BYZ GLOBAL ENERGY BIOGAS PLANT

Document Prepared by

Project Title	BYZ Global Energy Biogas Plant
Version	Version 05
Date of Issue	02/12/2021
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CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

BYZ Global Energy Biogas Plant project (hereafter referred to as the project) is a biogas-to energy project that will generate renewable energy by capturing biogas from cattle manure -via anaerobic digestion- and utilizing it to produce thermal and electric energy through biogas systems. The project is being implemented by BYZ GLOBAL ENERJİ VE GÜBRE ÜRETİMİ TİCARET SANAYİ ANONİM ŞİRKETİ in Kocasinan district, Kayseri province, in Turkey.

Agricultural activities have been a main household income sources for those living in Kocasinan. However, whilst number of stockbreeders and poultry farms has substantially increased for the last years in the region, cattle manure generated at farms, which is left to decay at and around farms in aerobic conditions, has become a major environmental, economic and legal problem for cattle breeders and poultry farmers, as well as for the local people living around farms.

The project whose main feedstock will be cattle and chicken manure generated at farms in Kocasinan, provides an environmentally friendly solution to this manure management problem. It is estimated that approximately 220 tons of cattle manure and 110 tons of chicken manure generated at animal farms will be collected daily through special sewage trucks equipped with close-tanks in order to prevent any odor and/or manure leakages and to be fed into the anaerobic digesters at the proposed biogas power plant.

Within the scope of the project, biodegradation of organic wastes coming to the Biogas Plant in anaerobic environment will take place. The biogas that will be released during the biodegradation of organic wastes will be used for electricity and heat production in biogas unit. The proposed project activity has one biogas engine installed at the biogas power plant, with the total capacity of 1,501 KWe/h. Accordingly, the biogas generator system to be installed will be designed with a total power of 1.501 MWe/h. The annual feed-in electricity is estimated to be 12,968,640 KWh. Whilst heat generated at the plant is used at the facility to warm the digesters, the electricity generated is directly fed to the national grid.

Whilst providing sustainable development benefits to the host communities and the host country, the proposed project activity will reduce greenhouse gas (GHG) emissions mainly by

• preventing GHG emissions, methane in particular, from being emitted directly to the atmosphere from cattle manure that would be otherwise left to decay in aerobic conditions;

• replacing the electricity that would have otherwise been generated by the national grid which is heavily dependent on fossil-fuel-based resources, through generating renewable energy and feeding it to the grid;

• producing organic compost from solid waste stored in anaerobic digesters.

The project has obtained the approval of Environmental Impact Assessment (EIA) issued by the Ministry of Environment and Urbanization in Turkey on September 27th, 2018 and the Electricity Generation License (EGL) issued by the Energy Market Regulatory Authority (EMRA) in Turkey on October 18th, 2018. The project has begun to generate electricity on July 30th, 2019, which is regarded as the project start date. This project adopts the fixed crediting period of 10 years. The expected average annual emission reductions are 61,243 tCO_2eq/y. Accordingly, the project is expected to generate 612,430 tCO_2eq emissions reduction throughout its fixed crediting period.

1.2 Sectoral Scope and Project Type

The project falls into sectoral scope 01: Energy industries (renewable - / non-renewable sources) (Type I Component), sectoral scope 13: Waste handling and disposal (Type III Component). The project is not a grouped project.

1.3 Project Eligibility

The project is a biogas project, capturing Greenhouse Gases (GHGs), methane in particular, generated from animal manure in anaerobic conditions and utilizing them via biogas generator units, for electricity generation, which is eligible under Version 4.1 of the VCS Standard[1].

1.4 Project Design

The project is not a grouped project.

1.5 Project Proponent

Organization name	BIO SOLUTIONS LLC.
Contact person	Dr. Umut ÖNDER
Title	Founder

[1] https://verra.org/wp-content/uploads/2021/04/VCS-Standard_v4.1.pdf

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Organization name	KUZEY GLOBAL ENERJİ VE GÜBRE A.Ş. on behalf of BYZ Global Enerji ve Gübre Üretimi Ticaret Sanayi Anonim Şirketi[2]
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1.6 Other Entities Involved in the Project

NA

1.7 Ownership

Both the attached approval of Environmental Impact Assessment (EIA) issued by the Ministry of Environment and Urbanization in Turkey and the attached Electricity Generation License (EGL) issued by the Energy Market Regulatory Authority (EMRA) in Turkey established the project ownership to BYZ Global Enerji ve Gübre Üretimi Ticaret Sanayi Anonim Şirketi. These official documents are accordingly establishing the property and contractual right both in the plant and equipment that generate GHG emission reductions. Nevertheless, it is important to note here that the Board assigned Mr. Başar BEYAZOĞLU, the Chairperson of KUZEY GLOBAL ENERJİ VE GÜBRE A.Ş., as the Company's designated/authorized Carbon Manager. Moreover, a notarized document submitted by the BYZ Global Enerji ve Gübre Üretimi Ticaret Sanayi Anonim Şirketi, making KUZEY GLOBAL ENERJİ VE GÜBRE A.S. as focal point on their behalf.

1.8 Project Start Date

[2] Please see the supporting document containing the Corporation's BYZ Global Enerji ve Gübre Üretimi Anonim Şirketi and Kuzey Global Enerji ve Gübre A.Ş. that Mr. BEYAZOĞLU is a Board Member of both companies.

The project start date is 30 July 2019, as the operation start date on which the project began to generate not only renewable energy, but also emission reductions.

1.9 Project Crediting Period

This project adopts the fixed crediting period of 10 years, from 30/07/2019 to 29/07/2029 (the start and end dates included).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the scale of the project (project or large project) and the estimated annual GHG emission reductions or removals for the project crediting period.

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	61,243[3]
Year 2	61,243
Year 3	61,243
Year 4	61,243
Year 5	61,243
Year 6	61,243
Year 7	61,243
Year 8	61,243

[3] In accordance with the paragraph 9 of Small-scale Methodology: Methane recovery in animal manure management systems AMS-III.D., version 21.0, which is applied to the proposed project activity, "Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO2 equivalent annually from all Type III components of the project activity". In the case of the proposed project activity, it is estimated that net emission reduction generated out of the project's Type III components is 55,570 tCO_2eq/y, whilst the Type I components' reduction is 5,673 tCO_2eq/y.

Year 9	61,243
Year 10	61,243
Total estimated ERs	612,430
Total number of crediting years	10
Average annual ERs	61,243

1.11 Description of the Project Activity

As described in section 1.1., the scenario existing prior the project's implementation is the continuum of common practice for the livestock and poultry farm owners in the region to leave cattle and chicken manure generated at their farms to decay aerobically resulting in greenhouse gases generated from animal manure, methane in particular, were released directly into atmosphere.

Emissions associated with the baseline scenario are the CH_4 emissions due to the atmospheric release of methane sourced from animal manure left to decay aerobically and CO_2 emissions due to the power generation by the national grid which is dominated by fossil fuel burning power plants. Through the project's implementation, the methane previously released from animal manure left to decay aerobically will be captured via anaerobic digestion and utilized to produce thermal and electric energy through biogas generator systems in the biogas power plant. In addition, the electricity generated at the plant will be directly fed to the national grid, avoiding and/replacing the dispatch of the same amount of electricity from fossil-fuel based power plants connected to the national grid. Thus, none of the equipment installed within the project boundary exists in the baseline scenario.

In the proposed project activity's technical feasibility study, it is expected that the project will consist of the installation of parking area; wheel washing unit; weighbridge; waste receiving unit; liquid fermented product storage unit; solid fermented product warehouse; fermenter tank; hydrolysis tank; separator; hygiene unit; wastewater treatment plant; biogas generator system; desulphurization system; biogas burning chimney (flare); engine room; administrative building; gas engine; biogas processing; absorption towers; biogas drying units; ceramic and gravel filters; electricity transmission-monitoring and control units; plant and process monitoring control and management systems.

UNIT NAME	NUMBER OF UNITS (Unit)
Parking Area	1
Wheel Washing unit	1

Weighbridge	1
Waste Feeding and Pre-Pools (Waste Receiving Tanks)	1
Fermenter Tank	1
Hygiene Tank	1
Separator	1
Liquid Fermented Product Storage Unit	1
Solid Fermented Product Warehouse	1
Biogas Generator System	1
Desulphurization System	1
Biogas Burning Chimney	1
Transformer	1
Engine room	1
Generator	1
Administrative Building	1

- Waste Receiving Unit

Wastes shall be accepted to the facility in a way that does not pose an environmental risk and necessary control systems shall be established to monitor the processing of wastes. In order to collect the animal wastes brought to the facility daily and prepare them to be shipped to the fermenting tanks with a pump, a pool made of C30 concrete with impermeability insulation will be constructed. This pool will be used for preliminary acceptance of bovine animals' waste. The pool with a volume of 600 m3 will also be used as a unit where the amount of bovine animals' solid matter is balanced. Animal wastes that will be accepted to the facility through vacuum trucks, pumps or closed box trucks will be loaded into the bovine animals pre-pool unit.

A total of 290 tons/day of animal waste from PVC pipes will be loaded into the fermenter tank by means of the manure pump in the engine room, through pneumatically controlled valves.

- Liquid Fermented Product Storage Unit

The fermented product can be used as a liquid or a solid by dehydrating. Products with a dry matter content of up to 15 % are considered liquid fermented products. In case the liquid fermented product is dehydrated, the oxygenated process is applied to ensure that the solid product obtained provides the stability values in Annex-4 of this Communiqué.

- Solid Fermented Product Warehouse

As stated in the "Mechanical Separation, Bio-Drying and Biomethanization Plants and Fermented Product Management Communiqué ", for 30.8 tons/day of solid fermented product coming out of the solid fermented product hygiene and drying unit, a storage area with a total area of 760 m2 will be built, in a size where these products will be deposited for at least 6.5 months without being affected by meteorological events.

- Fermenter Tank

Within the scope of the project, it is a pool with a capacity of 5,500 m3, where the waste coming from the pre-pool is collected and the animal waste is fermented for 35-45 days. It will be covered with EPDM membrane and water and heat insulation will be performed. There will be a heating system in the fermenter where the hot water obtained from the biogas generator system will be circulated. The length of pipes required for the heating system will be determined according to the heat loss calculation, and the fittings will be installed on the base and side walls of the fermenter units. Heat insulation will be made on the ground and exterior of the fermenter in order to protect the heat inside.

- Separator

The separator is the machine necessary for the conversion of animal waste fermented in biogas plants to solid and liquid form. One separator will be used within the scope of the project. The fermented output will be separated in a separator with a power of 5.5-7.5 kW,

operating according to the squeezing screw filter principle to be transformed into the final product in liquid and solid form. The separator to be used will be capable of separating 20% solid fermented and 80% liquid fermented. The separator will have a part that will remove the solid part separated from the liquid with the help of a welt that opens to the outside. The separator will be designed in a way that it enables to remove the liquid ferment by gravity or a pump.

- Hygiene Unit

Within the scope of "Mechanical Separation, Bio-Drying and Biomethanization Plants and Fermented Product Management Communiqué", 149,2 tons/day of liquid fermented product shall be heat treated for 1 hour at 70°C in a separate pool in order to meet the "Liquid Fermented Product Quality Criteria" listed in Annex-2, and hygiene will be ensured. The liquid fermented product coming out of the hygiene pool will be transferred to the liquid fermented product storage pool with a volume of 7,200 m3. Within the scope of the project, it is planned to sell 53,712 tons of liquid fermented products (149.2 tons of liquid fermented fertilizer per day x 360 days = 53,712 tons).

- Biogas Generator/Engine System

There will be one biogas engine unit within the scope of the facility. 1,501 kWh of electricity will be generated per hour in the biogas generator unit.

- Biogas Burning Chimney (Flare)

If a problem is encountered in the biogas power plant, a torch (emergency gas burning system) with 850 biogas/h flow and approximately 1700 kW thermal power will be used to stabilize the gas in the safest way in the case that the gas cannot be spent in the biogas unit and stored.

- Engine Room

In the facility, an engine room with an area of 210 m2 will be established, in which there will be pump ensuring the transfer between the tanks, screens through which the pressure fertilizer levels in the collector tanks will be monitored and control panels.

Combustion occurs after the gas passing through here is mixed with air in the gas engine. The mechanical energy generated here is transferred to the alternator by the shaft in order to convert it into electrical energy. Mechanical energy is converted into electrical energy here and sent first to the transformers and then to the network line.

OUTPUT / FUEL CONSUMPTION		
Power according to ISO Standards ICFN	kW	1.540
Effective fuel pressure and nominal speed	Bar	20.17
Fuel Type		Biogas
Methane content / Minimum methane content	MZ	135 (117 d)
Compression Ratio	Epsilon	12.5
Min. / Max. gas pressure (gas train inlet)	mbar	120 -200 c)
Gas pressure max. fluctuation	mbar/sec	10
Section 2 inlet temperature	°C	55
Specific engine fuel consumption	g/kWh	0.20
Max. oil temperature	°C	85
Jacket water temperature max.	°C	95
Oil tank capacity (filling)	Lit	~437

TECHNICAL DATA		
Manner of work		4 cycle
Configuration		V 70
Number of cylinders		20
Diameter	mm	145
Piston travel	mm	185
Nominal speed	rpm	1,500
Average piston speed	m/s	9.25

Length	mm	3,750
Width	mm	1,580
Height	mm	2,033
Empty weight	kg	7,200
Gross weight	kg	7,900
Moment of inertia	kgm2	11.64
Rotation direction (from flywheel view)		Left
Radio interference level VDE 0875		N
Starter motor output	kW	13
Starter motor voltage	V	24

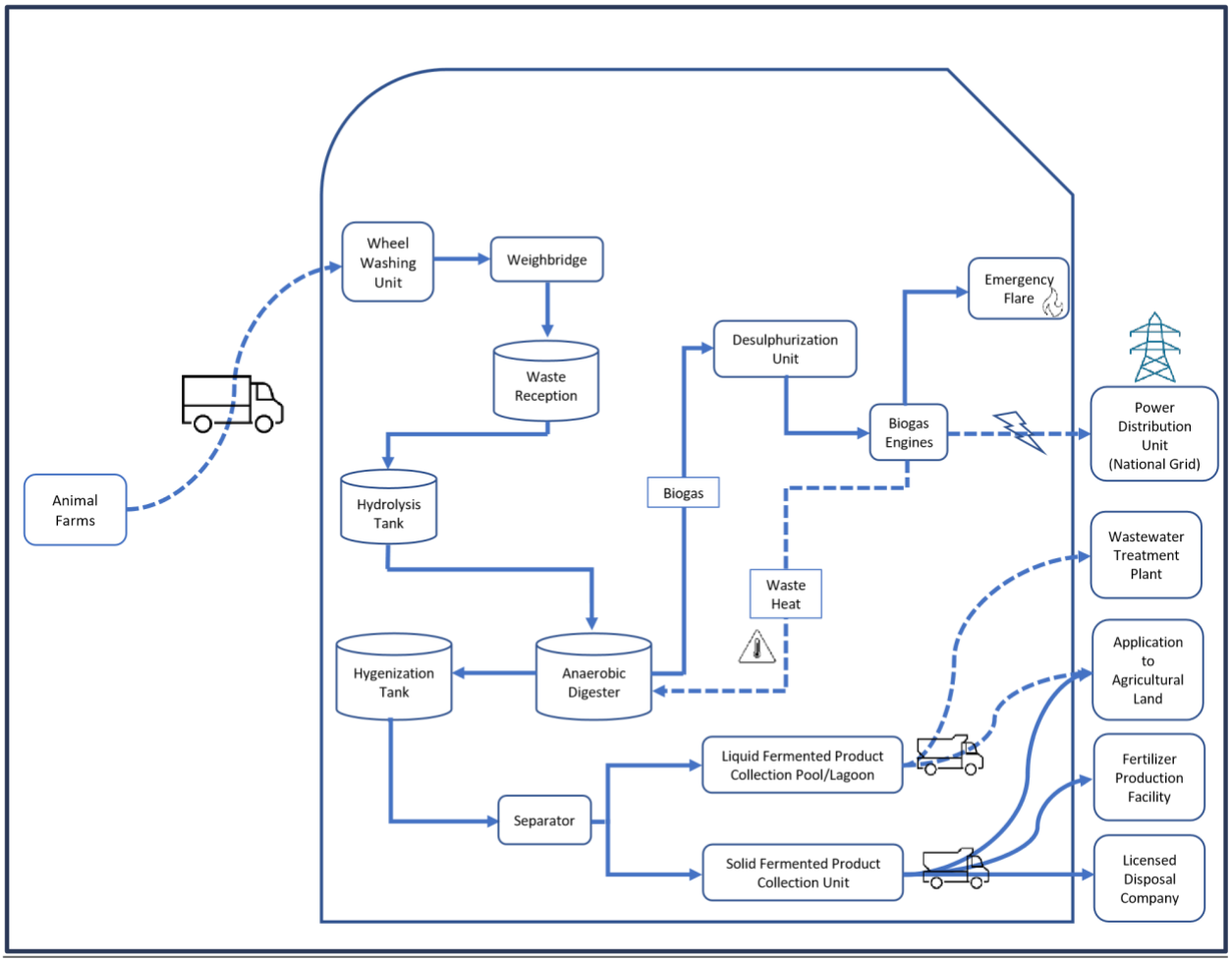
- **Electricity Transmission-Monitoring and Control Units**

Measurement and monitoring units are used in electricity production and distribution facilities to monitor energy consumption and quality. Monitoring current and voltage harmonics together with other energy quality parameters will give an accurate idea of the state of the power system. Monitoring the energy quality is a vital issue due to the increasing non-linear loads on the network.

- **Plant and Process Monitoring-Control and Management Systems**

Industrial facilities are operated, monitored and controlled through process management systems. The process management concept adapts to the process engineering structure of the facility. Maximum security, state-of-the-art usability and flexible expansion capabilities are achieved by configuring the plant horizontally into function units with specific control and automation tasks. In this way, a clearly structured, hierarchical and consequently transparent facility structure is achieved. Redundant structures related to the process are not cancelled with the control system.

PLANT FLOW CHART



BIOGAS AND LEACHATE MANAGEMENT

• Biogas Management

Biogas will be obtained from animal waste at the biogas power plant. With the biogas obtained, 1,501 kWh of electricity will be produced per hour. If a problem is encountered in the biogas power plant, a torch (emergency gas burning system) with 850 biogas/h flow and approximately 1700 kW thermal power will be used to stabilize the gas in the safest way in the case that the gas cannot be spent in the biogas engine unit and stored. Heat will be released in the facility. This amount will be used for heating the heat fermenter tanks.

• Leachate Management

Fermenter tanks and other units where leakage can occur (waste feeding and pre-pools, mixture tank and liquid fermented product storage) to be used within the scope of the project shall be designed in a way to

prevent contamination of the receiving environment, soil, surface and underground waters in accordance with the provisions of "Mechanical Separation, Biodrying and Biomethanization Plants and Fermented Product Management communiqué". In this context, the waste reception unit will be built as top-covered with permanent construction material to provide protection against the effects of meteorological events. The base of the waste reception unit will be made of C30 concrete and non-flammable material with a thickness of at least 30 cm to ensure sealing. A separate collection system will be established on the floor to prevent the waste from coming into contact with or leakage of groundwater, sewage or surface water, and the ground will be properly inclined in order to collect the leachate that will occur in the waste receiving area.

1.12 Project Location

The project is located in Buğdaylı village, Kocasinan district, Kayseri province, Turkey. The central coordinated of the project location are longitude of +35.5514131 and latitude of +38.8171642.

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is: Before the project activity, cattle and chicken manure generated at cattle breeding and poultry farms were left to decay in aerobic conditions. Hence, greenhouse gases generated from animal manure were released directly into atmosphere. In addition, the quantity of electricity produced using biogas technologies would have been produced by power plants connected to the national grid in Turkey which is heavily dependent on fossil fuel resources.

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 two of main regulatory approvals for such project types to prove that they are in compliance with relevant laws, statues and regulatory frameworks in Turkey are the Environmental Impact Assessment and the Electricity Generation License whose obtainments are required for projects being in compliance with other relevant legal requirements.

The project has obtained the approval of Environmental Impact Assessment (EIA) issued by the Ministry of Environment and Urbanization in Turkey on June 27th, 2018 and the Electricity

Generation License (EGL) issued by the Energy Market Regulatory Authority (EMRA) in Turkey on October 18th, 2018.

Hence, the project is in compliance with laws, status and other regulatory frameworks.

1.15 Participation under Other GHG Programs

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

The project has not been registered or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related credit or renewable energy certificates.

1.17 Additional Information Relevant to the Project

Leakage Management

In accordance with the methodologies applied to the project, no leakage effects are accounted for.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

- Increasing labour demand of skilled labour for the fabrication, installation, operation and maintenance of the methane recovery and electricity generation system and thus, contributing to the sustainable economic growth of the region,
- Generating and dispatching electricity from a renewable and sustainable energy source to a grid nowadays reliant on fossil,
- Contributing to the climate change fight by reducing CH4 emissions.
- Constituting a new, clean and efficient technology model for the treatment of animal manure and other organic matter,
- Improving air quality (i.e. by reducing odour) and therefore having positive effects on the local environment.

Nevertheless, it is still important to note that the project will make positive contributions to at least three Sustainable Development Goals (SDGs). These are:

- SDG Goal 7: Affordable and Clean Energy

The proposed project activity is a biogas-to-energy project that will generate renewable energy by capturing biogas mainly from cattle-manure -via anaerobic digestion- and utilising it to produce thermal and electric energy through biogas generator systems. By supplying renewable energy generated at the Plant to the national grid, the proposed Project will contribute to increasing not only the share of renewable energy in the global energy mix, but also the proportion of population with primary reliance on clean fuels and technology.

- SDG Goal 8: Decent Work and Economic Growth

The demand for food and electric energy is rapidly increasing in Turkey for various reasons, such as industrialisation, urbanisation, economic development and population growth. The country's external dependence on agricultural products has intensified because the increasing demand cannot be met by a decreasing domestic agricultural production capacity which is due to several reasons, such as shrinkage of agricultural land, increasing migration to urban spaces from rural areas where agricultural production is densely located, and dramatic increase in the cost of inputs for agricultural production. Therewithal, Turkey, which cannot meet its increasing electricity demand due to the deprivation of conventional resources used to generate energy, such as coal, oil and natural gas, has also become foreign-dependent on energy. Through its implementation, the proposed project activity will contribute to reduce Turkey's foreign dependency by generating renewable energy out of disposing cattle manure and agricultural/agro-industrial wastes. In addition, the proposed project activity, as a biogas-based renewable energy technology implementation, will contribute to achieve higher levels of economic productivity; hence, to

increase annual growth rate of real GDP per employed person. Moreover, it will increase the employment capacity in the region, whilst enabling unemployment rate to decrease.

- **SDG Goal 13: Climate Action**

The proposed project activity will reduce GHG's emissions by capturing and utilising methane, one of the most potent GHGs triggering climate change. It is estimated that the annual emission reduction that the proposed Project will generate is around 61,243 tCO2. In addition, the Project owner plans to engage with the National Education Directorate in the Kocasinan district in order to organise two field-trips annually for high school students through which they would attend a brief seminar on climate change and its impacts, along with learning how a cattle manure-based biogas plant works. Such field trips will raise awareness amongst young generations on climate change and one of the ways in which it needs to be tackled, waste-toenergy systems.

As noted above, the proposed project activity's positive impacts on sustainable development will be defined in detail in the final version of the PDT. Moreover, the project developer aims to complete the VERRA's new "Sustainable Development Contributions Report"[4] for the project.

Further Information

N/A

2 SAFEGUARDS

2.1 No Net Harm

Summarize any potential negative environmental and socio-economic impacts and the steps taken to mitigate them.

The Environmental Impact Assessment (EIA) Report has been approved and issued by the Ministry of Environment and Urbanization in Turkey on September 27th, 2018. In accordance with the Turkish laws and regulations, EIA's approval shall be only made if a project subjected to the approval does not make any negative environmental and socio-economic impacts. Considering the fact that the proposed project activity already obtained EIA approval by the

[4] https://verra.org/sustainable-development-contributions-report-template-now-available/

Ministry of Environment and Urbanization in Turkey, it is therefore possible to claim that there is no net harm linked to the project.

2.2 Local Stakeholder Consultation

The proposed project's local stakeholder consultation meeting is postponed due to the CoVid-19 measures for not being the public at risk. Once the pandemical conditions finish, the LSC meeting is going to take place in line with the VCS v4.0 rules and modalities.

2.3 Environmental Impact

The environmental matters in Turkey are jurisdiction of the Ministry of Environment and Urbanization. The Law defines among others the general requirements of the Environmental Impact Assessment (EIA) states specific requirements according to the type of project, location, size and other characteristics.

The Environmental Impact Assessment (EIA) certificate has been approved and issued by the Ministry of Environment and Urbanization in Turkey on September 27th, 2018. In accordance with the Turkish laws and regulations, EIA's approval shall be only made if a project subjected to the approval does not make any negative environmental and socio-economic impacts. Considering the fact that the proposed project activity already obtained EIA approval by the Ministry of Environment and Urbanization in Turkey, it is therefore possible to claim that there is no net harm linked to the project.

2.4 Public Comments

To be reported once the local stakeholder consultation is conducted when the CoVid-19 pandemic restrictions are lifted. In addition, the project was open for public comment on its VERRA/VCS page[5] from 16/03/2021 to 15/04/2021. Any comments received have been uploaded in the "Other Documents" section below in the page.

2.5 AFOLU-Specific Safeguards

[5] https://registry.verra.org/app/projectDetail/VCS/2457

Since the project is a non-AFOLU project, this section is not required.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Applied approved baseline and monitoring methodologies:

- ***AMS-III.D.: "Methane recovery in animal manure management systems", Version 21.0***[6]
    - Sectoral scopes:
        - 13 – Waste handling and disposal
- ***AMS-I.D.: "Grid connected renewable electricity generation", Version 18.0***[7]
    - Sectoral scopes:
        - 1 – Energy industries (renewable - / non-renewable sources)

Applied tools:

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", Version 03.0;
- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", Version 03.0;
- "Project emissions from flaring", Version 03.0;
- "Project and leakage emissions from anaerobic digesters", Version 02.0;
- "Tool to calculate the emission factor for an electricity system", Version 07.0;
- "Tool to determine the remaining lifetime of equipment", Version 01;
- "Project and leakage emissions from biomass", Version 04.0;

[6] https://cdm.unfccc.int/methodologies/DB/H9DVSB24O7GEZQYLYNWUX23YS6G4RC

[7] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

3.2 Applicability of Methodology

Category III.D.: Methane recovery in animal manure management system.

The methodology is applicable under the following conditions:

Applicability of AMS-III.D. – v21.0			
Ref.		***Application Criteria***	***Applicability***
1.	**(a)**	*The livestock population in the farm is managed under confined conditions;*	The Project's primary feedstocks, as cattle-manure and chicken-manure, will be supplied by neighboring animal farms. These farms function under the control of the Ministry of Agriculture and Forestry in Turkey. The farm owners manage the livestock population in their farms in accordance with the relevant Turkish laws and regulations confining conditions, especially regarding animal health, such as Law No. 5996[8], Law No. 3285[9] and Regulation on Livestock Farms[10]. These farms are constantly inspected by the relevant governmental institutions to check whether they are managed under confined conditions set by the relevant Turkish laws and regulations. *As such, this project activity qualifies as a Type III.D small-scale CDM project activity.*

[8] https://www.tarimorman.gov.tr/Belgeler/ENG/Legislation/law_veterinary_services.pdf
[9] http://www.zmo.org.tr/mevzuat/mevzuat_detay.php?kod=55
[10] http://www.resmigazete.gov.tr/eskiler/2006/08/20060809-4.htm

	(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 wastewater treatment" shall be applied;*	As shown in the Section 1.11. of the PDD, the waste streams after the treatment will not be discharged into natural water resources. In the baseline scenario, as noted above, the farms where manure is collected for the Project are managed in accordance with the relevant laws and regulations which prohibit manure to directly discharge into natural water resources. Hence, the proposed project activity complies with this criteria/condition. In addition, both the biogas power plant and the farms from where manure is supplied to the plant are constantly inspected by the relevant governmental institutions to check whether they are in compliance with the environmental laws and regulations which also cover dischargement of waste into natural water sources.
	(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 manure is collected from multiple farms in KAYSERİ is 10.7°C[11]. Hence, the

[11] https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=A&m=KAYSERI

			proposed project activity complies with this criteria/condition.
	(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, cattle and chicken manure generated at farms is stored generally in lagoons in anaerobic conditions. Lagoons' depths, when applicable, are more than 1 m. In addition, the retention time of manure waste is greater than one month in the baseline scenario. b Baseline surveys, will be provided as documentary evidence to confirm that the proposed project activity complies with these two criteria.
	(e)	*No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario*	In the project activity, the baseline scenario consists of uncovered lagoons that generate methane emissions in anaerobic conditions. However, no methane recovery and destruction by flaring, combustion or gainful use takes place. The baseline scenario for the cattle manure is to be left to decay anaerobically in uncovered lagoons/ponds at the farms. Baseline survey will be provided as documentary evidence to confirm

			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;*	The residual waste from the manure management process will be handled aerobically utilized as fertilizer which will not result in methane emissions. Thus, this criteria/condition is met by the proposed project activity.
	(b)	*Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared;*	In the project activity, the technical measures considered in the design ensures that all the biogas produced by the digester is used. In case of emergencies, flaring system is also provided. Hence, the proposed project activity complies with this criteria/condition.
	(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 anaerobic digesters under the project are constructed near the animal barns. The manure after removal from the animal barns will be transferred into the anaerobic digesters via pre-treatment pool within same day.

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";*	In the project activity, methane is not recovered from landfills and hence AMS-III.G is not applicable. Similarly, the project does not involve wastewater treatment, hence AMS-III.H is not applicable. Moreover, the project boundaries do not include composting of animal manure and hence AMS-III.F is not applicable. Further, project does not involve co-digestion of animal manure and other organic matter and hence AMS-III.AO is not applicable.
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*	The recovered biogas is used to produce and deliver power to the grid. Thus, AMS-III.D. is applied to the proposed project activity.
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"*	The design of this greenfiield project activity is limited to 1.5MWe/h which is within the limit of the maximum output capacity equivalent to up to 15MW and hence complies with the related and relevant requirements in the "Guideline: General Guidelines for

		SSC CDM methodologies, Version 23[12]".
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"*	The project is a Greenfield project, does not involve the replaced equipment; therefore, this condition is not applicable to the proposed project activity.
7.	*Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO2 equivalent annually from all Type III components of the project activity*	The generation of the project's emission reduction is estimated as 61,243 tCO_2e/y in total. However, the project's emission reduction from all Type III components is estimated as 55,570 tCO_2e/y which is lower than the threshold of 60,000 tCO_2e/y. Therefore, the proposed project activity complies with this condition.

Category I.D.: Grid connected renewable electricity generation.

The Methodology of AMS-I.D. comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:

(a) Supplying electricity to a national or a regional grid; or

(b) Supplying electricity to an identifier consumer facility via national/regional grid through a contractual agreement such as wheeling.

[12] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20190916153417994/MethSSC_guid25.pdf

Also, it is important to note that AMS-I.D. is applicable to the proposed project activity since the project falls under the renewable biomass category as per "Clarifications on Definition of Biomass and Consideration of Changes in Carbon Pools due to a CDM Project Activity[13]" reported in the CDM-EB's 20th Meeting as Annex 8. The Annex clarifies that "biomass also includes gases and liquids recovered from decomposition of non-fossilized and biodegradable organic material."

The methodology is applicable under the following conditions:

Applicability of AMS-I.D. – v18.0			
Ref.		***Application Criteria***	***Applicability***
1.	**(a)**	*Install a Greenfield plant;*	The proposed project activity is implemented as a Greenfield Power Plant at the site where there was no renewable energy power plant operating prior to the implementation of the project activity. Hence, the project implies with this condition.
	(b)	*Involve a capacity addition in (an) existing plant(s);*	N/A
	(c)	*Involve a retrofit of (an) existing plant(s);*	N/A
	(d)	*Involve a rehabilitation of (an) existing plant(s)/unit(s); or*	N/A
	(e)	*Involve a replacement of (an) existing plant(s)*	N/A
2.	**Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:**		

[13] https://cdm.unfccc.int/Reference/Guidclarif/ar/methAR_guid07_v01.pdf

	(a)	*The project activity is implemented in an existing reservoir with no change in the volume of reservoir;*	Since the proposed project activity is not a hydro power plant, this condition is not applicable to the project.
	(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/m2;*	N/A
	(c)	*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/m2*	N/A
3.		*If the new unit 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 new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW*	The proposed project activity only involves biogas power generation system, without non- renewable components, thus this condition is not applicable for the project.
4.		*Combined heat and power (co-generation) systems are not eligible under this category.*	The project activity generates electricity from biogas recovered from animal manure via biogas generators/engines/units and is not a combined heat and power system. Although waste heat generated out of biogas engines may be used to warm the digesters, it is not a cogeneration

		project as per the definition of cogeneration in ACM0018, Version 4.0[14], i.e. a "Cogeneration plant is a heat and power plant in which at least one heat engine simultaneously generates both heat and power". Since there is no heat engine installed within the project boundaries, the proposed project activity shall be considered neither as a cogeneration plant nor a project involving co-generation systems.
5.	*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*	This project activity is a green-field project activity which does not involve addition of renewable energy generation units at an existing renewable power generation facility. Hence, the proposed project activity complies with this condition.
6.	*In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW*	As a greenfield project, the proposed project activity the project activity does not involve retrofit or replacement of an existing facility. Therefore, this condition is met by the project.
7.	*In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the*	Methane is recovered from the type III component of project activity and the baseline for the type I component of project activity is determined in

[14] https://cdm.unfccc.int/UserManagement/FileStorage/ZI5NXTD6R4AQGOC307L82MYEK9JSHV

	recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored	accordance with AMS-I.D. As noted in the fourth applicability condition of AMS-I.D. above - regarding to be co-generation plant-, the proposed project activity aims to recover and utilize the methane from animal manure in digesters via biogas engines/units/generators to generate electricity which will be fed directly to the national grid in Turkey. Thus, the baseline for the electricity component shall be in accordance with procedure prescribed under AMS-I.D.
8.	*In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply*	The proposed project activity's main feedstock is animal manure. Thus, this condition is not applicable to the project.

Apart from the methodologies, following tools are applicable for the project activity:

- Project emissions from flaring – v03.0

Ref.	***Application Criteria***	***Applicability***	***Justification***
1	Methane is the component with the highest concentration in the flammable residual gas; and	Applicable	Methane component is highest in the project case
2	The source of the residual gas is coal mine methane or a gas from a biogenic	Applicable	In this gas source of gas is landfill gas

	source (e.g. biogas, landfill gas or wastewater treatment gas).		

- Tool to calculate the emission factor for an electricity system – v07.0

Ref.	Application Criteria	Applicability	Justification
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, i.e. 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).	Applicable	The project activity substitutes grid electricity by supplying renewable power to grid. Hence this criterion is applicable.
2	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Applicable	Project is not a CDM project.

- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation – v03.0

Ref.	**Application Criteria**	***Applicability***	***Justification***

1	If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity cons	Applicable	Scenario A, *Electricity consumption from the grid* fits for the project activity

2	This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	Applicable	Scenario I, *Electricity is supplied to the grid* fits for the project activity
3	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emissions.	Not Applicable	This does not fit for the project case since it exports the electricity to the grid.

3.3 Project Boundary

As noted above, the baseline and monitoring methodologies applied to the proposed project activity are AMS-III.D. "Methane recovery in animal manure management systems", Version 21.0, and AMS-I.D. "Grid connected renewable electricity generation", Version 18.0.

In accordance with these Methodologies, the project boundary includes:

- The livestock;

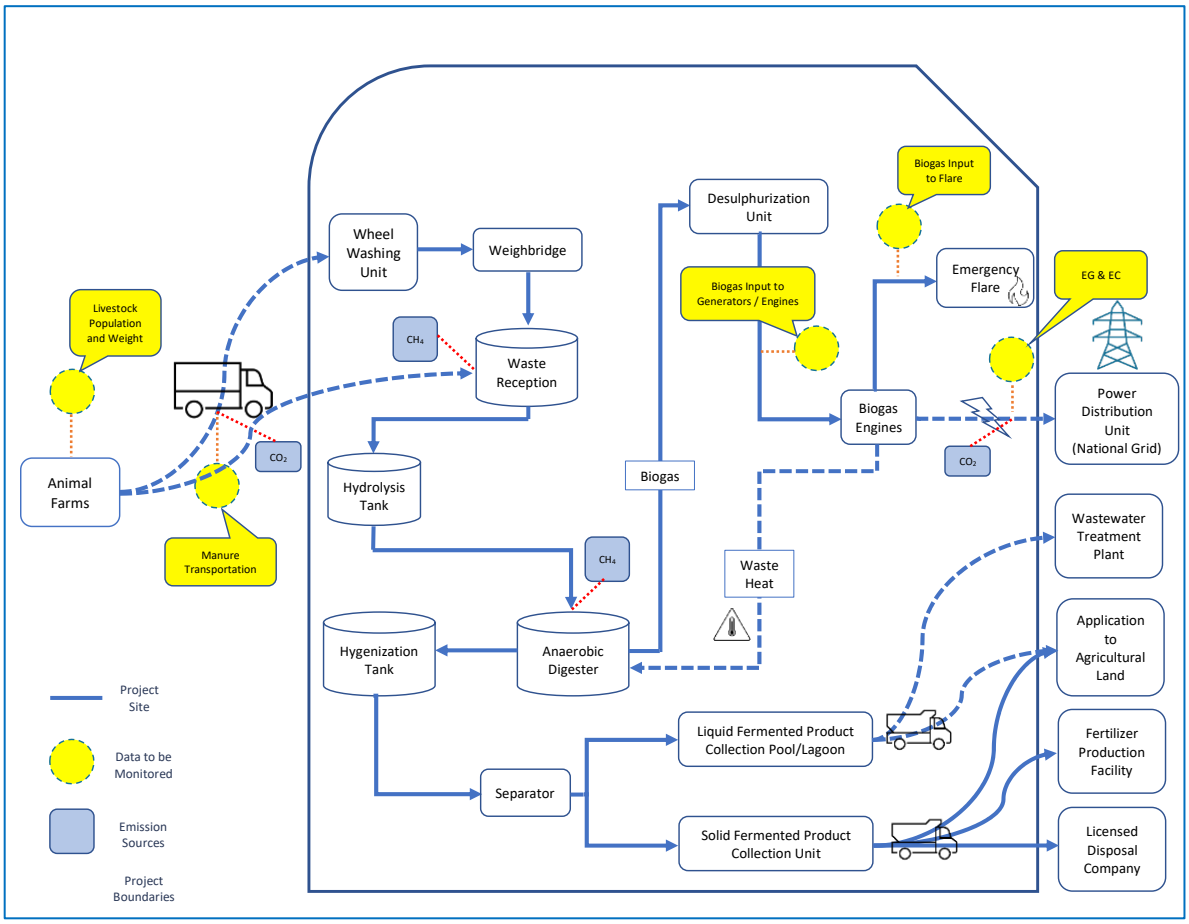
- Animal manure management systems (including centralized manure treatment plant);
- Facilities which recover and flare/combust or use methane;
- The project power plant and all power plants connected physically to the electricity system that the proposed project power plant is connected to.

The relevant GHG sources included in or excluded from the project boundary are shown on the Table below.

Source		Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the manure treatment processes	CO_2	No	Excluded for simplification. This is conservative.
		CH_4	Yes	The major source of emissions in the baseline
		N_2O	No	Direct and indirect N20 emissions are accounted
		Other	-	N/A
	Emissions from electricity consumption / generation	CO_2	Yes	Major source of emissions in the baseline
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		Other	-	N/A
Project	Physical leakage of biogas	CO_2	No	Excluded for simplification.
		CH_4	Yes	Main emission source. Leakage from biogas digester has been considered.
		N_2O	No	Excluded for simplification.
		Other	-	N/A
	Emissions from on-site electricity or fossil fuel use	CO_2	Yes	The emission from use of electricity is accounted for, since the proposed project will consume electricity from the national grid. However, since the proposed project activity does not involve fossil fuel consumption, the emission form use of fossil fuel is not included.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.

Source		Gas	Included?	Justification/Explanation
		Other	-	N/A
	Emissions from flaring or combustion of the gas stream	CO_2	No	The flare system would be used only in exigencies. In case the flare operation, the emission reduction will be excluded during this period, and thus emission source is not included.
		CH_4	No	
		N_2O	No	
		Other	-	N/A
	Emissions from incremental transportation distances	CO_2	Yes	May be an important emission source. Hence, they are accounted.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
		Other	-	N/A
	Emissions from storage of manure	CO_2	No	Excluded for simplification.
		CH_4	No	The anaerobic digesters under the project are constructed close to the animal barns, the manure after removal from the animal barns will be transferred into the anaerobic digesters via pre-treatment pool within same day, so the storage time of manure is less than 24 hours, this source of emissions is not accounted for according to AMS-III.D. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification.
		Other	-	N/A

In addition, the diagram of the project boundary below shows clearly the physical locations of the various installations or management activities taking place as part of the project activity.



3.4 Baseline Scenario

The proposed project activity has two major GHG emission reduction components. The first one is the reduction of methane emissions resulting from improved animal manure management, whilst the second one is the use of biogas recovered from improved animal manure management for generating power and feeding the electricity generated directly to the national electricity grid network.

Primary Component of the Proposed Project Activity as per AMS-III.D., version 21.0

The primary component of the proposed project activity includes improved animal manure management and biogas recovery resulting in the decrease of the extent of methane emissions that emanate from the present mode of animal manure management at the farms whose manure

is supplied to the project. Hence, the applicable baseline as per the approved methodology AMS-III.D., version 21.0, for the first component of the project activity is the following:

- The maximum methane-producing capacity of manure (B_o) varies by species and diet, and
- The organic material in livestock manure measured as Volatile Solids (VS) which consist of both biodegradable and non-biodegradable fractions.

The above parameters are used along with Global Warming Potential of methane, methane density, methane conversion factor, number and type of livestock, fraction of manure handled and correction factors appropriately and the baseline emissions measured in t CO_2e is calculated in a conservative and transparent manner as per the approved methodology AMS-III.D., version 21.0.

With reference to AMS-III.D., version 21.0, for project activities involving methane recovery in animal manure management, the baseline scenario fits well the scenario defined in the paragraph 17 of the approved methodology:

> "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".

The baseline methodology selected approach from paragraph 48 of the CDM modalities and procedures[15] called "existing actual or historical emissions, as applicable" have been applied in the context of the project activity. The approach selected in the baseline methodology checks the additionality of the project activity and determines the baseline emission factor for selected baseline scenario.

The applicable baseline scenario is animal manure being left to decay anaerobically within the project boundary and methane being emitted directly to the atmosphere in the absence of the proposed project activity. The results of the baseline survey which is going to be presented in time of validation as a documentary evidence, confirm that the common practice for livestock farm owners to treat manure generated at their farms is to store manure in uncovered anaerobic lagoons/ponds for several months till manure taking away. As such, the baseline scenario can be characterized as anaerobic lagoon.

[15] https://cdm.unfccc.int/Reference/COPMOP/08a01_abbr.pdf

Identification of Baseline Scenario

As per the paragraph 7 of the approved methodology AMS-III.D., version 21.0, the proposed project activity, as a Greenfield project, compared to the baseline scenario is only eligible if it complies with the related and relevant requirements in the "General guidelines for SSC CDM methodologies", version 23.0[16]. The Section 4.11 of the Guidelines describes the "procedure to determine baseline scenario for Type II and Type III Greenfield projects" which is a 4-step process to be followed in order to determine whether the requirements are met.

Step 1: Identify the various alternatives to the project proponent that deliver comparable levels of service, including the proposed project activity undertaken without being registered as a CDM project activity.

The table 10.14 in Chapter 10, Volume 4 of 2019 Refinement of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[17] provides a list of possible manure management systems for different livestock species, including dairy cattle, non dairy cattle and poultry, three livestock species whose manure is treated in anaerobic digesters by the proposed project activity.

Manure management systems are listed as follow:

- Uncovered anaerobic lagoon;
- Liquid/Slurry, Pit storage;
- Solid storage;
- Dry lot;
- Daily spread;
- Anaerobic Digestion – Biogas;
- Burned for fuel;
- Pasture Range and Paddock.

[16] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20190916153417994/MethSSC_guid25.pdf

[17] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

Step 2: List the alternatives identified in Step 1 that are in compliance with local regulations. Alternatives that are not in compliance with local regulations are excluded that from further consideration.

Uncovered anaerobic lagoon – Current animal waste manure management

The Regulation on Livestock Farms[18] implemented in 2006 in Turkey was vaguely requested the livestock farms to have a lagoon to collect the manure generated at the farms. While the regulation did not prescribe any technical specificity for such lagoons, it was stating that the lagoons' interior walls which stayed underground shall be of concrete foundation -in order to prevent the manure from leaking into ground and underground water sources. Thus, it is justifiable to state that there is currently no legal regulation for the livestock farms to define anaerobic lagoon design.

Both liquid and solid manure generated at cattle and poultry farms are stored in the lagoons for several months till they are evacuated – usually to agricultural fields. This system is compliant with environmental and legal regulations in Turkey and therefore applicable as a baseline and/or alternative scenario for the proposed project activity.

Liquid/Slurry– Excluded due to regulatory requirements

This kind of manure management system is not allowed due to the regulation that requires that manure shall be kept only on concrete made floor.

Pit storage under animal confinements - Excluded due to regulatory requirements

This form of manure management was used to be applied in animal farms. However, in line with the legal regulations made on livestock farms, this form of manure management system is not allowed anymore. Those who had an installed system of this kind had given legal notice to reform their systems accordingly.

[18] https://www.resmigazete.gov.tr/eskiler/2006/08/20060809-4.htm

Solid storage – Excluded due to regulatory requirements

This manure management system is not in line with current regulations, one of which mentioned above, as The Regulation on Livestock Farms[19].

Dry lot - Excluded due to regulatory requirements

Since animal farms in Turkey are mandated to function in confined conditions, store the manure for several months and then spread it in agricultural fields, this alternative is not in compliance with regulatory requirements.

Anaerobic digestion (biogas) – The proposed project activity

In accordance with Chapter 10, Volume 4, Table 10.18 of the Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, anaerobic digester is defined as animal manure with and without straw are collected and anaerobically digested in a containment vessel and/or in covered lagoon.

This is the proposed project activity not being registered as a VERRA/VCS project activity. Due to barriers such as – technological barriers, lack of skilled labour to operatethe facility and prevailing practice, as well as the investment barrier, this system is not applicable for the baseline scenario.

Burned for fuel - Excluded due to regulatory requirements

This manure management system is not in line with current regulations, which is only in confined condition and therefore cannot be considered as an alternative scenario.

Pasture Range and Paddock - Excluded due to regulatory requirements

[19] https://www.resmigazete.gov.tr/eskiler/2006/08/20060809-4.htm

Since animal farms in Turkey are mandated to function in confined conditions, store the manure for several months and then spread it in agricultural fields, this alternative is not in compliance with regulatory requirements.

All the plausible scenarios stated above are in compliance with all mandatory applicable laws and regulatory requirements.

Step 3: **Eliminate and rank the alternatives identified in Step 2 taking into account barrier tests specified in the "Guidelines on the demonstration of additionality of small-scale project activities".**

Uncovered anaerobic lagoon – Current animal waste manure management

As noted earlier, since there is no legal regulation to mandate the livestock farm owners to implement different anaerobic lagoon design and to capture and/or utilize methane generated at these lagoons, the continuum of this common practice -without making any modification of their existing manure management systems which are based on uncovered anaerobic lagoons/ponds- is the most economic, viable and reasonable for cattle farm owners.

Anaerobic digestion (biogas) – The proposed project activity – Eliminated due to technological and investment barriers

This alternative face both investment and technological barriers. Investment barriers relate to the increased levels of manure management complexity and significant capital outlay that are necessary for the installation and operation of anaerobic digester systems. Technological barriers relate to the fact that there are no local providers of this technology and PP would need to rely in international providers for installation and maintenance, which also represents increased investment in time and effort when it comes to implementing a technology that is not locally available. Due the technological and investment barriers for local livestock farm owners, this alternative has to be implemented as a CDM Project Activity.

Step 4: **If only one alternative remains that is not the proposed project activity undertaken without being registered as a CDM project activity and also corresponds to one of the baseline scenarios provided in the methodology, then the project activity is eligible under the methodology. If more than one alternative remains that correspond to a baseline scenario provided in the methodology, choose the alternative with the lowest emissions as the baseline.**

Only one alternative remains that fulfils the requirements. The proposed project activity, as a Greenfield facility, shall, hence, be consideredas eligible under methodology AMS-III.D.,version 21.0, with the baseline scenario being the continuum of uncovered anaerobic lagoons as manure management system.

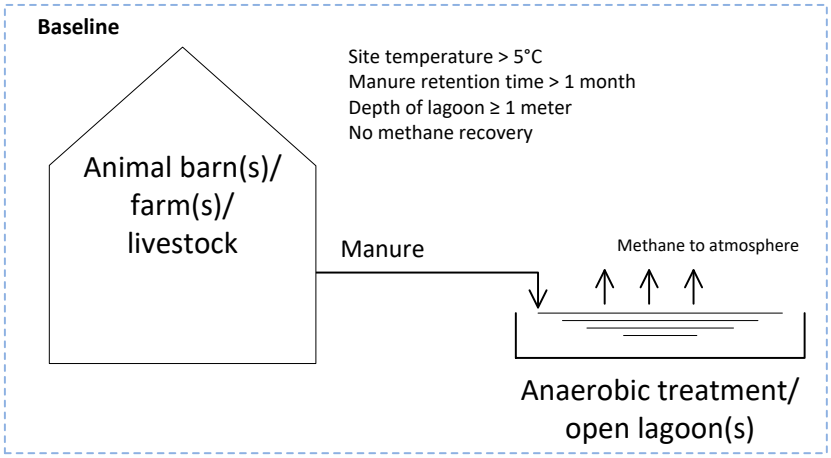


Figure 1: Baseline Scenario

As per AMS III.D, baseline emissions of the uncovered lagoon are calculated using option (a), based on 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. See section 4 for detailed information regarding calculation method, formula and parameters.

Second Component of the Proposed Project Activity as per AMS-I.D., version 18.0

The paragraph 19 of AMS-I.D., version 18.0, defines the baseline scenario for greenfield power plant, like in the case of the proposed project activity, as “the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid”.

Since the source of the power has reduced GHG emissions, the power generated will save the anthropogenic GHG emissions that would have been generated by the fossil fuel based thermal

power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by the second component of the project activity is limited to CO_2 only.

3.5 Additionality

Section 3.13.1. of VCS Standard, v4.1, clearly mandates that "Additionality shall be demonstrated and assessed in accordance with the requirements set out in the methodology applied to the project". Also, same section of para 2 of the VCS Standard V4.1 states that *"the project proponent shall demonstrate to the validation/verification body that the simplified procedure is appropriate to apply to the project considering the project characteristics, including the context in which the project activity takes place."*

Here project proponent would like to ascertain that project limited to a small farms' community and only 28 small farms are part of the project, this makes the project characteristics unique. A list of the farms with their animal capacity has been submitted to the DOE.

The paragraph 15 of the approved methodology of AMS-III.D., version 21.0, applied to the proposed project activity, states 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'".

As noted in the section 3.4, there is no legal regulation in Turkey that requires the collection and destruction of methane from livestock manure. Thus, it is not required to apply the 'Guidelines on the demonstration of additionality of small-scale project activities'. Accordingly, Type III component of the proposed project activity, as methane recovery from animal manure, shall be considered as deemed additional.

Moreover, the paragraph 16 of AMS-III.D., version 21.0. clarifies 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".

Within the boundaries of the Type III component of the proposed project activity, the project captures and utilizes biogas from animal manure in anaerobic digesters to generate electricity

with biogas engines/units with the total installed capacity 1.5 MW, lower than 5 MW. Hence, as per the paragraph 16 of AMS-III.D., version 21.0, 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 proposed project activity which is grid-connected renewable electricity generation. Accordingly, Type I component of the proposed project activity, as grid-connected renewable electricity generation, shall also be considered as deemed additional.

Therefore, the proposed project activity, as per the approved methodology of AMS-III.D., version 21.0, is deemed to be additional without further documents of barriers as per "Guidelines on the demonstration of additionality of small- scale project activities".

3.6 Methodology Deviations

No methodology deviation is applied in the project.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Calculation of Baseline Emissions as per AMS-III.D.

To calculate the baseline emissions, the project proponents propose to utilise the Option 17 (b) presented in the AMS-III.D., version 21.0., Paragraph 17. This is because the project proponent is aware of the existing animal manure management systems i.e, anaerobic lagoon and the IPCC guidelines are utilised for determining the manure characteristics.

The baseline emissions for the manure received from the other animal farms shall be calculated using the Option Para 17 (b) as follows: As per AMS III.D., version 21.0., baseline emissions are determined as follows:

Equation (1)

$$BE_y = GWP_{CH_4} \times D_{CH_4} \times UF_b \times \sum_{j,LT} (MCF_j \times B_{0,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y})$$

Where:

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

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

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

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

$BE_{Other\ Cattle,y}$ = 28 x 0,00067 x 1000 x 0,94 (0,76 x 0,18 x 15821 x 0,8573)

$BE_{Other\ Cattle,y}$ = 32719 tCO_2eq/y

$BE_{Hens,y}$ = 28 x 0,00067 x 1000 x 0,94 (0,76 x 0,39 x 8417 x 0,7641)

$BE_{Hens,y}$ = 33616 tCO_2eq/y

$BE_{animal\ manure\ total,\ y}$ = 32719 + 33616

$BE_{animal\ manure\ total,\ y}$ = 66335 tCO_2eq/y

Calculation of Baseline Emissions as per AMS-I.D.

As per the paragraph 22 of AMS-I.D, version 18., baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected

power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

Equation (2)

$$\boldsymbol{BE_y = EG_{PJ,y} \times EF_{grid,y}}$$

Where:

BE_y = Baseline emissions in year y (t CO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

Since the proposed project activity is the installation of a greenfield power plant, as per the paragraph 26 of AMS-I.D, version 18., $EG_{PJ,y}$ is calculated as follows:

Equation (3)

$$\boldsymbol{EG_{PJ,y} = EG_{PJ,facility,y}}$$

Where:

$EG_{PJ,facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

As per the paragraph 23 of AMS-I.D, version 18., the emission factor shall be calculated in a transparent and conservative manner. The project participants

choose to calculate a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system", version 07.0.

According to the Tool, the "combined margin" emission factor is calculated through the following six steps:

Step (1): Identify the relevant electricity system;

Step (2): Choose whether to include off-grid power plant 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 system

According to the applicable "Tool to calculate the emission factor for an electricity system", version 07.0, the relevant project electricity system has to be identified by the project participants. a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity, and that can be dispatched without significant transmission constraints.

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

According to the applicable "Tool to calculate the emission factor for an electricity system", version 07.0, project participants 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 participants choose Option I and therefore only grid power plants are included in the calculation.

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

According to the applicable "Tool to calculate the emission factor for an electricity system", version 07.0, the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM; or

b) Simple adjusted OM; or

c) Dispatch data analysis OM; or

d) Average OM.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by one of the following two options:

Option A: *Based on the net electricity generation and a CO_2 emission factor of each power unit; or*

Option B: *Based on the total net electricity generation of all power plants serving and the fuel types and total fuel consumption of the project electricity system.*

Ministry of Energy and Natural resources of Turkey has published the data for OM using simple OM calculation[20]

$EF_{grid,OM,y}$ = *0.6993*

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including

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

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

Option 1: *for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PDD submission to the DoE for validation.*

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 proposed project activity, the project participants choose ***Option 1*** *in terms of availability of vintage of data.*

Based on 2018 data, Ministry of Energy and Natural resources of Turkey has calculated build margin and published the data:

[20] https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular//0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf

$$EF_{grid,BM,y} = 0.3812$$

Step 6: Calculate the combined margin emissions factor

According to the applicable "Tool to calculate the emission factor for an electricity system", version 07.0, the calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

The combined margin emissions factor is calculated as follows:

Equation (4)

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

Where:

$EF_{grid,BM,y}$ = *Build margin 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)*

$EF_{grid,CM,y}$ = *Combined margin CO_2 emission factor in year y (t CO_2/MWh)*

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

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

As per the applicable "Tool to calculate the emission factor for an electricity system", version 07.0, the default weights for the operating margin and build margin emission factors for the proposed project activity is defined as:

$w_{OM} = 0.50$

$w_{BM} = 0.50$

Based on 2018 data, Ministry of Energy and Natural resources of Turkey has calculated combined margin and published the data:

$$EF_{grid,CM,y} = 0.5403$$

Hence,

$BE_{EC,y}$ = *10.500 x 0,5403*

$BE_{EC,y}$ = *5.673 tCO2eq/y*

4.2 Project Emissions

Calculation of Project Emissions as per AMS-III.D.

In accordance with AMS-III.D., version 21.0., Project activity emissions consist of:

Equation (5)

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

Where:

PE_y = Project emissions (tCO_2e)

$PE_{PL,y}$ = Emissions due to physical leakage of biogas in year y (tCO_2e)

$PE_{flare,y}$ = Emissions from flaring or combustion of biogas stream in the year y (tCO_2e)

$PE_{power,y}$ = Emissions from use of fossil fuel or electricity for the operation of the installed facilities in the year y (tCO_2e)

$PE_{transp,y}$ = Emissions from incremental transportation in the year y (tCO_2e), as per relevant paragraph in AMS-III.AO

$PE_{storage,y}$ = Emissions from the storage of manure (tCO_2e)

As per the paragraph 21(b) of AMS-III.D., version 21.0., 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 are

determined as, in accordance with the paragraph 23 of the methodological tool "Project and leakage emissions from anaerobic digesters, version 02.0,:

Equation (6)

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

Where:

$PE_{CH4,y}$	*= Project emissions of methane from the anaerobic digester in year y (t CO2e)*
$Q_{CH4,y}$	*= Quantity of methane produced in the anaerobic digester in year y (t CH4)*
$EF_{CH4,default}$	*= Default emission factor for the fraction of CH4 produced that leaks from the anaerobic digester (fraction)*
GWP_{CH4}	*= Global warming potential of CH_4 (t CO_2 /t CH_4)*

As per the paragraph 23 of AMS-III.D., version 21.0., project emissions from electricity and fossil fuel consumption are determined by following the methodological tool "Project and leakage emissions from anaerobic digesters", version 02.0., where $PE_{power,y}$ is the sum of $PE_{EC,y}$ and $PE_{FC,y}$ in the tool.

In accordance with the technical feasibility report of the proposed project activity, a small portion of the electricity consumed as auxiliary shall be used from on-site electricity generation. This portion will be monitored accordingly and $PE_{EC,y}$ will be accounted as zero.

Nevertheless, the rest of the electricity consumed at the plant will be supplied by the Turkish national grid. Hence, as per the paragraph 19 of the methodological tool

"Project and leakage emissions from anaerobic digesters", version 02.0., the project participants chose Option 1: Procedure using monitored data in the paragraph 20 of the tool which states that $PE_{EC,y}$ shall be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", where the project emission source j referred to in the tool is the total electricity consumption associated with the anaerobic digestion facility.

Accordingly,

$PE_{PL,y}$= 3015 x 0,028 x 28

$PE_{PL,y}$= 2364 tCO_2eq/y

Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 03.0. In accordance with the Tool, in the generic approach, project emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as follows:

Equation (7)

$$\boldsymbol{PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EF,j,y} \times \left(1 + TDL_{j,y}\right)}$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in year y (t CO_2 / yr)

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

$EF_{EF,j,y}$ = Emission factor for electricity generation for source j in year y (t CO_2/MWh)

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

j = Sources of electricity consumption in the project

Accordingly,

$PE_{power,y}$= 612 x 0,5403 x (1 + 0,11)

$PE_{power,y}$= 367 tCO_2eq/y

As per the paragraph 22 of the methodological tool "Project and leakage emissions from anaerobic digesters", version 02.0., which determines project emissions from fossil fuel consumption ($PE_{FC,y}$), states that where the anaerobic digester facility uses fossil fuels, project participants shall calculate $PE_{EC,y}$ using the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". However, since in the proposed project activity the anaerobic digester facility does not use fossil fuels, $PE_{FC,y}$ will be accounted as zero.

In accordance with the paragraph 22 of AMS-III.D., version 21.0., in the case of flaring of the recovered biogas, project emissions are estimated using the procedures described in the methodological tool "Project emissions from flaring", version 03.0. If the recovered biogas is combusted for electrical/thermal energy production or for other gainful use, the methane destruction efficiency can be considered as 100%. However, this use of the recovered biogas shall be included in the project boundary and its output shall be monitored in order to ensure that the recovered biogas is actually destroyed, even if the emission reductions from this component are not claimed.

In the proposed project activity, an enclosed flare will be installed. The flare is installed for the case of emergency and malfunction in the plant. Thus, $PE_{flare,y}$ is considered as zero. Nevertheless, the monitoring plan of the facility shall measure the quantity of captured methane fed to the flare. If such measurement is positive, the emissions from flaring the biogas shall be determined following the procedure described in the methodological tool project emissions from flaring, version 03.0.

Equation (8)

$$PE_{flare,y} = GWP_{CH4} \times \sum_{m=1}^{525600} F_{CH4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

$PE_{flare,y}$	= Project emissions from flaring of the residual gas in year y (tCO_2e)
GWP_{CH4}	= *Global warming potential of methane valid for the commitment period (tCO2e/tCH4)*
$F_{CH4,RG,m}$	= *Mass flow of methane in the residual gas in the minute m (kg)*
$\eta_{flare,m}$	= *Flare efficiency in minute m*

As per the paragraph 24 of AMS-III.D., version 21.0., 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:

(a) The storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester;

(b) The dry matter content of the manure when removed from the animal barns is less than 20%.

Since the storage time of the manure after removal from the animal barns, including transportation, exceeds 24 hours before being fed into the anaerobic digester in the proposed project activity, $PE_{storage, y}$ shall be accounted as zero.

In accordance with AMS-III.D., version 21.0., $PE_{transp,y}$ is calculated as per the paragraph 14 of AMS-III.AO, version 01.0., which states project emissions due to incremental transport distances ($PE_{transp,y}$) are calculated based on the incremental distances between:

Equation (9)

$$\boldsymbol{PE_{transp,y} = \left(Q_y / CT_y\right) \times DAF_w \times EF_{CO2,transport}} + \boldsymbol{\left(Q_{res.waste,y} / CT_{res.waste,y}\right) \times DAF_{res.waste} \times EF_{CO2,transport}}$$

Where:

Q_y = Quantity of raw waste/manure treated and/or wastewater co-digested in the year y (tonnes)

CT_y = Average truck capacity for transportation (tonnes/truck)

DAF_w = Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)

$EF_{CO2,transport}$ = CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default values or local values may be used)

$Q_{res.waste,y}$ = Quantity of residual waste produced in year y (tonnes) (accounted as zero)

$CT_{res.waste,y}$ = Average truck capacity for residual waste transportation (tonnes/truck)

$DAF_{res.waste}$ = Average distance for residual waste transportation (km/truck)

Accordingly,

$PE_{trans,y}$ = (98375 / 21) x 7 x 0,245

$PE_{trans,y}$ = 8034 tCO_2eq/y

Calculation of Project Emissions as per AMS-I.D.

As per the paragraph 39 of AMS-I.D., version 18.0., for most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most

recent version of "ACM0002: Grid-connected electricity generation from renewable sources":

(a) Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);

(b) Emissions from water reservoirs of hydro power plants.

As per the paragraph 40 of AMS-I.D., CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". Also, the paragraph 41 of AMS-I.D. states that in case biomass is sourced from dedicated plantations, the procedures in the tool "Project emissions from cultivation of biomass" shall be used.

Since none of the exception stated in the relevant paragraphs of AMS-I.D. mentioned above is applicable to the proposed project activity, PE_y as per AMS-I.D., version 18.0., shall be accounted as zero.

4.3 Leakage

Calculation of Leakage Emissions as per AMS-III.D.

As per the paragraph 26 of AMS-III.D., version 21.0., it is determined by following the relevant procedure in the methodological tool "Project and leakage emissions from anaerobic digesters", version 02.0.

The footnote 1 of the methodological tool "Project and leakage emissions from anaerobic digesters", version 02.0., states that 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, since both the storage of digestate is occurring within the project boundary and no composting is applied to the proposed project activity, LE_y shall be accounted as zero.

Calculation of Leakage Emissions as per AMS-I.D.

As per the paragraph 39 of AMS-I.D., version 18.0., general guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues.

Since the methodological tool "Project and leakage emissions from biomass", version 04.0, is regarding the use of biomass residues which is not applicable to the proposed project activity, LE_y as per AMS-I.D., version 18.0., shall be accounted as zero.

4.4 Net GHG Emission Reductions and Removals

To Be Calculated (TBC)

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)
Year 1	72,008	10,765	0	61,243
Year 2	72,008	10,765	0	61,243
Year 3	72,008	10,765	0	61,243
Year 4	72,008	10,765	0	61,243
Year 5	72,008	10,765	0	61,243
Year 6	72,008	10,765	0	61,243
Year 7	72,008	10,765	0	61,243
Year 8	72,008	10,765	0	61,243
Year 9	72,008	10,765	0	61,243
Year 10	72,008	10,765	0	61,243
Total	**720,080**	**107,650**	**0**	**612,430**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	D_{CH4}
Data unit	*t/m³*
Description	*Density of methane*
Source of data	*AMS-III.D. Version 21.0, paragraph 18*[21]
Value applied	*0.00067*
Justification of choice of data or description of measurement methods and procedures applied	*0.00067 t/m³ at room temperature 20°C and 1 atm pressure*
Purpose of Data	*Used in* • *Calculation of baseline emissions*
Comments	-

Data / Parameter	GWP_{CH4}
Data unit	*t* CO_2e/t CH_4
Description	*Global Warming Potential for* CH_4
Source of data	*IPCC Fifth Assessment Report, Synthesis Report, page 87*[22]
Value applied	*28*
Justification of choice of data or description of	*Default value from IPCC is used as per the applied methodology and as per Version 4.1 of the VCS Standard*[23]

[21] https://cdm.unfccc.int/UserManagement/FileStorage/1AWXEKHVTYF423LCN56Z9GIMQOS8JR

[22] https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

[23] https://verra.org/wp-content/uploads/2021/04/VCS-Standard_v4.1.pdf

measurement methods and procedures applied	
Purpose of Data	*Used in* • *Calculation of baseline emissions* • *Calculation of project emissions*
Comments	*In Version 4.1 of the VCS Standard, an update to VCS rules requires use of global warming potential values from the IPCC Fifth Assessment Report (updating from the Fourth Assessment Report) for calculating greenhouse gas (GHG) emission reductions. This update is consistent with the Paris Agreement and other carbon crediting programs[24].*

Data / Parameter	UF_b
Data unit	*Fraction*
Description	*Model correction factor*
Source of data	*AMS-III.D. Version 21.0, paragraph 18[25]*
Value applied	*0.94*
Justification of choice of data or description of measurement methods and procedures applied	*Model correction factor to account for model uncertainities*
Purpose of Data	*Used in* • *Calculation of baseline emissions*
Comments	-

Data / Parameter	MCF_j
Data unit	*Fraction*

[24] https://verra.org/vcs-standard-v4-1-will-scale-up-finance-for-climate-mitigation/

[25] https://cdm.unfccc.int/UserManagement/FileStorage/1AWXEKHVTYF423LCN56Z9GIMQOS8JR

Description	*Annual methane conversion factor (MCF) for the baseline animal manure management system j*
Source of data	Obtained from 2019 Refinement to 2006 IPCC *Guidelines for National Greenhouse Gas Inventories (IPCC 2019), Volume 4, Chapter 10, Table 10.17 (Updated), page 67*[26]
Value applied	*0.76*
Justification of choice of data or description of measurement methods and procedures applied	*For the project location, Kayseri province in Turkey,* *Mean annual temperature is 10.7°C*[27]*;* *Mean annual precipitation (MAP) is 389.3*[28]*;* *Potential Evapotranspiration (PET) is 1,026.5*[29]*.* *Hence, in accordance with Information Required to Determine Climate Zones According to Chapter 10 of Volume 4 Current Guideline of IPCC 2019, page 10.129, Kayseri is considered as Warm Temperate Dry as its climate zone.* *j is Uncovered anaerobic lagoon. Thus, $MCF_{uncovered\ anaerobic\ lagoon}$ is accounted as 0.76*
Purpose of Data	*Used in* • *Calculation of baseline emissions*
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	*m^3CH_4/kg-dm*
Description	*Maximum methane producing potential of the volatile solid generated for animal type 'LT'*

[26] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

[27] https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=A&m=KAYSERI

[28] https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=A&m=KAYSERI

[29] Obtained from the Project Detailed Feasibility Study which will be submitted to the DoE at the time of validation and verification.

Source of data	*IPCC 2019, Volume 4, Chapter 10, Table 10.16, page 10.66*
Value applied	*For Other Region – High Productivity Systems (PS),* *Dairy Cattle: 0.24;* *Non Dairy Cattle: 0.18;* *Chicken Layer (Hens): 0.39*
Justification of choice of data or description of measurement methods and procedures applied	In accordance with the 2019 Refinement, Turkey is regarded under Middle East region.
Purpose of Data	*Used in* • *Calculation of baseline emissions*
Comments	-

Data / Parameter	$EF_{CO2,transport}$
Data unit	gCO_2/t km
Description	Default CO_2 emission factor for freight transportation
Source of data	*Methodological tool: Project and leakage emissions from transportation of freight Version 1.1.0*[30]
Value applied	*245*
Justification of choice of data or description of measurement methods and procedures applied	*Default value for light vehicles is selected. Selection is conservative compared to heavy vehicles and in agreement with the type of vehicles to be used for the project transportation activities.*
Purpose of Data	*Used in* • *Calculation of project emissions*
Comments	-

[30] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf

Data / Parameter	$EF_{CH4,default}$
Data unit	*Fraction (t CH_4 leaked / t CH_4 produced)*
Description	*Default emission factor for the fraction of CH4 produced that leaks from the anaerobic digester*
Source of data	*Methodological Tool: Project and leakage emissions from anaerobic digesters, Version 02.0*[31]
Value applied	*0.028*
Justification of choice of data or description of measurement methods and procedures applied	*Digesters with steel or lined concrete or fiberglass digesters and a gas holding system (egg shaped digesters) and monolithic construction.*
Purpose of Data	*Used in* • *Calculation of project emissions*
Comments	-

Data / Parameter	$EF_{CO2,grid,y} = EF_{EF,j,y}$
Data unit	tCO_2e/MWh
Description	Emission factor for the Turkish National Grid
Source of data	*Published data from The Ministry of the Energy and Natural Resources in Turkey*[32]
Value applied	*0.5403*
Justification of choice of data or description of	*Obtained from the most recent official national grid emission factor data published by the Ministry of the Energy and Natural Resources in Turkey*[33]

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

[32] https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf

[33] https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf

measurement methods and procedures applied	
Purpose of Data	Used in • Calculation of baseline emissions • Calculation of project emissions
Comments	-

Data / Parameter	$TDL_{j,y}$
Data unit	-
Description	*Average technical transmission and distribution losses for providing electricity to source j in year y*
Source of data	*Calculated from the Data Provided by Turkish Electricity Transmission Corporation (TEİAŞ)[34] in accordance with Methodological Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3.0[35]*
Value applied	*0.11*
Justification of choice of data or description of measurement methods and procedures applied	*The annual average value based on the most recent data available within Turkey is used from the data provided by TEİAŞ. In accordance with the Methodological Tool, for the data from the relevant year, 2021, is absence, most recent figures are used, but not older than 5 years. Accordingly, the annual network losses for the years of 2019, 2018, and 2017 are taken into account in calculating $TDL_{j,y}$.*
Purpose of Data	*Used in* • *Calculation of project emissions*
Comments	-

[34] https://webapi.teias.gov.tr/file/512cbf1d-0ca3-4492-b901-3722c7b682f7?download

[35] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

5.2 Data and Parameters Monitored

Data / Parameter	VS
Data unit	*kg-dm/animal/day*
Description	*Volatile solid excretion rate per day on a dry-matter basis for a defined livestock population*
Source of data	*Lab log book records*
Description of measurement methods and procedures to be applied	*Volatile solids will be measured at laboratory at project site*
Frequency of monitoring/recording	*Daily, accumulated to monthly records*
Value applied	-
Monitoring equipment	*The three main equipment used to determine volatile solid excretion rate in animal waste are as follow:* • *Muffle Furnace: MagmaTherm MTP-1100-20-P PRIMARY 1100 °C Kamara;* • *Dry air sterilizer ELEKTROMAG M5040 P;* • *Radwag Balances and Scales Model AS 220.R2*
QA/QC procedures to be applied	Log book records of Laboratory will be checked for cross verification
Purpose of data	Calculation of baseline emissions
Calculation method	Analysis has been performed in line with the "Standard for sampling and surveys for CDM project activities and programme of activities, Version 09.0[36]" and the Annex 2: 'Method for

[36] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210531160756223/Meth_Stan05.pdf

	determination for Volatile Solids in animal waste' of the approved baseline and monitoring CDM methodology of AM0073: "GHG emission reductions through multi-site manure collection and treatment in a central plant, Version 1.0[37]".
Comments	-

Data / Parameter	$Q_{CH4,y}$
Data unit	tCH_4/y
Description	*Quantity of methane produced in the anaerobic digester in year y (t CH4/y)*
Source of data	Project developer records
Description of measurement methods and procedures to be applied	*The scada software system which is an automized control panel providing data on biogas production processes at the site instantaneously, provides the data on the amount of biogas produced in the anaerobic digesters, along with the methane content in the biogas. These data will be exported daily and recorded to the analyzer's logbook.*
Frequency of monitoring/recording	Annually, based on daily records, monthly aggregation
Value applied	3,015 tCH_4/y
Monitoring equipment	*The two main equipment used to determine Quantity of methane produced in the anaerobic digester are as follow:* • *Flow meter of blower (Proline Prosonic Flow B 200 HART) which provides an instantaneous data on the amount of biogas sent to the biogas engines from the anaerobic digesters;* • *Gas analyzer (AwiFLEX Cool+/XL) which provides an instantaneous data on the methane content in the biogas sent to the biogas engines*
QA/QC procedures to be applied	Flow meter of the blower and the gas analyser's data exported from the scada software linked to the blower's daily and recorded to the log book will be for cross verification

[37] https://cdm.unfccc.int/methodologies/DB/2N19WQ6DCXNYRNJVZQQOHG7TK0Q2D8

Purpose of data	Calculation of project emissions
Calculation method	*In accordance with the Paragraph 16 of the Tool, Option 1: Procedure using monitored data is chosen to determine quantity of methane produced in the anaerobic digester in year y.*
Comments	

Data / Parameter	FE
Data unit	%
Description	The flare efficiency
Source of data	Log book records
Description of measurement methods and procedures to be applied	A flow meter has been installed to measure flare efficiency
Frequency of monitoring/recording	Once per minute
Value applied	
Monitoring equipment	NA ENT MAKİNA (Flare 850 Assy)
QA/QC procedures to be applied	Regular maintenance will be carried out according with manufacturer recommendation to ensure optimal flare operation.
Purpose of data	Calculation of project emissions
Calculation method	90% when the following two conditions are met to demonstrate that the flare is operating: - the temperature of the flare (TEG,m) and the flow rate of the residual gas to the flare (FRG,m) is within the manufacturer`s specification for the flare (SPECflare)in

	minute m; - The flame is detected in minute m (Flamem) 0% otherwise
Comments	Will be measured in case of flaring

Data / Parameter	$Q_{manure,LT,y}$
Data unit	Tonnes-dm/year
Description	Quantity of manure treated from livestock type *LT* at animal manure management system *j*
Source of data	On-site measurement / logbook records
Description of measurement methods and procedures to be applied	Each manure load transported to the site will be measured with weight balance / or truck load capacity. In case of weigh bridge failure. Rated capacity of truck load will be considered for the calculation
Frequency of monitoring/recording	Each manure load transported to the site will be measured
Value applied	98,375
Monitoring equipment	Weigh bridge scales at the entrance and/or truck load capacity and trip aggregation
QA/QC procedures to be applied	The monitored equipment will be calibrated periodically according with manufacturer's recommendations or local/international standard to ensure accuracy and data will be recorded and backed-up.
Purpose of data	Calculation of baseline emissions
Calculation method	
Comments	

Data / Parameter	$Q_{manure,AF,y}$
Data unit	Tonnes-dm/year
Description	Quantity of manure treated from livestock type AF at animal manure management system *j*
Source of data	On-site measurement / logbook records
Description of measurement methods and procedures to be applied	Manure will be supplied through pipeline from Aksa Tarım Cattle Farm. Flow meter will be installed to measure Volume and density of the manure supplied. Quantity will be calculated by using volume and density.
Frequency of monitoring/recording	Continuous, aggregated to monthly
Value applied	-
Monitoring equipment	Flow meter
QA/QC procedures to be applied	The monitored equipment will be calibrated periodically according with manufacturer's recommendations or local/international standard to ensure accuracy and data will be recorded and backed-up.
Purpose of data	Calculation of baseline emissions
Calculation method	
Comments	

Data / Parameter	$PE_{power,y}$
Data unit	MWh/yr
Description	Parameters related to emissions from electricity and/or fuel consumption in year *y*

Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Monthly bill supplied by electricity authority
Frequency of monitoring/recording	Continuous measurements and monthly recorded.
Value applied	
Monitoring equipment	This parameter will be monitored using energy meter Class 0.5S
QA/QC procedures to be applied	The monitored equipment will be calibrated periodically according with manufacturer's recommendations or local/international standard to ensure accuracy and data will be recorded and backed-up.
Purpose of data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	CT,y
Data unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	Capacity is assessed from the rated load capacity of the truck

Frequency of monitoring/recording	A fixed value is assumed until operator practices are observed to change and a new measurement is warranted.
Value applied	21
Monitoring equipment	Truck manufacturer's specifications and loader operator's observations.
QA/QC procedures to be applied	Value is within the rated capacity of the truck and is thus conservative.
Purpose of data	Calculation of project emissions
Calculation method	
Comments	Ex ante value estimated according to specifications of on-site truck. The procedure is considered appropriate given that no other practical methods exist which would materially improve accuracy.

Data / Parameter	DAFw
Data unit	Km/truck
Description	Average incremental distance for raw solid manure transportation
Source of data	Project developer measurements of distance
Description of measurement methods and procedures to be applied	Direct measurement of the distance between the collection point of manure to manure discharge point
Frequency of monitoring/recording	A fixed value is assumed until the locations of the collection point and discharge point are changed.
Value applied	7

Monitoring equipment	Google map
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method	
Comments	In case of any changes in the source of manure it will be logged and recorded electronically for the crediting period plus two years.

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meter / Bill generated
Description of measurement methods and procedures to be applied	This parameter will be monitored energy meter Class 0.5S
Frequency of monitoring/recording	Continuous measurements and monthly recorded.
Value applied	10,500
Monitoring equipment	This parameter will be monitored using energy meter Class 0.5S
QA/QC procedures to be applied	The monitored equipment will be calibrated periodically according with manufacturer's recommendations or local/international standard to ensure accuracy and data will be recorded and backed-up.

Purpose of data	Calculation of project emissions
Calculation method	
Comments	

5.3 Monitoring Plan

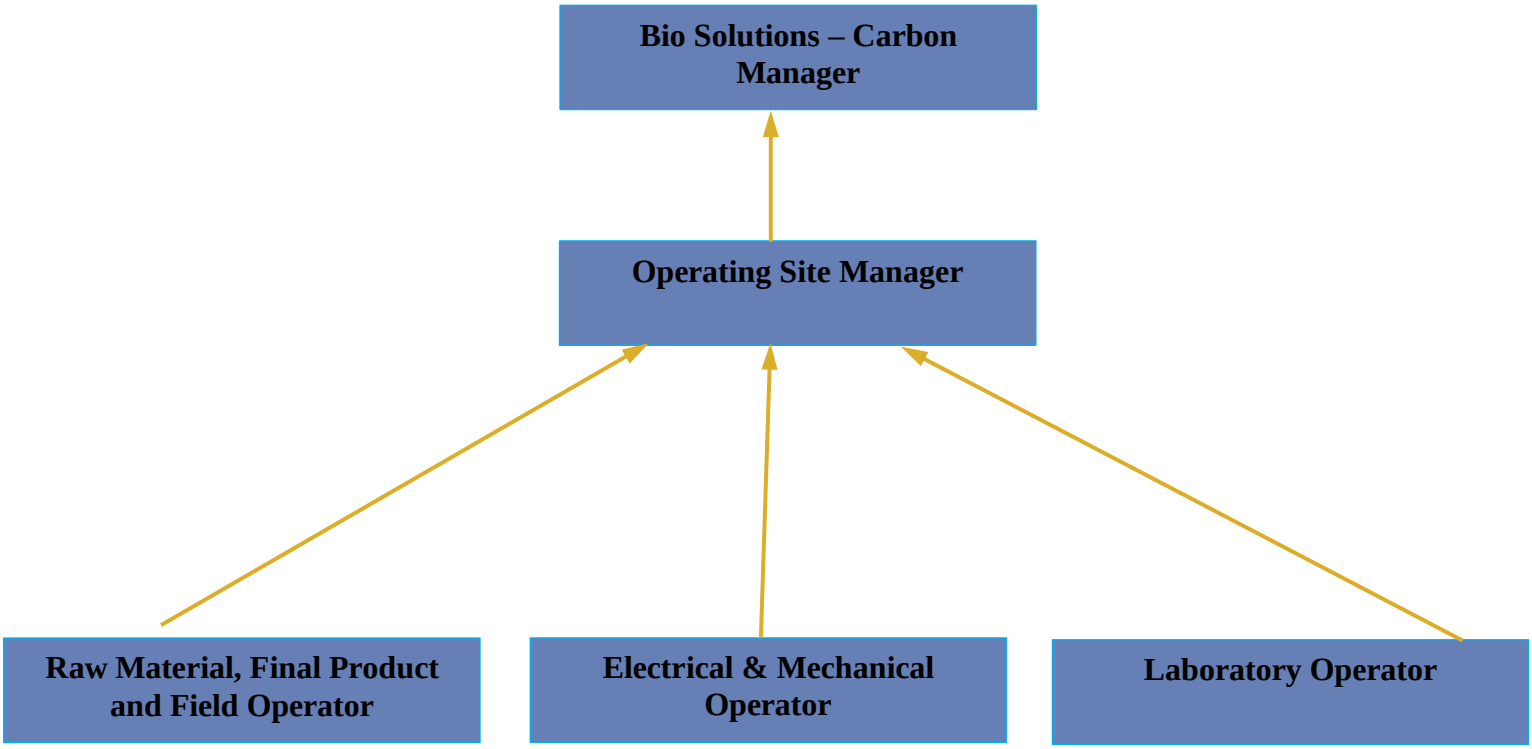
TBR

Methods for measuring, recording, storing, aggregating, collating and reporting data and parameters:

The biogas plant is computerized management and control system includes: the management of the automatic loading of the fermenters, including the management of the quantities; monitoring of level management in gas meters through the level indicators; monitoring and control of the heating system; alarm management of minimum and maximum levels and security; and monitoring of the data analysis of the biogas analysis. With regards to the electricity generation component of the project, given that it dispatches electricity to the National Grid, measuring, recording, storing, aggregating, collating and reporting data and parameters will follow the procedure described by the authorities.

Organizational structure, responsibilities and competencies of the monitoring personnel:

The operators of the methane recovery and electricity generation system will be responsible for collecting all data monitored on-site. The operating and maintenance personnel will be skilled technicians, with extensive experience in equipment operation, maintenance and calibration, and emergency procedures. Overall responsibility for the monitoring and maintenance of all required tasks and their adequate management lies with the project manager. Detailed roles and responsibilities of the relevant staff involved in VCS monitoring are placed. Furthermore, this staff will receive relevant training, if required, to ensure that monitoring duties will be performed by trained staff.



Quality Assurance and Quality Control:

Quality control and quality assurance procedures will guarantee the quality of monitored data. All data will be archived electronically, and backed up regularly.

All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period. Regarding the monitoring equipment of the methane recovery component of the project, maintenance and calibration will be performed in line with manufacturers' recommendations. With regards to the electricity meter, as mentioned above, it is a high accuracy measurement device/s and meets all relevant metrological requirements prescribed by the state authority. Procedures for maintenance of the meter will be conducted in accordance with national procedures and standards.

Emergency Preparedness:
Operation Manager ensures that the personnel of the Project owner acquires the skills to carry out these tasks properly through capacity building practices and trainings and handling any emergency situation.
The all staff receives health and safety trainings to minimise exposure to workplace hazards. At every shift, at least one trained technical personnel is present. All relevant information such as data files, maintenance and defect records and other monitoring related records is kept at a designated location in a transparent and organised manner.

6 APPENDIX