BIOGAS BASED POULTRY WASTE MANAGEMENT PROJECT AT SIDDIPET DISTRICT, TELANGANA STATE, INDIA

Document Prepared by
Sow and Reap Agro Private Limited

Project Title	Biogas based Poultry Waste Management Project at Siddipet District, Telangana State, India
Version	01
Date of Issue	04- October- 2023
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity is a biogas-based electricity generation project. The project involves methane recovery through controlled anaerobic digestion of poultry waste and utilization of recovered biogas to produce electricity. The project involves installation of two centralized anaerobic bio-digesters having capacities of 1500m^3/day each, at the existing two poultry firms of the project owner with a total capacity of 3000 m^3/day and utilization of one number of 100 KVA and one number of 250 kVA capacity biogas based electrical engines for each biogas unit. On an average each poultry farm produces about 18 MT of poultry manure per day with total of 36 MT from two poultry firms. The electricity generated from the project is utilized for the captive use in the poultry farms. The project activity is being implemented in phased manner where the first 1500m^3 biogas unit is installed in phase I and second 1500 m^3 biogas unit is installed in phase II. The project is owned and operated by Sunmax Hatcheries Private Limited company. The project is located in DasarlaPalli Village in Siddipet district of Telangana State, India.

Scenario existing prior to the implementation of project activity

Prior to the implementation of the project activity, the poultry manure waste utilized by the project activity is left to decay in open pits, tanks or anaerobic lagoons at the poultry farms, where the manure undergoes fermentation and release methane, that is emitted to the atmosphere directly without any methane recovery and destruction facility.

For electricity component, prior to the implementation of the project activity, the electricity supply for the poultry farm was generated mainly from grid connected power plants.

The project activity helps to avoid methane emissions from open pits, tanks or anaerobic lagoons in the absence of the project activity and generate renewable electricity, which displaced part of the electricity otherwise supplied by grid connected power plants. The expected CO_2 emission reduction from the project activity is 83,401 tCO_2e in total over the first 7 years renewable crediting period.

1.2 Sectoral Scope and Project Type

The types/categories of the project are classified as follow:

Waste treatment component:

Type III:	Other project activities
Sectoral Scope 13:	Waste handling and disposal

Switch of fossil fuel component:

Type I:	Renewable energy projects

Sectoral Scope 1: Energy industries (renewable/non-renewable sources)

This is not a grouped project and there are no other project participants.

1.3 Project Eligibility

The project activity results in GHG emission reductions included in six Kyoto Protocol greenhouse gases, which are listed under the scope of the VCS Program according to VCS Standard version 4.5.[1].

The scope of VCS programme includes

The Seven Kyoto Protocol Greenhouse gases	The project is expected to avoid two greenhouse gases[2]: i. Methane (CH_4) emissions from the anaerobic animal manure management system in the baseline scenario, which will be recovered and utilised in the project scenario. ii. CO_2 emissions from the production of equivalent amount of electricity replaced by the project that would otherwise have been produced by conventional fuel-sourced power plants. Thus, the project is applicable to this scope.
Ozone-depleting substances (ODS)	Not applicable, CH_4 and CO_2 are not Ozone-depleting substances.
Project activities supported by a methodology approved under the VCS Program through the methodology development and review process.	Not applicable
Project activities supported by a methodology approved under an approved GHG program, unless explicitly exclude.	The applied methodology AMS-III.D. ver. 21.0 – "Methane Recovery in animal manure management systems" and AMS-I.F. ver. 05.0- "Renewable electricity generation for captive use and mini-grid" are approved under CDM Program, which is a VCS approved GHG program.
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the	Not applicable

[1] https://verra.org/wp-content/uploads/2023/08/VCS-Standard-v4.5.pdf

[2] https://unfccc.int/sites/default/files/08_unfccc_kp_ref_manual.pdf

VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	

The project uses AMS-III.D. ver. 21.0 – "Methane Recovery in animal manure management systems" and AMS-I.F. ver. 05.0- "Renewable electricity generation for captive use and mini-grid". The methodology AMS-III.D. applies to project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane and the methodology AMS-I.F. applies to project activities that use renewable energy technologies to produce electricity thereby displacing fossil fuel use. Since AMS-III.D and AMS-I.F. are approved methodology under an approved GHG program, the project is eligible under the scope of the VCS Program according to VCS Standard.

Furthermore, the project activity is not included in any of the excluded project activities, those are listed under the Table 1 of VCS Standard version 4.5[3].

Hence the project activity is eligible to register under the VCS program standard version 4.5.

1.4 Project Design

☒ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☐ The project is a grouped project

Eligibility Criteria

This is single location project and not a grouped project.

1.5 Project Proponent

Organization name	Sunmax Hatcheries Private Limited
Contact person	Mr. K. Anup Kumar Reddy
Title	Director
Address	H.no-37/18/24/1, plot no-28, Defence colony, DasarlaPalli Village, Mulugu Mandal, Siddipet District.
Telephone	+91- 9885291800

[3] https://verra.org/wp-content/uploads/2023/08/VCS-Standard-v4.5.pdf

Email	Info@deccanagrofarm.com

1.6 Other Entities Involved in the Project

Organization name	Sow and Reap Agro Pvt. Ltd.
Role in the project	Authorized Representative
Contact person	Mr. Suraj Teja
Title	Director
Address	Plot No. 159/A (Part), MLA Colony Banjara Hills, Road No. 12, Hyderabad, Telangana- 500034
Telephone	+91- 8500030747
Email	suraj@sowandreap.in

1.7 Ownership

Sunmax Hatcheries Private Limited company is the legal project owner of this project activity who possess all relevant licenses and regulations required for the establishment of biogas project. The approval of Consent to Establish (CTE) by the State Pollution Control Board (SPCB) is the evidence for legislative rights to establish the project activity. Besides, the equipment purchasing contract and the construction contracts are the evidence for the ownership of the plant and equipment.

1.8 Project Start Date

The start date of the project activity is the commercial operation date, which is the date when the project began generating GHG emission reductions. The project is commissioned in phased manner, where the commissioning date of the of first biogas unit is on 28th January 2022 which is considered as the start date of the project activity. The second biogas unit of 1500m^3 is expected to be commissioned on 16th October 2023.

1.9 Project Crediting Period

The VCS Standard 4.5[4] states that the project crediting period for non-AFOLU projects shall be either seven years, twice renewable for a total of 21 years, or ten years fixed. Since this project is a non-AFOLU project, the renewable crediting period of 7 years, twice renewable for a total of 21 years is chosen by the Project Proponents (PPs).

[4] https://verra.org/wp-content/uploads/2023/08/VCS-Standard-v4.5.pdf

The first crediting period starts on 28.01.2022 and ends on 27.01.2029.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☒ <20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☐ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	Yes
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
28-01-2022 to 27-01-2023	6,790
28-01-2023 to 27-01-2024	8,707
28-01-2024 to 27-01-2025	13,581
28-01-2025 to 27-01-2026	13,581
28-01-2026 to 27-01-2027	13,581
28-01-2027 to 27-01-2028	13,581
28-01-2028 to 27-01-2029	13,581
Total estimated ERs	**83,401**
Total number of crediting years	**7 years**
Average annual ERs	**11,914**

1.11 Description of the Project Activity

The project activity is a centralized anaerobic manure treatment plant installed to recover methane from decomposition of poultry waste. The total capacity of the project is installed in phased manner, where first unit of 1500m^3 is commissioned in phase I and the second unit is

expected to be commissioned on 16th October 2023. The project involves operation of two anaerobic bio-digestors of capacity 1500m³/day each with a total capacity of 3000m³/day. The plant will treat about 36 MT of manure generated from the poultry farm. The recovered biogas will be treated and used for electricity generation. Electricity will be generated through one number of 100 KVA and one number of 250 kVA capacity biogas based electrical engines for each biogas unit.

The project activity will consist the following components: manure collection tank, sedimentation tank, biogas digestor, liquid storage tank, solid storage tank, biogas balloon, separator, biogas generator system, and desulphurization system. The main components of the project activity are detailed below:

Manure collection tank

The waste generated from the poultry sheds will be collected and processed in the manure collection tank. The poultry farm has six sheds. Each poultry shed house has 70,000 birds (total of 4,20,000 birds for 6 sheds), which results in the production of 6 tonnes of organic waste each day from each poultry shed (a total of 36 tonnes per six poultry sheds). This organic waste is collected using PVC pipes and conveyor belts. During the collection of this organic waste, there is meticulous manual monitoring in place to ensure that any volatile faecal matter is not reduced. One of the three tanks is reserved for the agitation process (stirring the slurry). During the agitation procedure, we remove ammonia as a component of the organic mixture by making use of centrifugal force.

Sedimentation tank

The manure from collection tank is subjected to sedimentation tank, where suspended particles in the mixture is allowed to settle down by the use of gravity, which then separates sand and other features from the input slurry. The clean slurry is allowed to enter the subsequent compartment by means of gravity. The sedimentation tank is made up of metal and has a diameter of 3m and a height of 5.5m.

Anaerobic Biodigester

The slurry mix is then subjected to the anaerobic digestor, where controlled digestion process takes place in two stages. The acid forming bacteria converts soluble organic compounds into volatile acids. Then, the methane forming bacteria convert the volatile acids into biogas, that is composed of about 50-60% methane, 40-48% carbon dioxide, and trace amounts of water vapor, hydrogen sulphide, and ammonia. Two numbers of anaerobic digesters having storage capacity of 1500 m³ is used for manure treatment.

The finished product of the biogas digestor can be broken down into three distinct categories: solid or dry waste, liquid matter, and biogas with the help of separator.

Separator

The residual material left after the digestion process is composed of liquid and solid portions known as digestate. The fermentation process output will be separated in a 5-kW separator with a 7.5HP capacity that operates on the principle of a squeezing screw filter. The separator will have the capability of separating 40 percent of the fermented solids and 60 percent of the fermented liquids.

Biogas Balloon

About 65% of raw biogas is methane, 35% is carbon dioxide, 5% is water, and various other inert gases. The biogas that is generated at the plant is collected in the biogas balloon. The biogas balloons are constructed to be resistant to the tremendous pressure that is generated by the collected biogas and to prevent any leaks from occurring.

Desulphurisation Unit

During the digestion process, sulphur-containing compounds are produced, which can give biogas a foul odour and make it corrosive to certain materials. The desulfurization unit is used to remove these sulphur compounds from biogas, making it more suitable for use as a fuel.

Biogas Engine

The collected biogas is used to generate electricity with the use of biogas engines. Biogas engines are similar to traditional internal combustion engines in that they convert the energy stored in a fuel into mechanical energy through the process of combustion. However, they are designed specifically to run on biogas, which has a different composition and characteristics than other fuels such as gasoline or diesel. The biogas engine is typically connected to the biogas production facility via a pipe, and it is controlled by a system of valves and sensors that regulate the flow of biogas and ensure optimal performance.

The process flow diagram of the manure management system is given below in figure 1.

Figure 1: Process Flow Diagram

1.12 Project Location

The project activity is located DasarlaPalli Village of Siddipet District in Telangana state, India. The geographical coordinates are 17°41'43.3"N 78°34'15.1"E. The location map is given below.

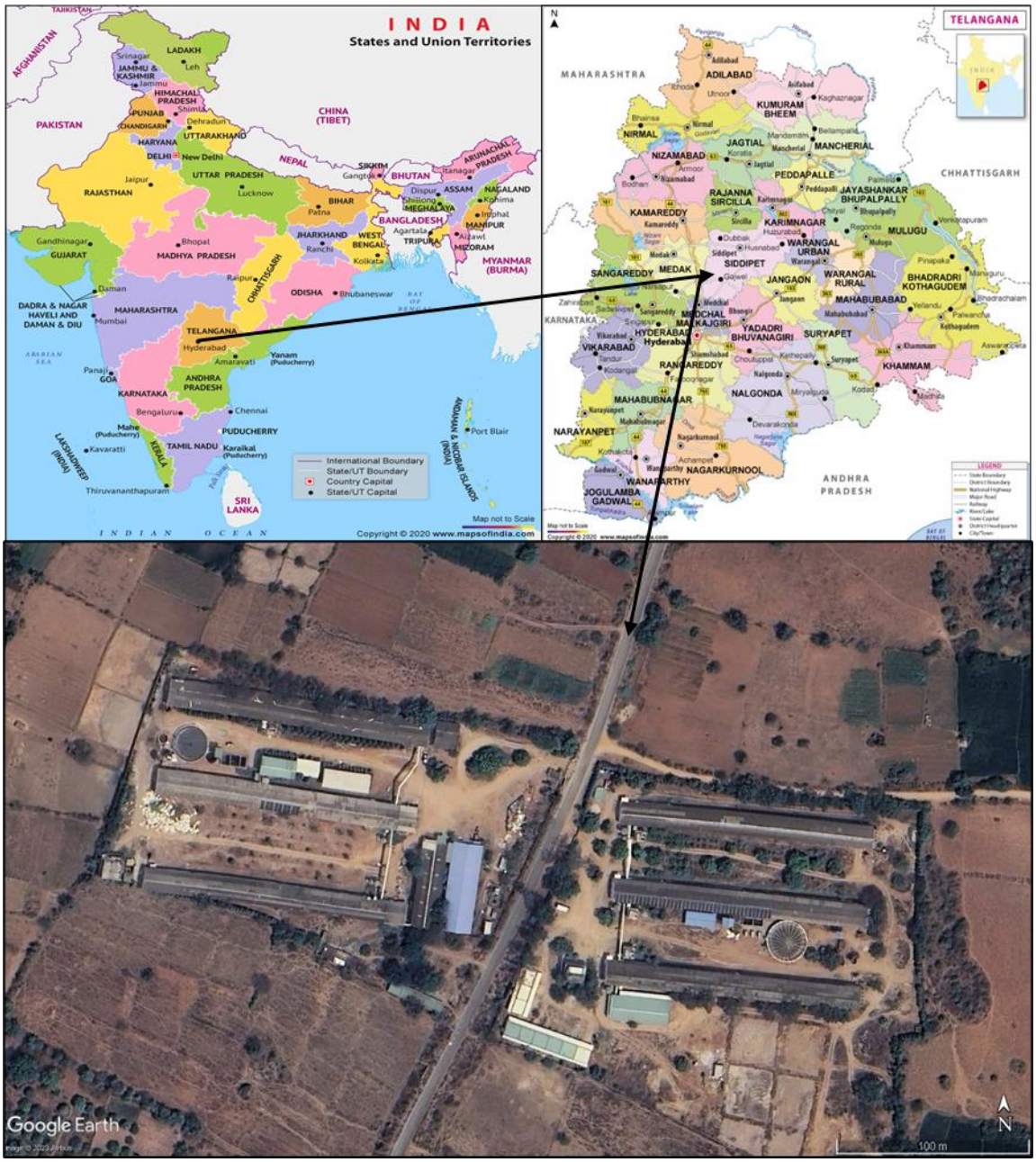

Figure 2: Location of the project activity

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is:

Animal Manure:

In the absence of the project activity, manure generated from the poultry farm were left to decay in pits and storage tanks in aerobic conditions, where, the greenhouse gases (GHG) generated from animal manure were released directly into atmosphere.

Electricity Generation:

In the absence of the project activity, the electricity supply for poultry farm was generated mainly from grid connected power plants, where the use of fossil fuel would also lead to GHG emissions.

The baseline scenario is the same as the scenario existing prior to the start of the implementation of the project activity. Please refer to Section 3.4 (Baseline Scenario) for details.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment, Forest & Climate Change (MOEF&CC), Government of India (As per MOEF&CC Notification No. - S.O. 1533, dated 14th September 2006[5]). In addition to that, all applicable laws and regulations in India were complied with.

The Consent to Establish (CTE) and Consent to Operate (CTO) are obtained from the state Pollution Control Board under Air (Prevention and Control of Pollution Act, 1981[6] and Water (Prevention and Control of Pollution) Act 1974[7].

The project activity is in compliance with all relevant statutory and regulatory laws applicable in the host country.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity is neither registered nor applied for registration in other GHG or Non GHG program(s) to obtain the certified GHG emission reductions. Project proponent is here by declaring that the emission reductions claimed under this project activity will not be double counted under any other GHG program.

1.15.2 Projects Rejected by Other GHG Programs

The project activity is neither registered nor rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

[5] https://environmentclearance.nic.in/writereaddata/EIA_Notifications/1_SO1533E_14092006.pdf

[6] https://cpcb.nic.in/displaypdf.php?id=aG9tZS9haXItcG9sbHV0aW9uL0dTUi02RS5wZGY=

[7] https://maitri.mahaonline.gov.in/pdf/The_Water_Prevention_and_Control_of_Pollution_Act_1974.pdf

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

If yes, provide the name of the emissions trading program or other mechanism that allows GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

If yes, provide the name of the other program(s) under which the project has sought or received another form of GHG-related credit.

Supply Chain (Scope 3) Emissions

Have the owner(s) or retailer(s) of the impacted goods and services[8] posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with [organization name(s)] [name of good or service]" since the project's start date?

☐ Yes ☒ No

Has the project proponent posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with [name of good or service][describe the region or location, including organization name(s), where practicable]."

☐ Yes ☒ No

Have the producer(s) or retailer(s) of the impacted good or service been notified of the project and the potential risk of Scope 3 emissions double claiming via email?

☐ Yes ☒ No

As per the Corporate Value Chain (Scope 3) Accounting and Reporting Standard[9], the project activity does not involve any direct impact emissions associated with good or services. The project activity is not related with scope 3 emissions. Hence this section is not applicable to the project activity.

[8] Impacted goods and services are all goods and services directly impacted by the technologies and measures specified as project activities in the project description. Please see the VCS Program document *VCS Program Definitions* for additional information.

[9] https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

1.17 Sustainable Development Contributions

The project contributes to six of the UN Sustainable Development Goals (SDGs)

- **SDG 3: Good health and Well-being-** The project helps in reduction of health hazards by sustainable and non-human interface-based poultry waste treatment and operations.

- **SDG 7 Affordable & Clean Energy-** The project activity contributes to generating electricity from renewable sources, that helps in country energy security, reduces the GHG emissions and encourages clean, renewable and efficient technologies.

- **SDG 8 Decent Work & Economic Growth-** The project is a clean technology investment in the region, which would not have taken place in the absence of the VCS benefits. In addition, the project activity will generate permanent and temporary employment opportunity within the vicinity of the project. This directly and indirectly positively effects the economy of nearby populace.

- **SDG 12 Responsible Consumption and Production-** The project will also contribute towards achieving sustainable waste management. The project activity produces improved quality of digestated manure compared to manure and the reduces odour emissions.

- **SDG 13 Climate Action-** Reduction of 83,401 tCO_2 eq. greenhouse gas (GHG) throughout the crediting period by fossil fuel replacement and avoiding dumping of poultry waste in pits/lagoons.

- **SDG 15 Life on Land-** The project makes significant efforts in enhancing the biodiversity by tree plantations in the poultry farm and prevention of pollution through sustainable poultry manure waste management.

1.18 Additional Information Relevant to the Project

Leakage Management

Leakage emissions are considered as per the applicable tool 14.

Commercially Sensitive Information

Not applicable.

Further Information

Not applicable.

2 SAFEGUARDS

2.1 No Net Harm

The project activity is methane recovery from anaerobic digestion of poultry waste and production of biogas, which is utilised for electricity generation. This is a green technology which replaces the electricity generated from conventional grid connected power plants and results in greenhouse gas emission reduction. The project activity contributes to a significant higher ecological sustainability by using biogas plants.

Hence, the project has no negative environmental and socio-economic impacts and contributes positively by providing environment friendly power generation leading to sustainable development of the region.

2.2 Local Stakeholder Consultation

The scope of Local Stakeholder Consultation (LSC) meeting is to provide an opportunity to engage stakeholders in a meaningful manner at an early stage of the project activity which helps them to understand the project, participate in decision-making and exchange views and/or concerns regarding the project impacts and opportunities. This also enables or helps the project owner to identify, avoid and minimize adverse impacts and establish ongoing communications with relevant stakeholders during the lifetime of the project activity.

Since the local communities are the predominant stakeholders for the meeting, sending individual invitations is not a possible option. So, the local people were invited through the public notice which is more appropriate. The demographic information of the participants was received during the registration for the meeting

The Local stakeholder consultation was conducted on 20.06.2023 at the project site. The LSC meeting was arranged by considering the VCS rules and requirements.

Minutes of the Meeting

The project representative welcomed all the panel members and provided the technical description of the biogas-based poultry waste management project including environmental, social and economic impacts on the local community. He described the operational flow of the project activity starting from the waste collection, pre-treatment of waste, anaerobic digestion process, residue management, environmental compliance and concluded with the sustainability views of the project activity. Further, he explained the role of this poultry waste management project over the years in addressing community development and livelihood issues and its contribution towards promoting sustainable development by linking local priorities to global challenges.

He explained how the biogas plants were contributing to the global warming and provided a comparison between baseline scenario and the project scenario to the stakeholders, where it was shown how the biogas recovery is beneficial for the environment. Further, he briefed the stakeholders about the precautionary and safety measures to be kept in mind while working or visiting the plant. He explained the benefits of project and its contribution to poultry waste management and climate mitigation. Further, he briefed the stakeholders about the UN Sustainable Development Goals and how this project was contributing towards the UN SDGs.

The feedback questionnaire was distributed to the stakeholders to collect the comments and concerns about the project activity. The following questions were asked in the questionnaire.

- Are you aware of this project activity?
- Does the construction and operation of the project provide the contribution to local employment?
- Does the project activity generate any kind of hazardous waste affecting the local premises?
- Does the project construction impact the quality of soil or soil erosion?
- Does the project construction impact the quality and quantity of ground water?
- Does the project construction and operation cause air pollution?
- Does the project operation cause noise pollution?
- Does the project construction have any negative impact on local population or animal or plant species?
- Does the project developer contribute any social development activities to the local community?
- Are you aware of the carbon credit program and carbon revenue?
- What do you like about the project?
- What do you don't like about the project?

This was followed by questions and experience sharing from the participating stakeholders. After listening to all the stakeholder comments, suggestions and answering their queries successfully, the meeting reached a closure and thanked everyone for being part of the stakeholder consultation meeting and requested everyone to keep up the momentum towards tackling climate change.

There were no concerns raised by the local stakeholders. The potential benefits of the project activity for the local stakeholders were acknowledged.

No negative comments have been received on project activity from any of the local stakeholders consulted. As all comments were very positive about the project, no further action is required. There were no further comments raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The photographs and attendance sheet of the LSC meeting is provided in the Appendix.

2.3 Environmental Impact

The project activity is poultry waste treatment to energy generation, which is free from any kind of anthropogenic emission. The project activity does not have any negative environmental impacts.

2.4 Public Comments

As per section 3.18.6 of the VCS Standard, Version 4.5, all 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. This project will be open for public comment on the verra website. The project shall be listed, and comments shall be incorporated later.

2.5 AFOLU-Specific Safeguards

This is a Non AFOLU project activity hence this is not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project uses two approved CDM small-scale methodologies

Type III, Other project activities:

AMS III.D "Methane recovery in animal manure management systems", Version 21.0

Type I, Renewable Energy Projects:

AMS I.F, "Renewable electricity generation for captive use and mini-grid", Version 05.0

The methodologies also refer to the latest approved version of the following tools:

- Tool 07- Tool to calculate the emission factor for an electricity system, Version 07.0[10]
- Tool 14- Project and leakage emissions from anaerobic digesters, Version 2[11]

3.2 Applicability of Methodology

[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf

Project Proponent has used CDM small scale methodology AMS III.D, version 21.0. and AMS I.F, version 05.0. The applicability criteria of the applied methodology are demonstrated below.

Title: Methane recovery in animal manure management systems Reference of methodology applied: AMS-III.D. ver. 21.0		
S. No	**Applicability conditions**	**Project Eligibility**
1	The methodology AMS-III.D. covers project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane. It also covers treatment of manure collected from several farms in a centralized plant.	The project activity is methane recovery from anaerobic digestion of poultry waste generated from the poultry farm and production of biogas in a centralised plant. Hence the methodology is applicable for the project activity.
2	This methodology is only applicable under the following conditions: a) The livestock population in the farm is managed under confined conditions;	All the livestock population in the farms within the project boundary is managed under the confined sheds dedicated for the livestock.
	b) Manure or the streams obtained after treatment is not discharged into natural water resources (e.g., river or estuaries), otherwise “AMS-III.H Methane recovery in wastewater treatment" shall be applied;	The bio-residual discharged from the digester will be handed to the farmers. Hence, project proponent ensures that the manure or streams obtained after treatment will not be discharged into natural water resources (e.g., river or estuaries).
	c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The project activity is located in Siddipet district of Telangana State. The annual average temperature of the project site is 29°C, which 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 retention time of manure waste is greater than one month.
	e) No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	In the baseline scenario, the manure generated in the poultry farms are left to decay in pits and storage tanks in aerobic

		conditions. Hence no methane recovery takes place in the baseline scenario.
3	The project activity shall satisfy the following conditions: 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;	The residual waste from the poultry manure management system will be handed to the farmers and will be 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;	The project proponent will utilise the recovered biogas for electricity generation. Electricity meters will be installed with the biogas engines to monitor the utilisation of biogas to produce electricity. Therefore, the project proponent ensures that all the biogas produced by the digester is used.
	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.	The storage time of the manure after removal from the poultry farm will not exceed 45 days before being fed into the anaerobic digester.
4	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	The project does not involve landfill methane recovery, wastewater treatment, composting animal manure, co-digestion of animal manure and other organic matters. Therefore, the criterion is not applicable.

	manure and other organic matters shall use the methodology "AMS-III.AO Methane recovery through controlled anaerobic digestion".	
5	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.	The recovered biogas will be used for electricity generation by using biogas engines. Hence as per para 6 in AMS-III.H, the methodology AMS- I.F "Renewable electricity generation for captive use and mini-grid" is applied to the project activity. The recovered biogas is not used to power any auxiliary equipment of the project activity; hence the criterion is not applicable.
6	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".	This is a greenfield project. The average emission reductions from the project activity are 11,914 tCO_2e/yr, which is less than the threshold of 60,000 tCO_2e/yr. Hence, the Project is in line with "General Guidelines to SSC CDM methodologies".
7	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".	This is a greenfield project. Hence the criterion is not applicable.
8	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.	The average generation of the project emission reductions is estimated as 11,914 tCO_2e/y, which is lower than the threshold of 60,000 tCO_2e/y.
Title: Renewable electricity generation for captive use and mini-grid **Reference of methodology applied: AMS-I.F. ver. 05.0**		
1	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)	The project is a greenfield biogas-based electricity generation project. Therefore, it confirms to the said criteria.

<table>
<tr><td></td><td colspan="4">existing plant(s); or (d) Involve a replacement of (an) existing plant(s).</td><td></td></tr>
<tr><td>2</td><td colspan="4"><table>
<tr><td>Project Type</td><td>AMS I.A.</td><td>AMS I.D.</td><td>AMS I.F.</td></tr>
<tr><td>Project supplies electricity to a national/regional grid</td><td></td><td>✓</td><td></td></tr>
<tr><td>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)</td><td></td><td></td><td>✓</td></tr>
<tr><td>Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td>✓</td><td></td></tr>
<tr><td>Project supplies electricity to a mini grid[12] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel</td><td></td><td></td><td>✓</td></tr>
<tr><td>Project supplies electricity to household users (included in the project boundary) located in off grid areas</td><td></td><td>✓</td><td></td></tr>
</table></td><td>The project activity displaces grid electricity consumption by the captive poultry farm within the project boundary which would have been otherwise being consumed in the baseline scenario.
Hence this condition is complied.</td></tr>
</table>

[12] The sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW.

3	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.	The project activity is installation of new biogas-based electricity generation project. Therefore, the said criterion is not applicable.
4	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.	The project activity is installation of new biogas-based electricity generation project. Therefore, the said criterion is not applicable.
5	If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility 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.	The project activity is installation of new biogas-based electricity generation project. Therefore, the said criterion is not applicable.
6	Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is installation of new biogas-based electricity generation project. Therefore, the said criterion is not applicable.
7	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) 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,	The project activity is installation of new biogas-based electricity generation project. Therefore, the said criterion is not applicable.

	as per definitions given in the project emissions section, is greater than 4 W/m^2;	
8	If electricity and/or steam/heat produced by the project 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.	The electricity generated from the project activity is consumed for its own in the hatcheries located within the project boundary. Since the project owner for the hatcheries and the biogas plant is same, no separate contract is required for electricity supply component Hence this condition is not applicable.
9	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.	The project activity is methane recovery from anaerobic digestion of poultry waste generated from the poultry farm and production of biogas in a centralised plant. The project activity does not use biomass. Hence this condition is not applicable.

Project Proponent has used CDM methodological tool 07 and 14. The applicability criteria of the applied tools are demonstrated below.

Title: Tool to calculate the emission factor for an electricity system Tool 07, Version 07.0		
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).	The project activity is a greenfield waste to energy generation plant and hence, according to the applied methodology, the baseline scenario is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in "TOOL07: Tool to calculate the emission factor for an electricity system".
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	Since the project activity is grid connected biogas-based electricity generation project this condition is applicable.

	power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e., option II a and option IIb. If option II a is chosen, the conditions specified in "Appendix 1: 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 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.	Combined margin grid emission factor has been calculated as per the CO_2 emission factor data base published by the CEA in which for the calculation of emission factor CEA have only considered grid connected plants.
Title: Project and leakage emissions from anaerobic digesters **Tool 14, Version 02.0**		
1	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.	The project activity involves the following project emissions (a) CO_2 emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) 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)
2	The following sources of leakage emissions are accounted for in this tool:	The digestate will be handed to the farmers immediately after treatment and therefore it is not subjected to

	(a) CH_4 and N_2O 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.	anaerobic storage. Hence no leakage emissions from the project activity are accounted.
3	Emission sources associated with N_2O emissions from physical leakages from the digester, transportation of feed material 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.	There is no N_2O emissions associated with the project activity. Hence this condition is not applicable.

3.3 Project Boundary

The project boundary defined as per the applied methodologies are:

(i) According to paragraph 14 of AMS-III.D, version 21.0

The project boundary includes the physical, geographical site(s) of:

a) The livestock;
b) Animal manure management systems (including centralised manure treatment plant where applicable);
c) Facilities which recover and flare/combust or use methane.

(ii) According to paragraph 18 of AMS-I. F, version 05.0

The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g., residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system as per the requirements provided in TOOL07 to which the project power plant is connected.

In addition, the diagram demonstrating the project scenario is given below.

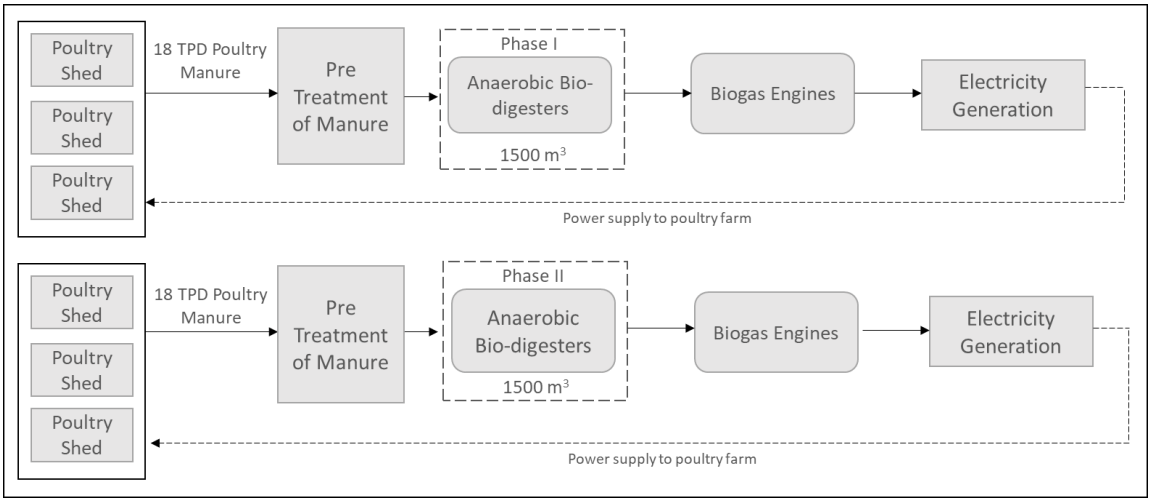

Figure: Project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Direct emissions from manure treatment processes	CO_2	No	Excluded
		CH_4	Yes	The major source of emissions in the baseline.
		N_2O	No	Excluded
		Other	-	-
	Emissions from Grid Connected Electricity generation	CO_2	Yes	The major source of emissions in the baseline.
		CH_4	No	Excluded
		N_2O	No	Excluded
		Other	-	
Project	Physical leakage of biogas	CO_2	No	Excluded
		CH_4	Yes	The source of emissions in the project activity.
		N_2O	No	Excluded
		Other	-	-
	Auxiliary electricity consumption	CO_2	Yes	The source of emissions in the project activity.
		CH_4	No	Excluded
		N_2O	No	Excluded
		Other	-	-
	Project Emission from manure	CO_2	No	Excluded
		CH_4	Yes	The source of emissions in the project activity.

Source		Gas	Included?	Justification/Explanation
	management system	N_2O	No	Excluded
		Other	-	-

3.4 Baseline Scenario

The baseline study was conducted using relevant methodology AMS-III.D, Version 21.0 and AMS-I. F, Version 05.0 as shown below:

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 anaerobically within the project boundary and methane is emitted to the atmosphere.

Prior to the implementation of the project activity, the poultry manure waste utilized by the project activity is left to decay in open pits, tanks or anaerobic lagoons at the poultry farms, where the manure undergoes fermentation and release methane, that is emitted to the atmosphere directly without any methane recovery and destruction facility.

The methodology AMS- I.F, has been followed along with the "Tool 07: Tool to calculate the emission factor for an electricity system, version 7.0" are used to establish the baseline scenario.

As per the paragraph 20 of the methodology "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".

The project activity involved setting up of a Biogas based power generation plant to supply and displace the electricity which would have been otherwise consumed from the national grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian electricity grid, which is fed mainly by fossil fuel fired plants.

Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

3.5 Additionality

As per para. 3.14.2 of VCS Standard 4.5, it is stated that additionality shall be demonstrated and assessed in accordance with the requirements set out in the methodology applied to the project.

As per para 15 of AMS.III.D, ver. 21.0, it is stated that "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".

In reference to the above-mentioned point, there are no legal regulations in the host country, that requires the collection and destruction of methane from livestock manure. Hence, it is not required to apply the "Guidelines on the demonstration of additionality of small-scale project activities".

In addition, as per para 16 of AMS.III.D, ver. 21.0, it is stated that "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".

The project activity is a greenfield project that involves methane recovery from poultry manure and utilisation of the same to produce electricity. Project proponent has applied the Type 1 methodology AMS I.F for the electricity generation component. Total installed capacity of the electrical energy component is 0.7 MW which is less than 5 MW.

Type of source	Installed capacity (Electrical) MW
Electrical generation	250 kVA (~ 0.500 MW) 100 kVA ((~ 0.200 MW)
Total	**0.7 MW**

Hence as per the above-mentioned condition, it is not required to apply the "Guidelines on the demonstration of additionality of small-scale project activities" to the Type I component of the project activity which is electricity generation.

Therefore, the project activity is deemed automatically additional, in line with the applied methodology AMS.III.D, ver. 21.0.

3.6 Methodology Deviations

There are no deviations in the applied methodology.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline Emissions from Manure Management

As per AMS-III.D, the baseline emissions are calculated by using one of the following two options:

(a) Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 approach (please refer to the chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure (Bo);

(b) Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (SVS) content.

The project applies option (b) to calculate baseline emissions from the manure treatment processes.

As per para. 19 of AMS.III.D, ver. 21.0, the baseline emissions are determined as follows:

$$\mathrm{BE_y} = \mathrm{GWP_{CH4}} \times \mathrm{D_{CH4}} \times \mathrm{UF_b} \times \sum_{\mathrm{j,LT}} \mathrm{MCF_j} \times \mathrm{B_{0,LT}} \times \mathrm{Q_{manure,j,LT,y}} \times \mathrm{SVS_{j,LT,y}}$$

where,

BE_y = Baseline emissions in year y (t CO_2e)

GWP_{CH4} = Global Warming Potential (GWP) of CH_4 applicable to the crediting period (t CO_2e/t CH_4)

D_{CH4} = CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)

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

$Q_{manure,j,LT,y}$ = Quantity of manure treated from livestock type LT and animal manure management system j (tonnes/year, dry basis)

$B_{0,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg-dm)

$SVS_{LT,y}$ = Specific volatile solids contents of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis)

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

Baseline Emissions from Electricity Generation

As per para 20 of AMS-I. F, ver. 5.0, the baseline emissions are calculated by using the following equation:

$$BE_y = EG_{BL,y} \times EF_{CO2.y}$$

BE_y = Baseline emissions in year y (t CO_2)

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

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

4.2 Project Emissions

Project Emissions from Manure Management

As per para 20 of AMS- III. D, ver. 21.0, the project activity emissions consist of

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

PE_y = Project emissions in year y (t CO2e)

$PE_{PL,y}$ = Emissions due to physical leakage of biogas in year y (t CO2e)

$PE_{flare,y}$ = Emissions from flaring or combustion of the biogas stream in the year y (t CO2e)

$PE_{power,y}$ = Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (t CO2e)

$PE_{transp,y}$ = Emissions from incremental transportation in the year y (t CO2e), as per relevant paragraph in AMS-III.AO

$PE_{storage,y}$ = Emissions from the storage of manure (t CO2e)

Project Emissions from Physical Leakage from Animal Waste Management System

As per para. 21(b) of AMS.III.D, ver. 21.0, the project emissions from physical leakage are determined as follows:

$$\mathrm{PE_{PL,y}} = 0.10 \times \mathrm{GWP_{CH4}} \times \mathrm{D_{CH4}} \times \sum_{\mathrm{i,LT}} \mathrm{B_{0,LT}} \times \mathrm{Q_{manure,LT,y}} \times \mathrm{SVS_{LT,y}} \times \mathrm{MS\%_{i,y}}$$

GWP_{CH4} = Global Warming Potential (GWP) of CH_4 applicable to the crediting period (t CO_2e/t CH_4)

D_{CH4} = CH_4 density (0.00067 t/m^3 at room temperature (20 °C) and 1 atm pressure)

$B_{0,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg-dm)

$Q_{manure,j,LT,y}$ = Quantity of manure treated from livestock type LT and animal manure management system j (tonnes/year, dry basis)

$SVS_{LT,y}$ = Specific volatile solids contents of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis)

$MS\%_{i,y}$ = Fraction of manure handled in system i in year y

Project Emissions from Anaerobic Digestor

As per tool 14, ver. 02.0, the project emissions associated with the anaerobic digester is determined as follows.

$$PE_{AD,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{Flare,y}$$

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

$PE_{EC,y}$ = Project emissions from electricity consumption associated with the anaerobic digester in year y (t CO2e)

$PE_{EC,y}$ = Project emissions from fossil fuel consumption associated with the anaerobic digester in year y (t CO2e)

$PE_{CH4,y}$ = Project emissions of methane from the anaerobic digester in year y (t CO2e)

$PE_{Flare,y}$ = Project emissions from flaring of biogas in year y (t CO2e)

Project Emissions from Physical Leakage from Anaerobic Digestor

As per para 23 of tool 14, ver.02.0, the project emissions of methane from the anaerobic digestor include 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. The emissions are calculated as follows:

$$\mathrm{PE_{CH4,y}} = \mathrm{Q_{CH4,y}} \times \mathrm{EF_{CH4,default}} \times \mathrm{GWP_{CH4}}$$

Where,

$PE_{CH4,y}$ = Project emissions of methane from the anaerobic digester in year y (t CO_2e)

$Q_{CH4,y}$ = Quantity of methane produced in the anaerobic digester in year y (t CH_4)

$EF_{CH4,default}$ = Default emission factor for the fraction of CH4 produced that leak from the anaerobic digester (fraction)

GWP_{CH4} = Global Warming Potential (GWP) of CH_4 applicable to the crediting period (t CO_2e/t CH_4)

Project Emissions from Electricity Consumption

As per para 21 of tool 14, ver. 02.0, the project emissions electricity consumption associated with the anaerobic digester are calculated as follows:

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

Where,

$PE_{EC,y}$ = Project emissions from electricity consumption associated with the anaerobic digester in year y (t CO2)

$Q_{CH4,y}$ = Quantity of methane produced in the anaerobic digester in year y (t CH_4)

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

$EF_{CH4,default}$ = Default emission factor for the electricity consumed in year y (t CO2 / MWh)

4.3 Leakage

As per the applied methodology AMS III.D, ver. 21.0, leakage is determined by following the relevant procedure in the methodological tool 14, ver. 02.0 "Project and leakage emissions from anaerobic digesters". The tool accounts for leakage emissions associated with storage and composting of digestate. The project activity does not involve any storage of digestate which is subject to anaerobic conditions within the project boundary (in line with the first footnote of the applied methodological tool: "If the storage of digestate or the composting of digestate is occurring within the project boundary, these emissions will be considered as project emissions."). Hence no leakage emissions are taken into account.

4.4 Net GHG Emission Reductions and Removals

As per para 30, equation 2 of AMS.I. F, ver. 05.0, Emission reductions are calculated as follows

$$\mathrm{ER_y} = \mathrm{BE_y} - \mathrm{PE_y} - \mathrm{LE_y}$$

ER_y = Emission reductions in year y (t CO_2e/y)

BE_y = Baseline emissions in year y (t CO_2e/y)

PE_y = Project emissions in year y (t CO_2e/y)

LE_y = Leakage emissions in year y (t CO_2e/y)

Baseline Emissions from Manure Management

Global Warming Potential (GWP) of CH_4	GWP_{CH4}	tCO_2e/tCH_4	28
CH_4 density	D_{CH4}	t/m^3	0.00067
Model correction factor to account for model uncertainties	UF_b	-	0.94
Annual methane conversion factor	MCFB	%	80%
Quantity of Manure Treated from Livestock type (Phase I)	$Q_{manure,j,LT}$	Kg dm/year	3285000
Quantity of Manure Treated from Livestock type (Phase II)	$Q_{manure,j,LT}$	Kg dm/year	3285000
Total Volatile Solid (Phase I)	$VS_{j,LT,y}$	kg dm/year	1533000
Total Volatile Solid (Phase II)	$VS_{j,LT,y}$	kg dm/year	1533000
Specific Volatile Solids content of Animal Manure	$SVS_{j,LT,y}$	kg VS/kg dm	0.47
Maximum methane producing potential of the volatile solid	$B_{o(T)}$	m^3 CH_4/kg VS	0.36

$$BE_y = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y}$$

Total Baseline Emissions for animal waste management system (BE_y)= 7,785 tCO_2e/yr

Baseline Emissions from Electricity Generation

Electricity generation by the project activity (Phase I)	$EG_{BL,y}$	kWh/year	460800
Electricity generation by the project activity (Phase II)	$EG_{BL,y}$	MWh/year	460.80
Electricity generation by the project activity (Phase I)	$EG_{BL,y}$	kWh/year	460800
Electricity generation by the project activity (Phase II)	$EG_{BL,y}$	MWh/year	460.80
Emission Factor	$EF_{CO2,y}$	(t CO2/MWh)	0.9102

Combined margin emissions factor

As per para 14 of Tool 7, version 07.0 the following steps have been followed.

(a) **Step 1:** Identify the relevant electricity systems;
(b) **Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);
(c) **Step 3:** Select a method to determine the operating margin (OM);
(d) **Step 4:** Calculate the operating margin emission factor according to the selected method;
(e) **Step 5:** Calculate the build margin (BM) emission factor;
(f) **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 has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However, since August 2006, 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 CO_2 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)
Project owners 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 owner 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)							
India	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22

	15.1%	14.6%	14.3%	14.5%	17.0%	16.5%	15.81%

Source: Central Electricity Authority (CEA) Database Version 18, 2022[13]

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.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/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.

PP 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 VCS verifier for verification. OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

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

The operating margin emission factor has been calculated using a 3-year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
INDIAN Grid	2019-2020	2020-2021	2021-2022
	9,65,009	9,58,218	10,35,672
Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
INDIAN Grid	2019-2020	2020-2021	2021-2022
	0.9541	0.9402	0.9605

[13] https://cea.nic.in/wp-content/uploads/baseline/2023/01/version_18.zip

Weighted Generation Operating Margin	
INDIAN Grid	0.9518

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

Option 1 as described above is chosen 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 PDD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
INDIAN Grid	2021-2022
	0.8687

STEP 6: Calculate the combined margin (CM) emissions factor:

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non-dispatch able generation types such as wind and solar photovoltaic, the tool to calculate the emission factor for an electricity system, Version 07.0.0, EB 100, Annex100, Annex 4, allows to weigh the operating margin and Build margin at 75% and 25%, respectively for wind and solar projects and 50% and 50%, respectively for hydro and biomass projects.

As per para 85 of Tool 07, version 07.0, the combined margin emissions factor is calculated as follows:

$$\mathrm{EF}_{\mathrm{grid,CM,y}} = \mathrm{EF}_{\mathrm{grid,OM,y}} \times \mathrm{w}_{\mathrm{OM}} + \mathrm{EF}_{\mathrm{grid,BM,y}} \times \mathrm{w}_{\mathrm{BM}}$$

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (per cent)

w_{BM} = Weighting of build margin emissions factor (per cent)

Baseline Emission factor (INDIAN Grid) = 0.50*0.9518 + 0.50*0.8687 = 0.9102 tCO_2/MWh

$$BE_y = EG_{BL,y} \times EF_{CO2.y}$$

Baseline emissions in year (BE_y)= 419 tCO_2e/yr

Project emission from physical leakage from animal waste management system

Global Warming Potential (GWP) of CH_4	GWP_{CH4}	tCO_2e/tCH_4	28
CH4 density	D_{CH4}	t/m_3	0.00067

Quantity of Manure Treated from Livestock type (Phase I)	$Q_{manure,j,LT}$	Kg dm/year	3285000
Quantity of Manure Treated from Livestock type (Phase II)	$Q_{manure,j,LT}$	Kg dm/year	3285000
Specific Volatile Solids content of Animal Manure	$SVS_{j,LT,y}$	kg VS/kg dm	0.47
Maximum methane producing potential of the volatile solid	$B_{o(T)}$	m^3 CH4/kg VS	0.36
Fraction of manure handled in baseline (liquid fraction)	MS%	%	100%
Annual methane conversion factor	MCFB	%	80%

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times Q_{manure,LT,y} \times SVS_{LT,y} \times MS\%_{i,y}$$

Project Emissions for animal waste management system= ($PE_{PL,y}$) = 828 tCO_2e/yr

Project Emissions from Physical Leakage from Anaerobic Digestor

Quantity of methane produced Phase I	$Q_{CH4,y}$	tCH_4	278.04
Quantity of methane produced Phase II	$Q_{CH4,y}$	tCH_4	278.04
Default emission factor for the fraction of CH4 produced that leak from the anaerobic digester (fraction)	$EF_{CH4,default}$	tCO_2e	0.028
Global warming potential of CH4	GWP_{CH4}	(tCO_2 /tCH_4)	28

$$PE_{CH4,y} = Q_{CH4,y} \times EF_{CH4,default} \times GWP_{CH4}$$

Total Project emissions of methane from the anaerobic digester ($PE_{CH4,y}$) = 218 tCO_2e/yr

Project Emissions from Electricity Consumption

Quantity of methane produced Phase I	$Q_{CH4,y}$	tCH_4	278.04
Quantity of methane produced Phase II	$Q_{CH4,y}$	tCH_4	278.04
Default factor for the electricity consumption associated with the anaerobic digester per ton of methane generated	$F_{EC,default}$	MWh/tCH_4	1.02
Default emission factor for the electricity consumed in year y	$EF_{EL,default}$	tCO_2 / MWh	1.3

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

Project emissions from electricity consumption ($PE_{EC,y}$) = 369 tCO_2e/yr

Project emission from fuel consumption

There is no auxiliary fuel consumption in the project activity. However, during monitoring if there are any emissions from fuel consumption, the same will be measured and accounted under project emissions.

Project emission from Incremental Transportation

The biogas plant is within the poultry farm Hence there is no incremental transportation.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
28-01-2022 to 27-01-2023	8204	1414	0	6,790
28-01-2023 to 27-01-2024	10520	1813	0	8,707
28-01-2024 to 27-01-2025	16409	2828	0	13,581
28-01-2025 to 27-01-2026	16409	2828	0	13,581
28-01-2026 to 27-01-2027	16409	2828	0	13,581
28-01-2027 to 27-01-2028	16409	2828	0	13,581
28-01-2028 to 27-01-2029	16409	2828	0	13,581
Total (7 years)	**1,00,768**	**17,367**	**0**	**83,401**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$B_{0,LT}$
Data unit	m^3CH_4 /kg-dm
Description	Maximum methane production potential of volatile solid generated by poultry manure
Source of data	IPCC 2019 Guidelines, table 10.16, chapter 10, volume 4.
Value applied	0.36
Justification of choice of data or description of	IPCC default value

measurement methods and procedures applied	
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	GWP_{CH4}
Data unit	tCO_2e/tCH_4
Description	Global Warming Potential for methane
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, 5th ASR
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	D_{CH4}
Data unit	t/m^3
Description	CH_4 density
Source of data	AMS-III.D Methane recovery in animal manure management systems --- Version 21.0
Value applied	0.00067
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	UF_b
Data unit	%
Description	Model correction factor
Source of data	As per methodology AMS.III.D (FCCC/SBSTA/2003/10/Add.2)
Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	MCF_j
Data unit	-
Description	Annual methane conversion factor (MCF) for the baseline animal manure management system j
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	80%
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 refinement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 is applied. The annual average temperature of baseline site where anaerobic manure treatment facility is located is 29°C and falls under tropical dry climatic zone. The corresponding annual methane conversion factor (MCF) is taken for the following system (i.e) Uncovered anaerobic lagoon
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	$EF_{grid,OM,y}$

Data unit	tCO_2e/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	CO_2 Emission Database, Version 18.0, Sep- 2022 published by Central Electricity Authority (CEA), Government of India.
Value applied	0.9518
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	CO_2 Emission Database, Version 18.0, Sep- 2022 published by Central Electricity Authority (CEA), Government of India.
Value applied	0.8687
Justification of choice of data or description of measurement methods and procedures applied	NA
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	CO_2 Emission Database, Version 18.0, Sep- 2022 published by Central Electricity Authority (CEA), Government of India.

Value applied	0.9102
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where, $EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh) $EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 50% W_{BM} = Weighting of operating margin emissions factor (%) = 50%
Purpose of Data	For the calculation of the Baseline Emission
Comments	NA

5.2 Data and Parameters Monitored

Data / Parameter	$Q_{manure,j,LT,y}$
Data unit	kg-dm/year
Description	Quantity of manure treated from livestock type LT at animal manure management system j (dry basis)
Source of data	Measured and recorded (weighbridge and logbook records)
Description of measurement methods and procedures to be applied	The manure load is measured using weigh bridge.
Frequency of monitoring/recording	Annually (Daily measured and recorded)
Value applied	Phase I - 32,85,000 kg-dm/year Phase II - 32,85,000 kg-dm/year
Monitoring equipment	Weigh Bridge
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline and project emissions

Calculation method	-
Comments	-

Data / Parameter	$MS\%_{i,y}$
Data unit	%
Description	Fraction of manure handled in system i in year y
Source of data	Measured
Description of measurement methods and procedures to be applied	Continuously measured by weigh bridge and monthly recorded
Frequency of monitoring/recording	Annually (Daily measured and recorded)
Value applied	100%
Monitoring equipment	Weigh Bridge
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$SVS_{j,LT,y}$
Data unit	Kg VS/kg-dm
Description	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y
Source of data	Measured as per the guideline in annex 2 of AM0073
Description of measurement methods and procedures to be applied	• Evaporate free water on steam able and dry in oven at 103°C for 24 hours or until constant weight to obtain the Total Solids. • Place Total Solids residue in furnace at 600ºC for at least 1 hour. Volatile Solids are determined from weight difference of total and Fixed Solids.

	Volatile Matter (dry basis) = $(W_2 - W_f) / (W_2 - W_1)$ Where • W_1 is the weight of sample container, • W_2 is combined weight of the sample container and oven dried sample, • W_f is the combined constant weight of the sample container and sample after heating at 600°C .
Frequency of monitoring/recording	Annually
Value applied	0.47
Monitoring equipment	The main equipment used to determine volatile solid excretion rate in animal waste are as follows: ✓ Muffle Furnace ✓ Scale
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	-
Comments	-

Data / Parameter	EG_y
Data unit	MWh
Description	Quantity of electricity generated from the project activity in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Continuously measured and monthly recorded
Frequency of monitoring/recording	Annually
Value applied	460.8 MWh
Monitoring equipment	Electricity meter

QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

The monitoring plan is developed to establish suitable data collection method for measurement & collection of data and maintenance of records according to the monitoring methodology of AMS.III. D. Version 21.0 and AMS.I.F. Version 05.0. The monitoring plan is project specific for which, the project performance with all relevant criteria will be monitored. Proper training will be provided to concerned personnel for operation purpose.

The purpose of monitoring is to calculate and monitor GHG emission reduction by the project activity. The monitoring plan, which is implemented by the project participant describes about the following aspects:

- Overall project management
- Monitoring Plan
- Emergency Preparedness
- Training on Monitoring & Archiving of Data and Internal Audit Procedures
- Quality Assurance and Quality Control (QA/QC) procedures

Overall Project Management and Team

The project owner organizes a separate team to be responsible for data collection, supervision and witness the whole process of data measuring and recording. A senior manager will be appointed to take full responsibility for the overall monitoring of the project. The monitoring and measurement will be carried out by designated monitoring officers. The site in-charge will be responsible for carrying out internal auditing and QA/QC. All the values from generation record will be checked with the invoices for consistency.

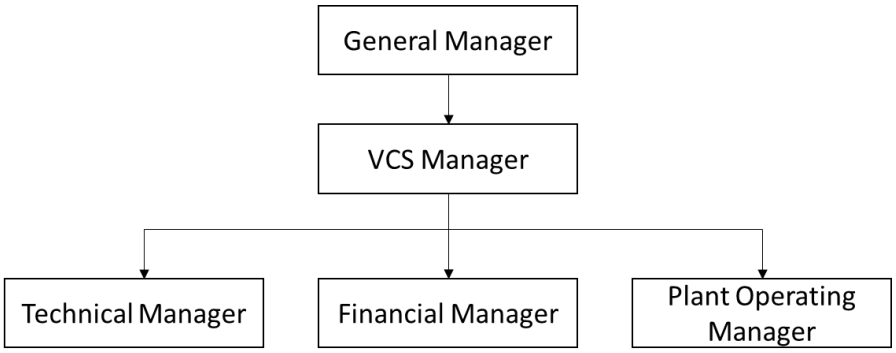

Figure 4: Structure of Monitoring Team

Monitoring Plan

The monitoring procedures will be carried out as mentioned in section 5.2. The data will be recorded on a continuous basis or as indicated in section 5.2 and backup of the same will be maintained.

In addition, the SDG parameters stated in section 1.17 will be monitored.

Personal Training:

The project employs qualified and experienced persons for plant operation. The training period shall be for three months, as this would be adequate and necessary to ensure proper imparting of the objective. The training course will be thoroughly and meticulously designed, highlighting the objectives, salient features, operational aspects and trouble shooting.

Emergency preparedness:

In case of any unforeseen event that is not covered under this monitoring plan, staff of the operation division will immediately inform the chief of the operation division. The chief of the operation division is then responsible to ensure that the cause for the unforeseen event is detected, the event is remedied and for the period of time in which the unforeseen event has occurred uncertainty in data gathered is limited as much as possible.

Internal auditing

Project owner will conduct the internal auditing by cross checking the data from the invoices and data logbooks for ensuring the quality and consistency of data measured and monitored for the purpose of emission reduction calculations.

Quality Assurance and Quality Control (QA/QC) procedures

Calibration of Measuring Equipment's:

The reliability of the monitoring system depends on the accuracy of the measuring instrument and the quality of the relevant equipment. Thus, the meters will be regularly calibrated as per the frequency specified by the manufacturer. To assist in future verifications, the project owner will preserve the calibration records, along with the data files of project monitoring. Error check routines will be established on site and at the point of data storage to detect data measuring as well as malfunctions. In the case of malfunction of the meters, the meter supplier will provide technical support to engage the problem promptly and emission reductions during the corresponding period will be calculated conservatively.

APPENDIX

Attendance sheet and photographs of stakeholder's consultation meeting:

"Local Stakeholder Consultation Meeting for Biogas based Poultry Waste Management Projec at Siddipet District, Telangana State, India"

Attendance Sheet

Project Proponent: Sunmax Hatcheries Private Limited

Date of meeting: 20/06/2023

S. No	Name of the person	Signature
1	M. Rajitha	M. రజిత
2	G. Nagamani	G. Nagamani
3	Niki DEVI	నిక్కి దేవి
4	PADMA. T	T పద్మ
5	SALMA.	Salma
6	DEVI	
7	SHANKER.	Pali
8.	RAVI	Ravi
9.	MEENA	మీనా
10.	NARASIMHA	N నరసింహ

11	ARAVIND	Arvind
12	VENKATESH	[illegible]
13	PRASAD	Prasad
14	GANESH.	Ganesh.
15	RAGHAV	Raghav.
16	SHIVA.	Shiva
17	DHANARAJ	Dhanraj
18	RAJEEV	Rajib
19	SAILANI	Sailani
20	ANJANEYLU.	Anjaneylu