_{grid, BM, y}$ = Build margin CO₂ emission factor in year y (tCO₂e/MWh)

$EF_{grid, OM, y}$ = Operating margin CO₂ emission factor in year y (tCO₂e/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

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

For otherproject activities: $W_{OM} = 0.5$ and $W_{BM} = 0.5$ (owing to their intermittent and non-dispatchable nature) for the second crediting period and for subsequent crediting periods. Since project activity is of power generation by using biogas methane, the above weightage has been considered for OM and BM.

Therefore, $EF_{grid, CM, y} = 0.8687 \times 0.5 + 0.9402 \times 0.5$

$$= 0.9045 \text{ tCO}_2\text{e/MWh}$$

Therefore, referring to the applied methodology AMS.I.F. Version 5.0, the $EF_{CO_2, y}$ for grid connected and mini grid project instances would be $EF_{grid, CM, y}$ i.e., 0.9045 tCO₂e/MWh. The baseline emission factor is ex- ante parameter and will remain constant throughout the crediting period.

$BE_{,y} = 903 \times 0.9045 = 816.718 \text{ tCO}_2\text{e}$ (estimated value for first year of operation)

Project Emissions:

According to AMS III.D,

$$PE_{,y} = PE_{transp,y} + PE_{power,y} + PE_{storage,y} + PE_{PLy} + PE_{flare,y}$$

$PE_{transp,y}$ = Emission from incremental transportation in the year y, tCO₂e.

$PE_{power,y}$ = Emission from electricity or fossil fuel consumption, tCO₂e.

$PE_{storage,y}$ = Emission from the storage of manure, tCO₂e.

PE_{PLy} = Emissions due to physical leakage of biogas in year y, tCO₂e.

$PE_{flare,y}$ = Emissions from flaring or combustion of the biogas stream in the year y, tCO₂e.

For $PE_{transp,y}$

Project emissions due to incremental transport distances ($PE_{transp,y}$) are calculated based on the incremental distance between:

- I. The collection points of biomass and/or manure and the digestion site as compared to the baseline solid waste disposal site or manure treatment site;
- II. When applicable, the collection points of wastewater and treatment site as compared to baseline wastewater treatment site;

III. Treatment sites and the sites for soil application, landfilling and further treatment of the residual waste.

As the digester is only at 10m distance from the cow shed hence they use scraper to move dung from the shed to the digester. The fertilizer generated through the project activity is being consumed in the same village. Hence there is no incremental distances. Also, there is no transportation involved in further treatment of residual waste. The residual waste has generated to site is distributed to farmers to use as a fertilizer as aerobic soil application. The project has no incremental transportation compared to the baseline scenario, so there are no emissions from incremental transportation.

During on site visit, VVB has confirmed that there is no incremental distances as the manure is shoved in digester via hand shovel in an inclined plane and farmer collect the manure from dairy itself. So there are no emissions from incremental transportation.

Hence $PE_{transp,y} = 0 \text{ tCO}_2\text{e}$.

For $PE_{power,y}$

Project emissions from electricity and fossil fuel consumption are determined by the following methodological tool “project and leakage emissions from anaerobic digester (version 02.0)”. where $PE_{power,y}$ is the sum of $PE_{EC,y}$ and $PE_{FC,y}$ in the tool. The project does not use any fossil fuel, so $PE_{FC,y}$ is not included in the project. Thus $PE_{FC,y} = 0 \text{ tCO}_2\text{e}$.

According to methodological tool “project and leakage emissions from anaerobic digester (version 02.0)”. The PP can use monitored data or default value to calculate $PE_{EC,y}$ for this project, PP has chosen default value to calculate $PE_{EC,y}$:

$$PE_{EC,y} = Q_{CH4,y} \times F_{EC,default} \times EF_{EL,default}$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption associated with the anaerobic digester in year y (tCO₂)

$Q_{CH4,y}$ = Quantity of methane produced in the anaerobic digester in year y (t CH₄)

$F_{EC,default}$ = Default factor for the electricity consumption associated with the anaerobic digester per ton of methane generated (MWh / t CH₄)

$EF_{EL,default}$ = Default emission factor for the electricity consumed in year y (t CO₂ / MWh)

According to the tool “Project and leakage emissions from anaerobic digester (version 02.0)”. PP choose paragraph 17 option 2 to determine the quantity of methane produced in digester in year y ($Q_{CH4,y}$):

$$Q_{CH4,y} = Q_{biogas,y} \times f_{CH4,default} \times \rho_{CH4}$$

$Q_{CH4,y}$ = Quantity of methane produced in the digester in year y (t CH₄)

$Q_{\text{biogas},y}$ = Amount of biogas collected at the digester outlet in year y (Nm^3 biogas)

$f_{\text{CH}_4,\text{default}}$ = Default value for the fraction of methane in the biogas ($\text{m}^3 \text{CH}_4 / \text{m}^3$ biogas)

ρ_{CH_4} = Density of methane at normal conditions ($\text{t CH}_4 / \text{Nm}^3 \text{CH}_4$)

$$Q_{\text{CH}_4,y} = 554.46 \text{ tCH}_4$$

Therefore,

$$PE_{\text{EC},y} = Q_{\text{CH}_4,y} \times F_{\text{EC},\text{default}} \times EF_{\text{EL},\text{default}}$$

= $554.46 \times 1.02 \times 1.3 = 735.21 \text{ tCO}_2\text{e}$ DG set is not used for the operation of the Biogas plant. However, it is kept at site only for emergency purpose and all captive activity of the biogas plant is met by the generated power through the biogas engine only. As there is no fossil fuel consumption and quantity of electricity is monitored.

$$\text{Hence } PE_{\text{power},y} = 735.21 + 0 = 735.21 \text{ tCO}_2\text{e}.$$

For $PE_{\text{storage},y}$

Project emissions on account of storage of manure before being fed into the anaerobic digester shall be accounted for if both condition (a) and condition (b) below are satisfied:

- The storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester;
- The dry matter content of the manure when removed from the animal barns is less than 20%.

The storage time of the manure after removal from the animal barns, including transportation within 24 hours before being fed into the anaerobic digester, hence emissions from the storage of manure are not accounted for,

$$\text{Hence } PE_{\text{storage},y} = 0 \text{ tCO}_2\text{e}.$$

For $PE_{\text{PL},y}$

Project emissions due to physical leakage of biogas from the animal manure management systems used to produce, collect and transport the biogas to the point of flaring or gainful use is taken 0.

$$PE_{\text{PL},y} = 0.10 \times GWP_{\text{CH}_4} \times D_{\text{CH}_4} \times \sum B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y}$$

Where:

$MS\%_{i,y}$ = Fraction of manure handled in system I in year y if the project activity involves sequential manure management systems, the procedure specified in paragraph 18€ shall be used to estimate the project emission due to physical leakage of biogas in each stage

$$PE_{PL,y} = 0.10 \times 28 \times 0.00067 \times 0.13 \times 252 \times 1 \times 8973 \text{ (For milking cows)} = 661.71 \text{ tCO}_2\text{e}$$

$$PE_{PL,y} = 0.10 \times 28 \times 0.00067 \times 0.13 \times 252 \times 1 \times 10767 \text{ (For dry cows)} = 550.94 \text{ tCO}_2\text{e}$$

$$PE_{PL,y} = 1212.65 \text{ tCO}_2\text{e}.$$

For $PE_{flare,y}$

As the biogas is stored in balloon and during maintenance process, instead of flaring, biogas is not released and is kept in balloon itself. Hence project activity due to flaring is nil.

$$\text{Hence } PE_{flare,y} = 0$$

$$PE_y = 1212.65 + 0 + 735.21 + 0 + 0 = 1,947.86 \text{ tCO}_2\text{e}.$$

According to the methodology AMS I.F.

As per the approved consolidated Methodology AMS.I.F. Version 5.0 “For most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_{Electricity,y} = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO₂e/yr)

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (tCO₂e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO₂e/yr)

As the project activity is the installation of biogas captive power plant and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF,y}$, $PE_{GP,y}$, $PE_{HP,y}$ is equal to zero and thus, $PE_y = 0$.

In the baseline scenario the electricity would have taken from the grid. Project activity is displacing electricity from the grid. Hence there is no project emissions in case electricity is imported from grid.

Leakage Emissions:

The leakage emissions associated with the anaerobic digester ($LE_{AD,y}$) depend on how the digestate is managed. They include emissions associated with storage and composting of the digestate and are determined as follows:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y}$$

Where:

$LE_{AD,y}$ = Leakage emissions associated with the anaerobic digester in year y (t CO₂e)

$LE_{storage,y}$ = Leakage emissions associated with storage of digestate in year y (t CO₂e)

$LE_{comp,y}$ = Leakage emissions associated with composting digestate in year y (t CO₂e)

As per para 33 of tool 13 the leakage due to composting digestate is zero as the waste residue is used in soil application aerobically. The project activity does not involve composting of digestate or anaerobic decay of digestate disposed in a SWDS, Digestate are not subjected to anaerobic storage, such as in a stabilization pond. Therefore, leakage emissions associated with the anaerobic digester is not accounted for the project.

The residual waste from the biogas plant is which comes out from the digester using the dewatering machine we are separating the solid and liquid parts and the separated liquid slurry we are selling to nearby farms in the solid manure we are doing the value addition of micronutrition in it and converting them into organic fertilizer in powder form, granulate form etc. The project activity will also produce 19008 MT/year of organic fertilizer which is used aerobically in farms.

Liquid waste generated from the project activity is separated by dewatering and recycled to produce organic fertilizer for the application in the farms aerobically. So no liquid waste is generated during the process.

The separated solid digestate from dewatering is calculated as per clause 6.2.1.4, tool 14, V2.0.

Step 1: Procedure using a default value

$$LE_{storage,y} = F_{SD,CH4,default} \times Q_{CH4,y} \times GWP_{CH4}$$

Where:

$LE_{storage,y}$ = Leakage emissions associated with storage of digestate in year y (t CO₂e)

$F_{SD,CH4,default}$ = Default factor representing the remaining methane production capacity of solid digestate (fraction)

$Q_{CH4,y}$ = Quantity of methane produced in the digester in year y (t CH₄)

GWP_{CH4} = Global warming potential of CH₄ (t CO₂/t CH₄)

Step 2: Finding $Q_{CH4,y}$

$$Q_{CH4,y} = Q_{biogas,y} \times f_{CH4,default} \times \rho_{CH4}$$

Where:

$Q_{\text{biogas},y}$ = Quantity of biogas collected at the digester outlet in year y

$f_{\text{CH}_4,\text{default}}$ = Default value for the fraction of methane in the biogas

ρ_{CH_4} = CH₄ density at room temperature (20°C) and 1 atm pressure.

$Q_{\text{CH}_4,y} = 554.46 \text{ tCH}_4$

Net GHG Emission Reductions and Removals

According to para 27 of AMS-III.D, the emission reductions achieved by the project activity will be determined ex post through direct measurement of the amount of methane fueled, flared or gainfully used. It is likely that the project activity involves manure treatment steps with higher methane conversion factors (MCF) than the MCF for the manure treatment systems used in the baseline situation, therefore the emission reductions achieved by the project activity are limited to the ex post calculated baseline emissions minus the project emissions using the actual monitored data for the project activity (i.e. $N_{\text{LT},y}$, $\text{MS\% i},y$, $\text{MS\% l}$, Al , as well as $V_{\text{SLT},y}$ in cases where adjusted values for animal weight are used). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,\text{ex post}} = \min[(BE_{y,\text{ex post}} - PE_{y,\text{ex post}}), (MD_y - PE_{\text{power},y,\text{ex post}})]$$

Where:

$ER_{y,\text{ex post}}$ = Emission reductions achieved by the project activity based on monitored values for year y (tCO₂e)

$BE_{y,\text{ex post}}$ = Baseline emissions calculated using equation 1 (for projects using option using ex post monitored values of $N_{\text{LT},y}$ and if applicable $V_{\text{SLT},y}$. For projects using option in paragraph 17(b), the ex post monitored values for $Q_{\text{manure},j,\text{LT},y}$ and $\text{SVS}_{j,\text{LT},y}$ are used.

$PE_{y,\text{ex post}}$ = Project emissions calculated using equation 6 using ex post monitored values of $N_{\text{LT},y}$, $\text{MS\% i},y$, $\text{MS\% l}$, Al , $Q_{\text{res waste},y}$ and if applicable $V_{\text{SLT},y}$

MD_y = Methane captured and destroyed or used gainfully by the project activity in year y (t CO₂e)

$PE_{\text{power},y,\text{ex post}}$ = Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year y (t CO₂e)

Biogas flared or combusted (MD_y) shall be determined using the flare efficiency and methane content of biogas:

$$MD_y = BG_{\text{burnt},y} \times w_{\text{CH}_4,y} \times D_{\text{CH}_4} \times FE \times GWP_{\text{CH}_4}$$

Where:

$BG_{\text{burnt},y}$ = Biogas flared or combusted in year y (m³)

$w_{CH_4,y}$ = Methane content in biogas in the year y (volume fraction)

FE = Flare efficiency in the year y (fraction)

Table No. 9: Data and parameter Taken.

Data	Parameters	Units	Data Input	Description	Reference
Region			Indian Subcontinent		
Annual Average number of animals in Year y	$N_{LT,y}$	Numbers	1615	Annual Average number of animals of LT type in year y	Calculated
Average number of milking Cow at the site	$N_{LT\text{milk Cow}}$	Numbers	1363	Annual Average number of animals of LT type in year y	Average Number of animals
Average number of dry Cow at the site	$N_{LT\text{dry Cow}}$	Numbers	252		DPR
Average Weight of Cows	$W_{default}$	Kg	275	Default average animal weight of a defined population, this data is sourced from IPCC 2006	Table 10A.3, DATA FOR ESTIMATING TIER 1 ENTERIC FERMENTATION CH ₄ EMISSION FACTORS FOR BUFFALO, P-10.75
Milking Cow	W_{site}	Kg	500		DPR, P-6
	For Milking Cow				
Dry Cow	W_{site}	Kg	600		DPR, P-6
	For Dry Cow				
Total Weight of Milking Cow		Kg	681500		Calculated
Total Weight of Dry Cow		Kg	151200		Calculated
Type of treatment plant					
Methane Conversion	MCF_j		0.71	Annual Methane conversion factor	IPCC default value, Volume4,

Factor				(MCF) for the baseline animal manure management system j	Chapter10, table 10.17, cattle and swine bedding
KVIC digester				3 numbers, 16 m diameter and 7m height	DPR, Page 20
Max Methane Producing Capacity	$B_{0,LT}$		0.13	Maximum methane producing potential of the volatile solid generated for animal type LT	IPCC default value, Volume4, Chapter10, table 10.A-4
Volatile Solid Producing Potential	$VS_{LT,y}$	Kg-dm/animal/year		Volatile solids production/excretion per animal of livestock LT in year y (on a dry matter weight basis, kg-dm/animal/year)	AMS-III.D, ver-21, P-7
Volatile solid Excretion rate per day	$VS_{default}$	Kg-dm/animal/year		Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population	Table 10.13A (NEW), Chapter 10: Emissions from Livestock and Manure Management, IPCC- 2019, P-10.56
Fraction of Manure handle	$MS\%_{BL,j}$	%	100%	Fraction of manure handled animal manure management system j	AMS-III.D, ver-21, P-7
	Assume all the manure is collected and treated				
Model Correction factor	UF_b		0.94	Model correction factor to account for model uncertainties (0.94)	AMS-III.D, ver-21, P-7
Methane Density	D_{CH_4}	$t\ CH_4/m^3$	0.00067	CH4 density at room temperature (20°C) and 1 atm pressure	AMS-III.D, ver-21, P-7
Operational Day	nd_y	Days	350		DPR, page – 35
$FE_{SD,CH_4,default}$		Fraction	0.15	Default factor for the methane	Project and leakage

				generation capacity of solid digestate (for two phase)	emissions from anaerobic digesters
GWP			28		AR5 Synthesis Report – Climate Change 2014
$f_{CH_4, default}$		$m^3 CH_4 / m^3$	0.6	Default value for the fraction of methane in the biogas	Project and leakage emissions from anaerobic digesters, P-11
$F_{EC, default}$		MWh / t CH ₄	1.02	Default factor for the electricity consumption associated with the anaerobic digester	Project and leakage emissions from anaerobic digesters, P-13
$EF_{EL, default}$		t CO ₂ / MWh	1.3	Default emission factor for the electricity consumed in year y	Project and leakage emissions from anaerobic digesters, P-13

1. Calculation for baseline emission

According to AMS III.D,

$$BE_y = GWP_{CH_4} \times D_{CH_4} \times UF_B \times \sum_{j,LT} MCF_j \times B_{O,L,T} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{BL,j}$$

Calculation

$$VS_{LT,y} = \frac{W_{site}}{W_{default}} \times VS_{default} \times nd_y \text{ Kg/-dm/animal/year}$$

For Milking Cows = 8973 Kg-dm/animal/year

For Dry Cows = 10,767 Kg-dm/animal/year

Now

$$MCF_j \times B_{O,L,T} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{BL,j}$$

For Milking Cows = 1,128,813 Tons/year

For Dry Cows = 250,442 Tons/year

$$BE_{CH_4} = 24,322$$

For 7 years

BE _{CH4}	tCO ₂ e
Year 1	24,322
Year 2	24,322
Year 3	24,322
Year 4	24,322
Year 5	24,322
Year 6	24,322
Year 7	24,322

According to AMS I.F

Actual Installed Capacity	Number of operating Days	Number of Hours	Plant Load Factor	Net Estimated Generated Power	Estimated CO ₂ Reduced
250	350	8400	43%	903	816.718
KW	Days	Hours		MWh	tCO ₂

For 7 years

BE _{Electricity,y}	tCO ₂ e
Year 1	816.718
Year 2	816.718
Year 3	816.718
Year 4	816.718
Year 5	816.718
Year 6	816.718
Year 7	816.718

Total Baseline emission

BE _y	tCO ₂ e	tCO ₂ e	tCO ₂ e
Year 1	24,322	816.718	25138.718
Year 2	24,322	816.718	25138.718
Year 3	24,322	816.718	25138.718
Year 4	24,322	816.718	25138.718
Year 5	24,322	816.718	25138.718
Year 6	24,322	816.718	25138.718
Year 7	24,322	816.718	25138.718

Now, Total emission reduction

$$ER_y = BE_y - PE_y - LE_y$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
<u>22-June-2021 to 21-June-2022</u>	25138.718	1947.86	2328	20,862
<u>22-June-2022 to 21-June-2023</u>	25138.718	1947.86	2328	20,862
<u>22-June-2023 to 21-June-2024</u>	25138.718	1947.86	2328	20,862
<u>22-June-2024 to 21-June-2025</u>	25138.718	1947.86	2328	20,862
<u>22-June-2025 to 21-June-2026</u>	25138.718	1947.86	2328	20,862
<u>22-June-2026 to 21-June-2027</u>	25138.718	1947.86	2328	20,862
<u>22-June-2027 to 21-June-2028</u>	25138.718	1947.86	2328	20,862
Total	175,971 (Round down value)	13,635	16,296	146,040 (Round down value)

Validation Team confirms that all data sources and assumptions are appropriate, and calculations are correct, applicable to the project activity and will result in a conservative estimate of the emission reductions. In general, the validation team is able to confirm that the baseline methodology has been applied correctly to calculate project emissions, baseline emissions, and leakage emissions and all estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in VCS PD.

Refer CL4, CAR 7 regarding this.

3.3.7 Methodology Deviations

There is no such methodology deviation identified.

3.3.8 Monitoring Plan

The project activity uses the approved baseline and monitoring methodologies. Validation team considers the monitoring plan to be complying with the requirement of the methodology based on the following assessment.

Details of the data collection and frequency of data recording and associated formats are described and observed to be adequate. The monitoring plan will give opportunity for real measurement of emission reductions that will be accrued.

Data and Parameters Available at Validation

Validation team may confirm that all the measurement equipment/meters mentioned herein are all duly checked, and calibration procedure is reviewed.

Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/tCH ₄
Description	Global Warming Potential (GWP) of CH ₄ applicable to the crediting period.
Source of data	IPCC
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	Default value of 28 from IPCC Fifth Assessment Report (AR5). Shall be updated according to any future revision to VCS standard by VERRA
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	D _{CH4}
Data unit	t/m ³
Description	CH ₄ Density of methane at normal conditions

Source of data	AMS-III.D.
Value applied	0.00067 (CH ₄ density at room temperature 20°C and 1 atm pressure)
Justification of choice of data or description of measurement methods and procedures applied	'Thermophysical properties of fluids. II. Methane, Ethane, Propane, Isobutane and Normal Butane' by B.A. Younglove, J.F. Ely https://www.nist.gov/
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	UF _b
Data unit	%
Description	Model Correction factor to account for model uncertainties.
Source of data	AMS-III.D.
Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	The uncertainty values have been grouped into five sets of uncertainty bands, with corresponding conservativeness factors, by assigning a given uncertainty values to a given band. These bands relate to the underlying uncertainties, as follows Estimated uncertainty range - Greater than 10 and less than or equal to 30
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	MCF _j
Data unit	Dimensionless
Description	Annual methane conversion factor (MCF) for the baseline animal manure management system j
Source of data	2019 IPCC Guidelines for National Greenhouse Gas Inventories

Value applied	0.71
Justification of choice of data or description of measurement methods and procedures applied	No country or regional specific value is available. Default value from table 10.17 of 2019 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 is applied.
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	$m^3CH_4/kg-VS$
Description	Maximum methane producing potential of the volatile solid generated for animal type LT
Source of data	Table 10.16A of Chapter 10 of 2019 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	0.13
Justification of choice of data or description of measurement methods and procedures applied	No country or regional specific value is available. Default values from tables 10 A-4 to 10 A-9 of 2019 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 are applied.
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	$MS\%_{BL,j}$
Data unit	%
Description	Fraction of manure handled in baseline animal manure management system j
Source of data	AMS-III.D
Value applied	100
Justification of choice of data or description of measurement methods	If animal manure is treated in different treatment systems manure weight delivered to each system shall be directly

and procedures applied	measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for cross-check.
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	-

Data / Parameter	W_{default}	
Data unit	Kg	
Description	Default average animal weight of a defined population	
Source of data	IPCC 2019	
Value applied	275	
	Milking cow	500
	Dry cow	600
Justification of choice of data or description of measurement methods and procedures applied	Data is taken from Table 10A.I, IPCC 2019, Volume 4, of chapter 10. Default value of Indian Subcontinent is taken into account.	
Purpose of Data	Calculation of $VS_{LT,y}$	
Comments	-	

Data / Parameter	$EF_{\text{grid,OM},y}$
Data unit	tCO ₂ e/MWh
Description	Operating margin CO ₂ emission factor in year y
Source of data	Central Electricity Authority: CO ₂ Database
Value applied	0.9402
Justification of choice of data or description of measurement methods	Official and authoritative statistic data

and procedures applied	
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	According to section 4.1, the ex-ante option is selected to calculate $EF_{grid,OM,y}$ and fixed in the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ e/MWh
Description	Build margin CO ₂ emission factor in year y
Source of data	Central Electricity Authority: CO ₂ Database
Value applied	0.8687
Justification of choice of data or description of measurement methods and procedures applied	Official and authoritative statistic data
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	According to section 4.1, the ex-ante option is selected to calculate $EF_{grid,BM,y}$ and fixed in the crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ e/MWh
Description	Combined margin CO ₂ emission factor in year y
Source of data	Central Electricity Authority: CO ₂ Database
Value applied	0.9045
Justification of choice of data or description of measurement methods and procedures applied	Official and authoritative statistic data
Purpose of Data	Calculation of baseline emissions and leakage emission.
Comments	According to section 4.1, the ex-ante option is selected to calculate $EF_{grid,CM,y}$ and fixed in the crediting period.

Data / Parameter	VS _{default}
Data unit	kg/hd/day
Description	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population
Source of data	Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population
Value applied	2.6
Justification of choice of data or description of measurement methods and procedures applied	According to animals' genetic region and type, Default values from tables Table 10.13A (NEW), Chapter 10: Emissions from Livestock and Manure Management, IPCC- 2019, P-10.56 2019 IPCC Guidelines for national Greenhouse Gas Inventories volume 4 Chapter 10 are applied. The genetic source for all types of Dairy cows is from Indian Subcontinent, the average weight of Dairy cow is 500 kg and Dry Cow is 600 Kg, is taken. Thus, VS value from IPCC default value can be used, which is 14.1kg/hd/day and it is conservative. The animal purchase contract, Feed Purchase Contract and on-farm record keeping will be monitored in verification period.
Purpose of Data	Calculation of baseline emissions and project emissions.
Comments	-

Data / Parameter	f _{CH4,default}
Data unit	m ³ CH ₄ / m ³
Description	Default value for the fraction of methane in the biogas
Source of data	The default value was derived based on reported values from registered projects and research papers (Davidsson, 2007)
Value applied	0.6
Justification of choice of data or description of measurement methods and procedures applied	Use this value for Option 2 of the step "Determination of the quantity of methane produced in the digester"
Purpose of Data	Calculation of project emission

Comments	-
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Data / Parameter	$F_{EC, default}$
Data unit	MWh / t CH ₄
Description	Default factor for the electricity consumption associated with the anaerobic digester per ton of CH ₄ generated
Source of data	The values were derived based on a review of registered CDM projects, other projects using digesters and reference books (Metcalf & Eddy, 2003; and for solid waste Sri Bala et al., 2009)
Value applied	1.02
Justification of choice of data or description of measurement methods and procedures applied	Applicable to Option 2 in the step “Determination of project emissions from electricity consumption ($PE_{EC,y}$)”
Purpose of Data	Calculation of project emission
Comments	-

Data / Parameter	$EF_{El, default}$
Data unit	t CO ₂ / MWh
Description	Default emission factor for the electricity consumed in year y
Source of data	“Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emission
Comments	-

Data and Parameter Monitored

Data / Parameter	MS%,y
Data unit	%
Description	Fraction of manure handled in system i in year y
Source of data	Project proponents
Description of measurement methods and procedures to be applied	If animal manure is treated in different treatment systems manure weight delivered to each system shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample. The quantity of animal manure from different farms and different animal types shall be recorded separately for cross-check. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically.
Frequency of monitoring/recording	Annually
Value applied	100
Monitoring equipment	A register will be maintain describing fraction of manure handled with dully signed by plant manager.
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	-
Comments	-

Data / Parameter	N _{p,y}
Data unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	Project proponents
Description of measurement methods	The number of Dairy cows produced in the farm will be recorded

and procedures to be applied	manually in the plant registered with plant's manager dully signed.	
Frequency of monitoring/recording	Annually, based on monthly records	
Value applied	Milk Cow	1363
	Dry Cow	252
Monitoring equipment	Sale purchase agreement/Daily farm registered.	
QA/QC procedures to be applied	The values will be crossed check from sale/purchase agreement.	
Purpose of data	To calculate the annual average numbers of animals ($N_{LT,y}$)	
Calculation method	-	
Comments	-	

Data / Parameter	W_{site}	
Data unit	Kg	
Description	Average animal weight of a defined livestock population of the project site.	
Source of data	Project proponent	
Description of measurement methods and procedures to be applied	Stratified sampling will be used to determine animal weight by using sampling procedure mentioned in "Standard for sampling and surveys for CDM project activities and Programs of Activities"	
Frequency of monitoring/recording	Annually	
Value applied	Milking Cow	500
	Dry Cow	600
	These values are used for the calculation of VS_{LT} on Ex-ante basis. Actual values will be monitored during verification process.	
Monitoring equipment	Weighing Scale	
QA/QC procedures to be applied	The weight of animals will be maintained in plant registered in sample basis with plant managers duly signed.	

Purpose of data	Calculation of emissions reduction
Calculation method	-
Comments	The weighing scale which will be used for measuring animal weight will be calibrated according to manufacturer's specification.

Data / Parameter	EG _y											
Data unit	MWh											
Description	Total electricity generated from the recovered biogas in year y											
Source of data	Electricity meter											
Description of measurement methods and procedures to be applied	Registered will be maintained of continuous generation with plant manager dully signed											
Frequency of monitoring/recording	Continuous monitored and monthly recorded											
Value applied	903 (Ex-ante estimation)											
Monitoring equipment	Electricity meter <table><tr><td>Meter Sr. No.</td><td>Meter Make</td><td>Accuracy Class</td></tr><tr><td>20157905 (Main Meter)</td><td>Schneider</td><td>0.5S</td></tr><tr><td>19125179 (Backup Meter)</td><td>L&T</td><td>0.5S</td></tr></table>			Meter Sr. No.	Meter Make	Accuracy Class	20157905 (Main Meter)	Schneider	0.5S	19125179 (Backup Meter)	L&T	0.5S
Meter Sr. No.	Meter Make	Accuracy Class										
20157905 (Main Meter)	Schneider	0.5S										
19125179 (Backup Meter)	L&T	0.5S										
QA/QC procedures to be applied	The data will be maintained in plant registered with plant managers duly signed. The metering instruments with accuracy no less than 0.5s will be calibrated.											
Purpose of data	Calculation of emissions reduction											
Calculation method	-											
Comments	-											

Data / Parameter	nd,y
Data unit	Days
Description	Number of days that the animal manure management system was operational
Source of data	DPR, Page no.- 36
Description of measurement methods and procedures to be applied	If any farm has no operations on a given day it needs to be documented (e.g., logbook) and taken into account for the calculation of BE _{ex post}
Frequency of monitoring/recording	Annually, based on daily records and monthly aggregation
Value applied	350
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

Data / Parameter	N _{da,y}
Data unit	Number
Description	Number of days animal is alive in the farm in the year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The specific duty personnel appointed by the project proponent are responsible for the monitoring according to the farm operational requirements.
Frequency of monitoring/recording	Annually, based on monthly records
Value applied	365
Monitoring equipment	-

QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

Data / Parameter	$BG_{burnt,y}$
Data unit	m ³
Description	Biogas volume in year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The amount of biogas recovered and fueled, flared or used gainfully shall be monitored ex post, using flow meters. If the biogas flared and fueled (or utilized) is continuously monitored separately, the two fractions can be added to determine the biogas recovered. In that case, recovered biogas need not be monitored separately. The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Frequency of monitoring/recording	Annually, based on continuous flow measurement with accumulated volume recording (e.g. hourly/daily accumulated reading)
Value applied	-
Monitoring equipment	Flow meters
QA/QC procedures to be applied	Flow meters will be calibrated annually as per relevant national standard, e.g. Verification Regulation of Thermal Mass Gas Flowmeters
Purpose of data	Calculation of emissions reduction
Calculation method	-
Comments	-

Data / Parameter	W _{CH4}
Data unit	%
Description	Methane content in biogas in the year y
Source of data	AMS-III.D (Version 21.0) default value
Description of measurement methods and procedures to be applied	The fraction of methane in the biogas should be measured with a continuous analyzer (values are recorded with the same frequency as the flow) or, with periodical measurements at a 90/10 confidence/precision level by following the “Standard for sampling and surveys for CDM project activities and Programme of Activities”, or, alternatively a default value of 60% methane content can be used. Option chosen should be clearly specified in the PDD. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO ₂ is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Frequency of monitoring/recording	-
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emissions reduction
Calculation method	-
Comments	-

Data / Parameter	T
Data unit	°C
Description	Temperature of the biogas at the flow measurement site
Source of data	Project proponent
Description of	The temperature of the gas is required to determine the density

measurement methods and procedures to be applied	of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalized flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Frequency of monitoring/recording	Shall be measured at the same time when methane content in biogas ($w_{CH_4,y}$) is measured
Value applied	-
Monitoring equipment	Temperature Gauge
QA/QC procedures to be applied	Temperature Gauge will be calibrated annually as per relevant national standard.
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

Data / Parameter	P
Data unit	Pa
Description	Pressure of the biogas at the flow measurement site
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalized flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Frequency of monitoring/recording	Shall be measured at the same time when methane content in biogas ($w_{CH_4,y}$) is measured
Value applied	-
Monitoring equipment	Pressure Gauge
QA/QC procedures to be applied	Pressure Gauge will be calibrated annually as per relevant national standard.
Purpose of data	Calculation of emission reductions
Calculation method	-

Comments	-
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Data / Parameter	FE
Data unit	%
Description	The flare efficiency
Source of data	Determined according to AMS-III.D (Version 21.0)
Description of measurement methods and procedures to be applied	As per the tool "Project emissions from flaring". Regular maintenance shall be carried out to ensure optimal operation of flares
Frequency of monitoring/recording	Annually
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

Data / Parameter	-
Data unit	-
Description	Quantity of the residual waste used for soil application
Source of data	Project proponent
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually

Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

Data / Parameter	VS _{LT,y}	
Data unit	Kg dry matter/animal/year	
Description	Volatile solids for livestock LT entering the animal manure management system in year y	
Source of data	Calculated value	
Description of measurement methods and procedures to be applied	Only required when data from national published source are not available or IPCC default value from 2019 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4-chapter 10 table 10 A-4 to 10 A-9 are not used. When country-specific excretion rates are to be estimated from feed intake levels as indicated in the paragraph 18(b), via the enhanced characterization method (Tier 2) described in section 10.2 in 2019 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10, parameters of GELT, DELT, UE, ASH and EDLT shall be monitored as detailed below to derive this value. When developed country values are to be used in the project, relevant parameters specified in the paragraph 18(d) and 36(b) shall be monitored/documented. If IPCC default values are to be adjusted for a site-specific average animal weight as specified in paragraph 18(c), the average animal weight of a defined livestock population at the project site (W_{site}) shall be monitored as detailed in the table 4 below.	
Frequency of monitoring/recording	Annually	
Value applied	Milking Cow	8,973
	Dry Cow	10,767
Monitoring equipment	-	

QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reduction
Calculation method	-
Comments	-

The monitoring plan would ensure the accurate monitoring of the data/parameters mentioned in the VCS PD throughout the implementation of the project activity. The validation team confirms that the monitoring procedures mentioned are best as per industry norms.

The monitoring plan mentioned in VCS is in compliance with the applied methodologies and referenced tools; Based on the on-site audit, the assessment team confirms that monitoring arrangements described in the monitoring plan are feasible within project design.

3.4 Non-Permanence Risk Analysis

The project activity does not require a non-permanence risk analysis. Hence this section is not applicable.

4 VALIDATION OPINION

TUV SUD South Asia has been engaged by “EKL Energy Services Limited” to perform the validation of the project activity “Biogas to electricity generation group project in India”.

The management of the project participants/owner is responsible for the preparation of the GHG emissions data and the reported/estimated GHG emission reductions on the basis set out within the project’s Monitoring plan in the VCS PD and the approved methodologies AMS-III.D version 21.0 and AMS-I.F version 5.

Our Validation approach was based on the requirements as defined by the VCS board. Our approach is risk-based, drawing on an understanding of the risk associated with estimated GHG emissions data and the controls in place to mitigate these.

The validation team confirms that:

The project description compliance with the requirements and other relevant rules, including Host Country legislation and sustainability criteria along with VCS Standard version 4.4 and VCS programme Guide version 4.3.

The project's baseline and additionality are assessed against "AMS-III.D version 21.0 and AMS-I.F version 5 and assessment of CDM Tool 7 version 7, CDM tool 14 version 2, CDM tool 16 version 5.

The project's monitoring plan is assessed against "AMS-III.D version 21.0 and AMS-I.F version 5.

The review of the project description and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews with Project owner have provided TUV SUD with sufficient evidence for positive validation opinion as per the requirement of VCS.

The project is expected to generate 146,040 tCO₂e during the length of entire crediting period 22-June-2018 to 21-June-2028 (both days included).

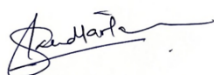
Validated GHG emission reductions and removals in the above period:

Validation period must be broken down into calendar year vintages: From 22-June-2018 to 21-June-2028

Validated GHG emission reductions and removals in the above period:

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
<u>22-June-2021 to 21-June-2022</u>	20,862
<u>22-June-2022 to 21-June-2023</u>	20,862
<u>22-June-2023 to 21-June-2024</u>	20,862
<u>22-June-2024 to 21-June-2025</u>	20,862
<u>22-June-2025 to 21-June-2026</u>	20,862
<u>22-June-2026 to 21-June-2027</u>	20,862
<u>22-June-2027 to 21-June-2028</u>	20,862
Total estimated ERs	146,040
Total number of crediting years	7
Average annual ERs	20,862

Pune, 21/06/2023



Shruti Kudtarkar

TÜV SÜD South Asia Private Limited

ValidationTeam Leader

APPENDIX 1: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS, FORWARD ACTION REQUEST (CL/CAR/FAR)

CL from this validation

CL ID	01	Section no.	3.1, 3.3.2, and 3.3.8	Date: 24/03/2023
Description of CL				

PP needs to provide the following supporting documents to DOE.

1. **Supporting documents for technical specifications mentioned in section 1.11 of PD version 1 dated 13/3/2023.**
2. **grievance register copy**
3. **Technical specifications of the UASB Digester**
4. **Supporting documents for the monitoring of MS%,y**
5. **The weight register of cows with plant managers duly signed.(Software copy)**
6. **Electricity generation records (Electronically) sourced from electric meter. (Daily Records)**
7. **Declaration of double counting**
8. **Purchasing Orders of Equipment.**
9. **Records of usages of DG Set.**

Project participant response

Date: 29/05/2023

1. **DPR has been provided for technical specifications to DOE.**
2. **Grievance register has been provided to DOE.**
3. **USAB digester is not available at the site, onsite modified KVIC Floating Dome model is available.**
4. **Log book has been provided for the Manure handling system to DOE.**
5. **Online slip has been provided for the weight register of cows to DOE.**
6. **Log book has been provided for electricity generation records to DOE.**
7. **Declaration of double counting has been provided to DOE.**
8. **Purchase order copy has been provided to DOE.**
9. **DG set is not used for the operation of the Biogas plant, all activity of the biogas plant is done using the generated power through the biogas engine only.**

Documentation provided by project participant

Change in the PD	Section (s):	New Version No:
Change in the ER xls	Worksheet (s):	New Version No:
Other:	Supporting documents	

VVB assessment

Date: 30/5/2023

1. PP has provided the Detail Project Report Prepared By M/s Urja Bio System Pvt Ltd. while the type of digester is inconstant with the provided DPR (Page 30 and content). Hence, CL is not Closed.
2. There was typo mistake, PP need to provide grievance mechanism. Hence, CL is not Closed.
3. PP has removed the UASB digester details from PD Version 02, but PP did not mention the KVIC digester details in Table 9. Hence, CL is not Closed.
4. PP has provided the Manure generation, Biogas Generation and Power generation records. After assessment it is found that, it does not provide the records of monitoring of MS%,y. As per table 10, "a register will be maintaining describing fraction of manure handled with dully signed by plant manager". PP need to provide the monitoring records of MS%,y. Hence, CL is not Closed.
5. PP has provided the records of weight register of cows. Hence, CL is Closed.
6. PP has provided the electricity generation records. Hence, CL is Closed.
7. PP has provided the declaration of double counting. Hence, CL is Closed.
8. PP has provided the purchase order of DG set of Kirloskar while PP need to submit the purchase orders of biogas engine, scrubbers, Balloons and KVIC digester with mention of their technical specifications. Hence, CL is not Closed.
9. As DG set is used to provide the electricity before the installation of Biogas plant. PP need to provide the records of DG set usage and fuel consumed by DG. Hence, CL is not Closed.

Project participant response

Date: 06/06/2023

- 1- Updated DPR has been provided to DOE.
- 2- Grievance mechanism has been provided to DOE.
- 3- KVIC digester details has been mentioned in section 4.4 of the revised VCS PD.
- 4- Daily work report has been provided for the Manure handling system to DOE.
- 8- Purchase order of biogas engine, scrubbers, Balloons and KVIC digester has been provided to DOE.
- 9- Records of DG set usage and fuel consumed has been provided to DOE.

Documentation provided by project participant

Change in the PD	Section (s): 4.4	New Version No: 03
Change in the ER xls	Worksheet (s):	New Version No:
Other:	Supporting documents	

VVB assessment

Date: 7/6/2023

1-PP has provided the Detail Project Report Prepared By M/s Urja Bio System Pvt Ltd. while the type of digester is consistent with the provided DPR. Hence, CL is closed.

2-Grievance records were submitted by PP. Hence, CL is closed.

3-KVIC digester details has been mentioned in section 4.4 of the revised VCS PD version 3 dated 6/6/2023. Hence, CL is closed.

4-Daily work report has been provided for the Manure handling system which is consistent with the PD version 3 dated 6/6/2023.

8-PP has provided the purchase orders of equipment and procedure of installation which is 7/11/2018 and 3/5/2021 while the date of commissioning is 22/5/2021. Hence, CL is closed.

9-PP has provided the records of the DG set. Hence, CL is closed.

CL ID	02	Section no.	3.2.4	Date: 24/03/2023
Description of CL				
PP needs to provide update to DOE if any public comments are received as per section 2.4 of PD version 1 dated 13/3/2023.				
Project participant response				Date: 29/05/2023
No public comments were received during the public comment period.				
Documentation provided by project participant				
Change in the PD	Section (s):		New Version No:	
Change in the ER xls	Worksheet (s):		New Version No:	
Other:	NA			
VVB assessment				Date: 30/5/2023
PP stated that no public comments were received during the public comment period. It has been verified from the <u>project page</u> from VEERA website.				
Hence, CL is Closed.				

CL ID	03	Section no.	3.3.2	Date: 25/03/2023
Description of CL				

1. In 1 (c) of section 3.2 of PD version 1 dated 13/3/2023, PP need to provide source from meteorological site for the annual average temperature at project site.
2. In 2 (a) of section 3.2 of PD version 1 dated 13/3/2023. PP need to clarify how the residual waste is handled aerobically?
3. In 2 (b) of section 3.2 of PD version 1 dated 13/3/2023. What are technical measures taken in case of emergencies? What will be done of gas?
4. In 2 (c) of section 3.2 of PD version 1 dated 13/3/2023. There is no mention of storage of manure before feeding it into aerobatic digester in provided PD and DPR. Need clarification. If the storage time of the manure after removal is less than 45 days before it is being fed into the anaerobic digester then provide the exact duration/ number of days the manure is being stored before feeding into anerobic digester and the reason of being stored.

Project participant response

Date: 29/05/2023

1. Web link has been provided in section 3.2 for the annual average temperature at project site.
2. The residual waste from the biogas plant is which comes out from the digester, using the dewatering machine we are separating the solid and liquid parts and the separated liquid slurry we are selling to nearby farms in the solid manure we are doing the value addition of micro-nutrition in it and converting them into organic fertilizer in powder form, granulate form, etc.
3. In case of emergencies, we have done provisions for fire extinguishers and other things which are required. If there is an emergency we can flare the gas, but as such no need to do so. As we have provided the 2 biogas balloons which store the generated gas and Generated biogas is consumed on a daily basis by Biogas Engine for generating the power.
4. We are not storing the manure before feeding. We are feeding the manure on a daily basis with water in a 1:1 ratio, where we have 3 nos of digesters which has a volume of 1400 cum each, having dia of 14 m and 7 ft. ht., and a manure storing process for 45 days which is a Hydraulic Retention Period (HRT), in which proportion we are feeding the manure into the digester into that proportion manure will get us from outlet slurry tank.

Documentation provided by project participant

Change in the PD	Section (s): 3.2	New Version No: 02
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	

VVB assessment

Date: 2/6/2023

1. As per meteorological site, the temperature of the project location is accordance with the PD Version 2.0. Hence, CL is closed. 2. During the site visit, it is confirmed that the PP has selling the residual waste generated from digester as a fertilizer. The entire procedure is aerobic as the residual waste after drying is air dried so, there is no methane emissions. Hence, CL is closed. 3. During the site visit, it is confirmed that the PP is using the all the gas for electricity generation and PP has provide the two balloons which does not work to its full capacity and regulate the continuous generation of the electricity. Hence, CL is Closed. 4. As per the explanation provided above, there are no storage of the manure then PP need to clearly justify the explanation in In 2 (c) of section 3.2 of PD version 2.0 dated 29/5/2023. Hence, CL is not closed.		
Project participant response		Date: 06/06/2023
4- Explanation has now been provided in 2 (c) of section 3.2 of the revised VCS PD.		
Documentation provided by project participant		
Change in the PD	Section (s): 3.2	New Version No: 03
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 7/6/2023
PP has explained the section in PD at appropriate place. Hence, CL is Closed.		

CL ID	04	Section no.	3.3.6	Date: 25/03/2023
Description of CL				
In Section 4.1 (Baseline Emission) of PD version 1 dated 13/3/2023, PP needs to point out the equation 1.				
Project participant response				Date: 29/05/2023
Equation 1 has been marked in section 4.1 of the revised VCS PD.				
Documentation provided by project participant				

Change in the PD	Section (s): 4.1	New Version No: 02
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 2/6/2023
PP has indicated the equation 1 and it is accordance with the methodology. Hence, CL is closed.		

CL ID	05	Section no.	3.1	Date: 11/05/2023
Description of CL				
During the audit it is found that the Canteen food waste and spoiled waste are added in manure. PP need to clarify the situation.				
Project participant response				Date: 29/05/2023
Canteen food waste which is wet waste has very fewer quantities of up to 15 kg food waste which is a very negligible quantity and very rare condition, hardly one time in a month not on a daily basis, and which does not make any issues to the anaerobic digestion process.				
Documentation provided by project participant				
Change in the PD	Section (s):	New Version No:		
Change in the ER xls	Worksheet (s):	New Version No:		
Other:	NA			
VVB assessment				Date: 2/6/2023
1. PP need to provide the clarification, if the canteen waste is weighted before adding it to anaerobic digester, if Yes, then need to provide the records and dates on which the canteen waste is added in digester. 2. PP also need to provide the supporting documents and explanation how it will not arise any issues to anaerobic digester. Hence, CAR is not closed.				
Project participant response				Date: 06/06/2023
Supporting Document has been provided to DOE for the same.				
Documentation provided by project participant				

Change in the PD	Section (s):	New Version No:
Change in the ER xls	Worksheet (s):	New Version No:
Other:	Supporting Document	
VVB assessment		
PP has provided the daily work records in which PP is been mearing the pH, dry matter and moisture content from animal manure. Hence, CL is closed.		

CAR from this validation

CAR ID	01	Section no.	3.1	Date: 26/03/2023
Description of CAR				
1. Inconsistencies have been found regarding the amount of emission reduction in section 1.11, specifically whether the project is grouped or not in PD version 1 dated 13/3/2023, nature of the project. The PP needs to fix the inconsistencies and clarify if the project is grouped or not. 2. PP need to ensure font, font colour and margins are consistent throughout the document. 3. PP need to number and name the figure and tables used in the PD.				
Project participant response				Date: 29/05/2023
1. Amount of emission reduction has been corrected in section 1.11 of the revised VCS PD. <i>The project is a grouped project activity and section 1.4 has been corrected.</i> 2. Font, font colour and margins has been corrected throughout the revised VCS PD. 3. Number and name the figure and tables has been used in the revised VCS PD.				
Documentation provided by project participant				
Change in the PD	Section (s): 1.11, 1.4	New Version No: 02		
Change in the ER xls	Worksheet (s):	New Version No:		
Other:	NA			
VVB assessment				Date: 2/6/2023

1. PP has corrected the inconsistency in PD version 2.0. Hence, CAR is Closed.
2. There is consistency in the font, font colour and size in PD version 2.0. Hence, CAR is Closed.
3. PP has added the number and name to the tables and figures presented in PD version 2.0. Hence, CAR is closed.

CAR ID	02	Section no.	3.1	Date: 26/03/2023
Description of CAR				
1. As per the VCS template version 4.2, in section 1.1, the PP needs to provide a brief description of the scenario that existed prior to the implementation of the project. 2. In section 1.7 of PD version 1 dated 13/3/2023, PP need to mention the owner of the project. 3. In section 1.10 of PD version 1 dated 13/3/2023, PP needs to mention the scale of the project. 4. In section 1.10 of PD version 1 dated 13/3/2023, the capacity of installed project is installed 250 KVA (125 KVA ×2). During the audit it is found that there is inconsistent with the configuration. PP need to mention the correct configuration of the capacity. 5. In section 1.10 of PD version 1 dated 13/3/2023, PP need to mention how the residual waste is handled. 6. In section 1.10 of PD version 1 dated 13/3/2023, Balloon Storage Capacity is inconsistent with the capacity of balloon on site. 7. In section 1.17 of PD version 1 dated 13/3/2023, PP need to provide the supporting documents for SGD 8 and SGD 11.				
Project participant response				Date: 29/05/2023
1. Section 1.1 has been updated of the revised VCS PD. 2. Section 1.7 has been updated of the revised VCS PD. 3. Section 1.10 has been updated of the revised VCS PD. 4. Capacity of installed project has been corrected in section 1.1 of the revised VCS PD. 5. The residual waste from the biogas plant is which comes out from the digester, using the dewatering machine we are separating the solid and liquid parts and the separated liquid slurry we are selling to nearby farms in the solid manure we are doing the value addition of micro-nutrition in it and converting them into organic fertilizer in powder form, granulate form, etc. 6. Balloon Storage Capacity has been corrected in section 1.1 of the revised VCS PD. 7. SDG 8 and SDG 11 has now been removed from section 1.17.				

Documentation provided by project participant			
Change in the PD	Section (s): 1.1, 1.7, 1.10, 1.17	New Version No: 02	
Change in the ER xls	Worksheet (s):	New Version No:	
Other:	NA		
VVB assessment			Date: 2/6/2023
1. PP has added a brief description of the scenario that existed prior to the implementation of the project. Hence, CAR is closed. 2. PP has mentioned the owner of the project. Hence, CAR is closed. 3. PP has mentioned the scale of the project. Hence, CAR is closed. 4. PP has corrected the capacity of the project in PD version 2.0. Hence, CAR is closed. 5. PP need to provide the explanation in section 1.10 of PD version 2.0 after the emission reductions not in the list of findings. Hence, CAR is not closed. 6. PP has corrected the balloon capacity in PD version 2.0. Hence, CAR is closed. 7. As PP has removed SDG from PD Version 2.0. Hence, CAR is closed.			
Project participant response			Date: 06/06/2023
5- Explanation has now been provided in 2 (a) of section 3.2 of the revised VCS PD.			
Documentation provided by project participant			
Change in the PD	Section (s): 3.2	New Version No: 03	
Change in the ER xls	Worksheet (s):	New Version No:	
Other:	NA		
VVB assessment			Date: 7/6/2023
PP has explained the portion in section 1.10. Hence, CAR is closed.			

CAR ID	03	Section no.	3.1	Date: 24/03/2023
Description of CAR				
PP need to provide the response for Supply chain (Scope 3 emissions) in section 1.16.2 of PD version 1 dated 13/3/2023				
Project participant response				Date: 29/05/2023

Supply chain (Scope 3 emissions) is not applicable as no transportation is used for delivering the manure which is produced within the dairy farm as the KVIC digester is placed within the dairy farm itself.		
Documentation provided by project participant		
Change in the PD	Section (s): 1.16.2	New Version No: 02
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 2/6/2023
PP has provided the response for Scope 3 emissions. During audit it is confirmed that there is no transportation is used for manure causing no scope 3 emissions. Hence, CAR is closed.		

CAR ID	04	Section no.	3.2.2	Date: 25/03/2023
Description of CAR				
1. PP need to correct the inconsistencies in the date of Local Stakeholder consultation mentioned in the 2.2 section of the PD version 1 dated 13/3/2023 and the supporting documents provided to the DOE. 2. In section 2.1 of PD version 1 dated 13/3/2023, PP need to justify the biodiversity parameter clearly.				
Project participant response				Date: 29/05/2023
1. Date of Local Stakeholder consultation has been corrected in section 2.2 of the revised VCS PD and supporting document has been provided to DOE. 2. Section 2.1 has been updated of the revised VCS PD.				
Documentation provided by project participant				
Change in the PD	Section (s): 2.2, 2.1	New Version No: 02		
Change in the ER xls	Worksheet (s):	New Version No:		
Other:	Stakeholder Documents			
VVB assessment				Date: 2/6/2023

1. There is consistency in local stakeholder consultation information in PD version 2.0 and supporting documents. Hence, CAR is closed.
2. PP has provided the explanation in section 2.1 of PD version 2.0. Hence, CAR is closed.

CAR ID	05	Section no.	3.3.2	Date: 26/03/2023
Description of CAR				
1. PP need to justify the applicability of Tools in section 3.2 of PD version 1 dated 13/3/2023. 2. In 8 (a-d) of section 3.2 of PD version 1 dated 13/3/2023, PP need to justify the Applicability of AMS-I.F. in clear and complete sentence. The statement provided by PP is redundant. 3. In 9 (b) of section 3.2 of PD version 1 dated 13/3/2023, PP stated that the Methodology AMS-I.F. is Not Applicable, as the project is a captive power project hence the project does not import electricity from the grid. While is the applicability criteria 9 states that the project displaces grid electricity consumption (e.g., grid import) [which is true as per the provided PD and DPR] and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid) [which is also true as per the statement provided by the PP in this justification.] Hence; PP need to correct the statement in this section and provide valid reason for it. 4. The storage time of the manure after removal from the animal barns, including transportation found to be inconsistent.				
Project participant response				Date: 29/05/2023
1. Applicability of Tools has been mentioned in section 3.2 of the revised VCS PD. 2. Sentence has been corrected in point 8 of section 3.2 of the revised VCS PD. 3. Statement has been corrected in point 9 (b) of section 3.2 of the revised VCS PD. 4. The storage time of the manure has now been corrected throughout the VCS PD.				
Documentation provided by project participant				
Change in the PD	Section (s): 3.2		New Version No: 02	
Change in the ER xls	Worksheet (s):		New Version No:	
Other:	NA			
VVB assessment				Date: 2/6/2023

1. PP has added the applicability of the tools in PD version 2.0 and it is found that tools are accordance with the methodology. Hence, CAR is closed.
2. The sentence 8 in section 3.2 of PD version 2.0 is as per syntax and as per the applicability of the clause. Hence, CAR is closed.
3. The sentence 9b in section 3.2 of PD version 2.0 is corrected and as per the applicability of the clause. Hence, CAR is closed.
4. The storage time of the manure is consistent in PD Version 2.0. Hence, CAR is closed.

CAR ID	06	Section no.	3.3.3	Date: 27/03/2023
Description of CAR				
1. PP need to mention the whether the N₂O gas is included or not in section 3.3 Project Boundary of PD version 1 dated 13/3/2023. 2. In section 3.3 of PD version 1 dated 13/3/2023, PP need to give the appropriate name for the second block in figure named Project Boundary. ‘Primary’ word does not explain the nature and type of procedure/ function of that apparatus.				
Project participant response				Date: 29/05/2023
1. Section 3.3 has now been updated of the revised VCS PD. 2. Appropriate name for second block has now been mentioned in section 3.3 of the revised VCS PD.				
Documentation provided by project participant				
Change in the PD	Section (s): 3.3		New Version No: 02	
Change in the ER xls	Worksheet (s):		New Version No:	
Other:	NA			
VVB assessment				Date: 2/6/2023
1. PP has excluded the N₂O gas for simplification, which is accordance with the methodology. Hence, CAR is closed. 2. PP has corrected the block diagram and it is consistent with the provided during the site visit. Hence, CAR is closed.				

CAR ID	07	Section no.	3.3.6	Date: 27/03/2023
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Description of CAR		
1. In point 2 of Section 4.1 of PD version 1 dated 13/3/2023, BE_{Electricity,y} is not consistent with the AMS-I.F. Version 5.0 and ER Sheet. 2. Emission from grid and DG need to be added in the baseline of section 4.1 of PD version 1 dated 13/3/2023.		
Project participant response		Date: 29/05/2023
1. Point 2 of Section 4.1 has been updated of the revised VCS PD. 2. Electricity from grid and DG were negligible in the baselines. Hence PP is not considering baseline emission from electricity import and DG, which is conservative.		
Documentation provided by project participant		
Change in the PD	Section (s): 4.1	New Version No: 02
Change in the ER xls	Worksheet (s): Baseline_AMS-I.F.	New Version No: 02
Other:	NA	
VVB assessment		Date: 2/6/2023
1. BE_{Electricity,y} parameter in ER Sheet and PD version 2.0 is consistent with methodology. Hence CAR is closed. 2. As PP is considering the conservative scenario, CAR is closed.		

CAR ID	08	Section no.	3.3.8	Date: 28/03/2023
Description of CAR				
1. In ER Sheet and Section 4.4 of PD version 1 dated 13/3/2023. PP need to provide the supporting documents for the number castles (Total, Milking, dry) present at the site. DPR is not verifying the data, PP need to provide the sale purchase agreement/Daily farm registered for verifying the number of Dairy cows produced in the farm. 2. As per section 4.4 of PD version 1 dated 13/3/2023, UASB digester did not find on site. PP need to give justification and correct the name of the digester.				
Project participant response				Date: 29/05/2023
1. Supporting document has now been provided to DOE. 2. USAB digester is not available at the site, onsite modified KVIC Floating Dome model is available. And the same has been corrected in section 4.4 of the revised VCS PD.				
Documentation provided by project participant				

Change in the PD	Section (s): 4.4	New Version No: 02
Change in the ER xls	Worksheet (s):	New Version No:
Other:	Supporting document	
VVB assessment		Date: 2/6/2023
1. PP has provided the documents for the number of cattle which is accordance with the ER sheet and PD Version 2.0. Hence, CAR is closed. 2. PP has maintained the consistency in the PD Version 2.0 in type of technology used. Hence, CAR is closed.		

CAR ID	09	Section no.	3.3.8	Date: 28/03/2023
Description of CAR				
In Section 5.2: Data and Parameter Monitored of PD version 1 dated 13/3/2023. • MS_{%y} 1. PP need to provide the description of the actual measurement method and its procedure. 2. PP need to provide the frequency of monitoring • N_{p,y} 1. PP need to provide the sales agreement/ dairy farm register • VSLT_y 2. PP need to provide the justification of adding it as a monitoring parameter. In Section 5.3: Monitoring Plan of PD version 1 dated 13/3/2023. 1. Inconsistency is found in the naming of the diagram and Project Monitoring diagram found irrelevant to the title of the section. PP need to provide appropriate name and number to the all diagrams with the diagram itself.				
Project participant response				Date: 29/05/2023

1. Description of the actual measurement method has been provided in section 5.2 of the revised VCS PD.
2. Monitoring frequency has been provided in section 5.2 of the revised VCS PD.
3. Dairy farm register has now been provided to DOE.
4. As per methodology of AMS-III.D., PP has added this parameter into monitoring parameter.
5. Diagram name has been corrected in section 5.3 of the revised VCS PD. And appropriate name and number has been mentioned for all the diagrams.

Documentation provided by project participant

Change in the PD	Section (s): 5.2, 5.3	New Version No: 02
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	

VVB assessment

Date: 2/6/2023

1. PP has provided the description of the measurement methodology. Hence, CAR is closed.
2. PP has provided the frequency of monitoring. Hence, CAR is closed.
3. Dairy register of cows is provide which found to be in line with PD Version 2.0 and ER Sheet. Hence, CAR is closed.
4. As per methodology of AMS-III.D. Version 21.0, is the Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population. So, it can not be the monitoring parameter. The value of VSLT,y is fixed. PP need to remove the parameter from section 5.2 and need to mention it on section 5.1. Hence, CAR is not closed.
5. The diagram in section 5.3 is corrected and information is consistent with PD version 2.0. Hence, CAR is closed.

Project participant response

06/06/2023

4- Parameter of VSLT,y has been removed from section 5.2 and incorporated in section 5.1 of the revised VCS PD.

Documentation provided by project participant

Change in the PD	Section (s): 5.1	New Version No: 03
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 7/6/2023
PP has incorporated the VSLT,y parameter in section 5.2 of PD version 3.0 dated 6/6/2023. Hence, CAR is closed.		

CAR ID	10	Section no.	3.1	Date: 11/05/2023
Description of CAR				
During the audit it is found that the manure was handed aerobically only in form of composting which is aerobic condition not anerobic. As per section 3.4 of PD version 1 dated 13/3/2023, “animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere”. PP need to calrify the baseline seniario and make changes accordingly.				
Project participant response				Date: 29/05/2023
Before the project activity of biogas to power generation, they are treating cattle manure through the composting method under aerobic conditions. Also, section 3.4 has been updated of the revised VCS PD.				
Documentation provided by project participant				
Change in the PD	Section (s): 3.4			New Version No: 02
Change in the ER xls	Worksheet (s):			New Version No:
Other:	NA			
VVB assessment				Date: 2/6/2023
PP has corrected the section 3.4 and it is consistent with the baseline. Hence CAR is closed.				

CAR ID	11	Section no.		Date: 28/03/2023
Description of CAR				
In section 5.1 of PD Version 01, For parameters: D_{CH_4} , UF_b , MCF_j , $MS\%_{BL,j}$				
PP need to provide the data unit and Justification of choice of data or description of measurement methods and procedures applied at required places.				

Project participant response		Date: 29/05/2023
Documentation provided by project participant		
Change in the PD	Section (s):	New Version No:
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 2/6/2023
PP need to address the CAR raised during the verification process. Hence, CAR is not closed.		
Project participant response		06/06/2023
Data unit and Justification of choice of data or description of measurement methods and procedures has now been provided in section 5.1 of the revised VCS PD.		
Documentation provided by project participant		
Change in the PD	Section (s): 5.1	New Version No: 03
Change in the ER xls	Worksheet (s):	New Version No:
Other:	NA	
VVB assessment		Date: 7/6/2023
PP has provided response for data unit and justification of data or description of measurement methods and procedures in section 5.1 of PD version 2.0 dated 6/6/2023. Hence, CAR is closed.		

FAR from this validation

FAR ID	01	Section no.		Date: 11/5/2025
Description of FAR				
During verification, VVB need to check if there is capacity addition in the existing plant. If there is addition of capacity, Applicability conditions of AMS-III.D will not be satisfied.				
Project participant response				Date: DD/MM/YYYY

Documentation provided by project participant			
Change in the PD	Section (s):	New Version No:	
Change in the ER xls	Worksheet (s):	New Version No:	
Other:			
VVB assessment			Date: DD/MM/YYYY

APPENDIX 2: REFERENCE DOCUMENTS

Sr. No.	Author	Title	Reference
1	UNFCC	AMS-III.D.: Methane recovery in animal manure management systems Version 21.0	UNFCC Website
2	UNFCC	AMS-I.F. : Renewable electricity generation for captive use and mini-grid Version 05.0	UNFCC Website
3	UNFCC	Tool 7: Tool to calculate the emission factor for an electricity system Version 07.0	UNFCC Website
4	UNFCC	Tool 14: Project and leakage emissions from anaerobic digesters Version 02.0	UNFCC Website
5	UNFCC	Tool 16: Project and leakage emissions from biomass Version 05.0	UNFCC Website
6	VCS	VCS Verified Carbon Standard: VCS Program Guide	VERRA Website

		V4.3	
7	VCS	VCS Verified Carbon Standard: VCS Standard V4.4	VERRA Website
8	VCS	VCS Verified Carbon Standard: Validation and Verification Manual V3.2	VERRA Website
9	IPCC	IPCC Guidelines for National Greenhouse Gas Inventories [Volume 4: Agriculture, Forestry and Other Land Use]	IPCC Website
10	EKI Energy Services Limited	VCS PD version 4 dated 21/6/2023	Project Proponent
11	EKI Energy Services Limited	Emission Reduction Sheet	Project Proponent
12	EKI Energy Services Limited	ISO Certificate	Project Proponent
13	EKI Energy Services Limited	Certificate of Incorporation	Project Proponent
14	EKI Energy Services Limited	Agreement and Board Resolution	Project Proponent
15	EKI Energy Services Limited	Commissioning Certificate	Project Proponent
16	EKI Energy Services Limited	PAN Self Attested	Project Proponent
17	EKI Energy Services Limited	Detailed Project Report	Project Proponent
18	EKI Energy Services Limited	Layout	Project Proponent
19	EKI Energy Services Limited	Google Coordinates	Project Proponent
20	EKI Energy Services Limited	CA Certificates 2020 - 2021	Project Proponent
21	EKI Energy	CA Certificates 2021 - 2022	Project

	Services Limited		Proponent
22	EKI Energy Services Limited	LSC- Attendance sheet	Project Proponent
23	EKI Energy Services Limited	LSC- FAQ by Stakeholders	Project Proponent
24	EKI Energy Services Limited	LSC- Invitation Letter	Project Proponent
25	EKI Energy Services Limited	LSC- Minutes of Meeting	Project Proponent
26	EKI Energy Services Limited	Daily Farm Register	Project Proponent
27	EKI Energy Services Limited	Bhagyalaxmi Dairy Cow Data	Project Proponent
28	EKI Energy Services Limited	Detailed Project Report	Project Proponent
29	EKI Energy Services Limited	Daily Work Report	Project Proponent
30	EKI Energy Services Limited	Diesel Records of DG Set	Project Proponent
31	EKI Energy Services Limited	Grievance Mechanism Records	Project Proponent
32	EKI Energy Services Limited	PO of Bhagyalaxmi Biogas	Project Proponent
33	EKI Energy Services Limited	Purchase orders	Project Proponent
34	EKI Energy Services Limited	Weight register of cows	Project Proponent