Gold Standard for the Global Goals

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS4817
Title of the project (s) covered by monitoring report	SÜTAS TIRE BIOGAS PLANT
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	08
Version number of the monitoring report	06
Completion date of the monitoring report	22/05/2025
Date of project design certification	21/06/2022
Date of Last Annual Report	-
Monitoring period number	1st Monitoring Period of 1st Crediting Period
Duration of this monitoring period	22/08/2022 – 31/05/2024 (21 months)
Project Representative	ENFAŞ ENERJİ ELEKTRİK ÜRETİM A.Ş. (Project Owner) GTE KARBON SUSTAINABLE ENERJI EGITIM DANISMANLIK VE TICARET A.S. (Project Developer)
Host Country	Türkiye
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission

	Reduction from Manure Management Systems and Municipal Solid Waste[1]
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 7	Production of Clean Energy	31,051	MWh
SDG 8	Creating Employment Opportunities	23	People
SDG 12	Ensure Sustainable Consumption and Production Patterns	267,666	tonnes
SDG 13	CO_2 Emission Reductions	197,821	tCO_2

[1] https://globalgoals.goldstandard.org/421-wm-ghg-emission-reductions-from-manure-management-systems-and-municipal-solid-waste/

Table 2 – Product Vintages

		Amount Achieved			
Start Dates	**End Dates**	**VER (tCO_2)**	**Electricity (MWh)**	**People**	**Total Waste (tonnes)**
22/08/2022	31/12/2022	63,549	5,496	23	51,564
01/01/2023	31/12/2023	104,583	17,907	23	153,441
01/01/2024	31/05/2024	29,689	7,648	23	62,661

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

The owner of the project is ENFAS Enerji Elektrik Üretim A.Ş. which is a subsidiary of SUTAS Group. SUTAS Group is one of the major companies in dairy products sector in Turkey and has several cattle farms for supply of milk to their production plants. There exist several cattle farms near the plant. Manure from these farms is used in biogas plant to generate electricity and output from digesters is used as fertilizer in nearby agricultural land.

The project activity is a biogas-to-energy and generates renewable energy by capturing biogas from cattle manure, chicken manure and agricultural wastes -via anaerobic digestion- and utilising it to produce thermal and electric energy through cogeneration systems. The project was implemented by Sütaş A.Ş. in İzmir province and aims to provide an environmentally friendly solution to this manure management problem. Prior to the project activity, baseline situation, cattle, chicken manure generated at farms managed by lagoons and agricultural wastes left in agricultural lands. Hence.

- The situation of cattle and chicken manure is simply with the applied methodology which states "This methodology is applicable to manure management on one or multiple livestock farms where the existing anaerobic manure treatment system, within the project boundary, is replaced by one or a combination of more than one animal waste management systems (AWMSs) that result in less GHG emissions compared to the existing system"
- The situation of agricultural waste complies with the applied methodology which states "In case of co-digestion, for one or more sources of substrates, it cannot be demonstrated that the organic matter would otherwise have been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero,"

In addition, there was no biogas plant in the region before this project and there was no anaerobic biogas generation activity too. Hence the project became a Greenfield Project activity in terms of biogas generation within the region. In terms of quantum of waste handled within project activity, SÜTAS Tire Biogas Plant project has operated with 267,666 tonnes waste including 87,013 tonnes agricultural and 168,372 tonnes manure waste and 12,281 tonnes WWTP sludge in the monitoring period.

The biogas released during the biodegradation of organic wastes is used for electricity and heat production in cogeneration unit. Installed capacity of the project is 4.380 MWm / 4.268 (with four gas motors, 4 x 1.067 MWe, license date is 01/09/2016). During the monitoring period 31,051 MWh electricity and 25,435 tonnes steam is generated. Corresponding emission reduction for the monitoring period (1st MP) is 197,821 tCO2 which is 117,264 tCO2 as annual average.
Main goals of the project are;

- Waste collected from the animal shelters is decomposed and turned in to more stable state fertilizer, which is environmentally favorable and odorless,
- Heat demand of the facility is met
- Biogas from cattle excrement is used to produce clean electrical energy,
- The obtained fertilizer has less odor compared to present fertilizers and contains more free nitrogen (N)

Prior to the start of the project activity manure from the farms were being washed out from underneath the animal barns and stored in anaerobic lagoons which allowed the manure to decay and emit methane to the atmosphere along with several other toxic gases. Such applications also bear the risk of lagoon overflow due to increased rainfalls, strong winds or improper construction.
In the baseline scenario manure from the farms were being left to decay in anaerobic lagoons or spread over the fields.
By the implementation of the project, the unattended manure is now collected daily and treated in a way that it no longer emits excessive amounts of methane. Methane potential of the manure is harnessed in the biogas plant and the captured methane is used to generate electricity through combustion in a co-generation unit. The produced electricity contributes to reduction of GHG emissions through fossil fuel combustion and also the produced heat is utilized in the project owner's dairy facility, replacing some of the natural gas which was being used for heating in the baseline scenario.

Table 1. Milestones for SÜTAS Tire Biogas Plant

Milestone	Date
Construction Agreement	02/12/2014
Gas Engine Agreement	29/12/2015
LSC Meeting	19/01/2016

Lincense Approvement	01/09/2016
Provisional Acceptance Protocol (all gas engines and heat boilers)	14/10/2016
EIA Report	23/08/2017
Expected Start Date of First Crediting Period	01/06/2022

A.2. Location of project

Tire District, Organize Sanayi Bölgesi Mah. Tosbi Yol 4 Sokak No:6/8 TİRE / İZMİR

Figure 1. Location of the project

	E	N
1	562734.98	4219688.01
2	562756.87	4219688.04
3	562756,84	4219706.63
4	562734.95	4219706.60

The Project's coordinates can be seen on the Table above (Ref: License of the project).

Coordinates of Manure Supplier Farms Which Have Agreements Between Project With Annual Animal Number Details

Name of the Farm	Type of the Farm	Final Contract Year	Latitude	Longitude	Distance to project site
İzmir Province Brood Cattle Farm	Cattle	2022	38°07'51"N	27°38'35"E	7.4
Ragyu Cattle Farm	Cattle	2022	38°04'17"N	27°12'40"E	82.4
Cactus Cattle Farm	Cattle	2022	38°04'30"N	27°14'55"E	63.9
Kamil Doğan	Cattle	2023	38°08'33"N	27°54'49"E	23.9
Omega Milk Agriculture Farm	Cattle	2024	38°04'44"N	27°11'00"E	64.3
Defne Agriculture and Animal Husbandry	Cattle	2023	38°07'53"N	27°40'03"E	5.2
Işık Egg Farm	Poultry	2023	38°28'19"N	27°36'19"E	56.1
Çetinel Kardeşler	Cattle	2024	38°06'26"N	27°27'41"E	24.1
Migros Tic. A.Ş.	Cattle	2024	38°06'37"N	27°27'42"E	24.1
Volkan Güler Egg Farm	Poultry	2024	38°04'15"N	27°12'43"E	62.3

Hatice Güler (Supplier)	Cattle	2024	38°13'48"N	27°58'29"E	44
Ercanlar Egg Farm	Poultry	2024	38°36'59.0"N	27°06'25"E	129
Şerif Demir (Supplier)	Cattle	2024	38°05'03.8"N	27°44'30.9"E	5.4
İzmir Pasteurized Egg Ind.	Poultry	2024	38°20'56"N	26°43'23"E	115

The farthest farm to the project site is 129 km as it could be checked from the coordinates given above. To be on the safe side the longest distance used for the project emissions due to transportation of all wastes.

A.3. Reference of applied methodology

The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[2] (v1.0).

Referred tools

"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", Version 03.0[3]

"Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", Version 03.0[4]

"Project emissions from flaring", Version 03.0[5]

"Project and leakage emissions from anaerobic digesters", Version 02.0[6]

"Project and leakage emissions from biomass", Version 04.0[7]

[2] https://globalgoals.goldstandard.org/421-wm-ghg-emission-reductions-from-manure-management-systems-and-municipal-solid-waste/
[3] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf
[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v3.0.pdf
[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf
[7] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v4.pdf

"Tool to calculate the emission factor for an electricity system", Version 07.0[8]
"Tool to determine the remaining lifetime of equipment", Version 01[9]
"Project and leakage emissions from road transportation of freight", Version 01.1.0[10]
"Combined tool to identify the baseline scenario and demonstrate additionality", Version 07.0[11]
"Emissions from solid waste disposal sites", Version 08.0[12]

A.4. Crediting period of project

Start date of the crediting period of 5 years had been stated as 01/06/2022 however this date is postponed to 22/08/2022, which is 2 years before the site visit held in 22/08/2024 and 23/08/2024. The postponement can be conducted as per Design Change Requirements par. 3.3.1.b. The crediting period ends on 21/08/2027. 5 years for the first crediting period, 15 years for total.

[8] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[9] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf
[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf
[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

Technology applied involves use of cattle manure, chicken manure and agricultural wastes. "Mesophilic" technology is applied according to the operating temperature in the planned biogas plant. The optimal operating temperatures of these bacteria are 37ºC. Manure is mixed and hydrolysed here to break the bonds and generate biogas. Biogas obtained is fed to the cogeneration unit to generate heat and electricity whereas the final product is stored and used as fertilizer. Electricity generated is fed to the national grid and heat is used in the dairy plant processes.

Anaerobic digesters with steel or lined concrete or fiberglass digesters and a gas holding system and monolithic construction are used in this project activity. Moreover, Anaerobic digesters hermetically sealed closed reinforced concrete pool was designed. The gas tank to be placed at the top of the pool during the reaction and stores the gas formed. The reactor contents are kept in a mixture with submersible mixers. Mixers operated intermittently for the purpose of energy saving. Parts that come into contact with biogas in digesters, and all interior surfaces coated with epoxy paint against corrosion. In addition, against heat losses to the reactor and there is thermal insulation on the surface (Project EIA Report, page 14)

The transport of the collected manure from the farms is achieved by totally confined trucks. The transported manure is directly transferred to the raw material pond without any storage time. Collected manure is then fed to the fermenters via leakage proof pipes and biogas capture in the fermenters. Captured biogas is sent to the cogeneration units where it is utilized to generate electricity and heat at the same time. Generated electricity is fed to the national grid and the produced heat is used by the project owner's diary facility. On the other hand, remaining sludge after the biogas extraction is sent to the separator and drier units to produce biologically enriched fertilizer and then stored on a specific parcel reserved for this process near the project site.

The system consists of following units:

- Waste collection unit: Weigh bridge and data control/storage system
- Waste preparation / feed unit: Equalization tank, vegetative waste stock area, central pumping system
- Anaerobic Digestion Unit: Digestors, gas storage unit, desulfurization unit, early warning system, temperature control system

- Cogeneration Unit: Cogeneration, gas treatment system, flare
- Fertilizer Dewatering / Hygenization Unit: Post-digestion tanks, hygenization unit, separator
- Automation system
- Product Storage Area: Liquid fermented storage area, solid fermented storage area

The project became a Greenfield Project activity in terms of biogas generation within the region and uses waste (cattle manure, chicken manure and agricultural wastes from nearby region farms) to generate biogas, electricity and heat energy. Prior to the project activity, baseline situation, cattle, chicken manure generated at farms managed by lagoons and agricultural wastes left in agricultural lands.

Prior to the project activity, baseline situation, cattle, chicken manure generated at farms commonly released to natural water bodies or lagoons and agricultural wastes left in agricultural lands commonly. There was not any biogas plant in the region before this project and there was no anaerobic biogas generation activity too. Hence the project became a Greenfield Project activity in terms of biogas generation within the region.

For the present situation with 4,268 MWe there is no composting operation and treated manure is separated into liquid and solid phases with separator unit. Then both solid phase and liquid phase are shared with farmers near to project site (within Tire District of İzmir Province) to be used as fertilizer. As discussed in remote site visit with local stakeholder, these fertilizers provided efficiency in agricultural activities.

Hydrogen sulfide (H2S) in biogas is reduced to 150 ppm and lower by biological internal desulfurization. In addition, the condensate path in the biogas line and condensate collection systems removes saturated gas from the coarse water through a cooling unit and remove it from the moisture up to the saturation point. In this way, the moisture in the biogas is reduced to the desired level.

Red dot presents weigh monitoring point, yellow dots present flow monitoring points for biogas, pink dot represents gas analyser monitoring point, blue dot presents steam monitoring point and green dot presents electricity monitoring point.

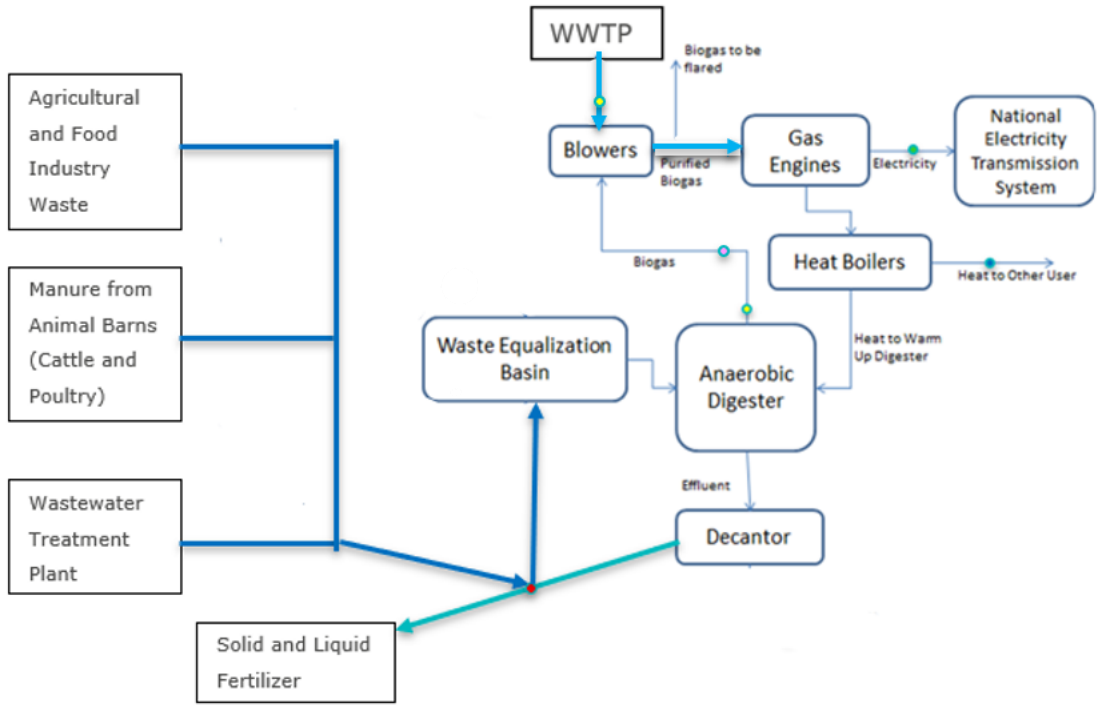

Figure 2. Schematic View of the Process_1

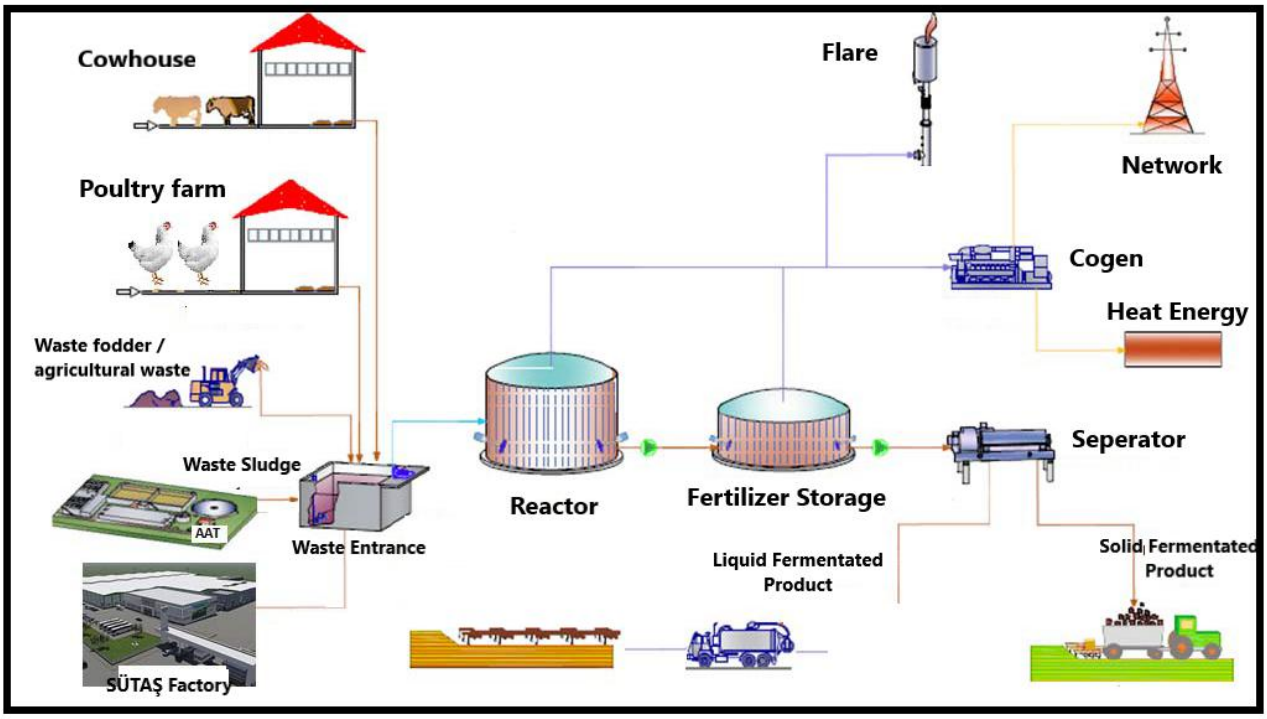

Figure 3. Schematic View of the Process_2

Heat usage divided into two; first usage point is to warm up the digesters and second usage point is to provide heat energy to dairy factory of Sütaş A.Ş. which is near to biogas plant (in the same project site). That is why heat usage is also considered in emission reduction calculations since dairy factory does not use any fossil fuel to generate heat energy for the production operation. Heat energy need of dairy factory is provided by heat boilers of biogas plant. This situation is referred to as "heat to other user" in flow diagram above.

As seen in the Project Operation Scheme, the key equipment of the project are;

- Mixing Tank (It is one of the digesters)
- Digesters
- Gas engines
- Heat Boilers
- Separators
- Biogas meters
- Electricity meters

The technical specifications of these key equipment are indicated as follows.

Mixing Tank

Number: 1

Type: vertical, cylindrical

Width: Wet volume: 5,150 m^3/tank

Volume: 5,720 m^3/tank

Material: Concrete, polyurethane for heat isolation, B2 class fireproof and isolation for corrosion

Digesters

Number: 6 digesters (one of them used as mixing tank)

Type: vertical, cylindrical

Volume: 5,720 m^3/digester

Wet volume: 5,150 m^3/digester

Material: Concrete, polyurethane for heat isolation, B2 class fireproof and isolation for corrosion

Gas Engine 1, 2, 3 and 4

Supplier Company: Jenbacher Gas Engines

Type: JMS 320 GS

Production Year: 2016

Fuel Gas Type: Biogas

Electricity Output: 1067 kW (full load)

ISO Standard Power (Mechanical Output): 1095 kW (full load)

Speed: 1500 rpm/min

Gas Volume: 443 Nm3/h (full load)

Electrical Efficiency: 40.2% (full load)

Thermal Efficiency: 25.3% (full load)

Total efficiency: 65.5(%) (full load)

Heat Boiler 1, 2, 3 and 4

Supplier Company: MNK Energy Waste Heat boiler

Type: Smoke Tube Type Waste Heat Boiler

Production Year: 2016
Test Pressure: 22.6 Bar
Operation Pressure: 10 Bar
Design Pressure: 14 Bar
Max. Heat Power: 412 kw
Volume: 2,700 liter
Standard: EN 12953

Separator

Brand: SEPCOM by WAMGROUP S.p.A.
Model: SEP***H12603
Material: Stainless steel
Power: 5.5 kW
The separator consists of a feeding section provided with compensator tank and overflow hopper; the stainless steel casing includes a screw conveyor and a cylindrical screen basket that conveys and separates the solids from the liquid phase which flows through the screen while the solid fraction is pushed towards the counterpressure diaphragm outlet where a material plug gets formed; this allows the automatic operation of the separator and avoids the flowing out of the liquid phase contained by the material handled. The drive unit consists of an electric motor and a flanged gear reducer fitted on the screw conveyor shaft.

Biogas Meters

Number: 2
The device consists of a transmitter and a sensor. The device is available as a compact version: The transmitter and sensor form a mechanical unit. These meters are located at the top of anaerobic digesters.

Transmitter Unit:

Number: 2
• Compact, aluminum coated:
Aluminum, AlSi10Mg, coated
• Compact, stainless:
For maximum corrosion resistance: stainless steel 1.4404 (316L)
Configuration:
• External operation via four-line, illuminated local display with touch

control and guided menus ("Make-it-run" wizards) for applications
• Via operating tools (e.g. FieldCare)

Sensor:

Number: 2
Designed exclusively to measure:
– Biogas
– Firedamp
– Air
– Methane
– Nitrogen
– Gas with a very high methane fraction
• Range of nominal diameter: DN 50 to 200 (2 to 8")
• Materials:
– Sensor:
Stainless steel 1.4404 (316L), cold worked
Stainless steel 1.4435 (316L), cold worked
– Process connections:
Stainless steel 1.4301 (304),
Stainless steel 1.4306 (304L),
Stainless steel 1.4404 (316L),
Steel S235JR,
Carbon steel A105

Details of 2 electricity meters (main and spare) is given in monitoring parameters (under the parameter $EG_{PJ,facility,y}$) part of this document.

Flare Unit

Number: 1
Model and Brand: C-nox environmental engineering
Year of manufacture: 2016
Flare Type: NTV 3,6 S
Firing capacity: 3600 kW
Volume flow max: 550 Nm3/h
Biogas heating value: 6,4 kWh/m3
Max flow pressure in front of flare: 120 mbar

Min flow pressure in front of flare: 50 mbar
Biogas temperature: < 140 Celcius
Combustion temperature (approximately): 850 Celcius

Fuel gas admission pressure min, and max: 5 mbar and 30 mbar
Fuel gas temperature: 35 Celcius
Exhaust gas temperature, max: 800 Celcius

Diesel Generator
Brand: Teksan
Model: TJ440DW5C
Serial Number: CKF0978
Power: 400 kVA
Production Year: 2016

Operational lifetime is estimated as 11 years stating with 01/09/2016 based on the date given in license till 31/08/2026. License amendments will be made in the future periods in order for the project to continue its operation after this date.

B.1.1 Forward Action Requests

Forward Action Request #1: The PP shall include trainings of employees for occupational health and safety trainings and use of relevant safety protocols along with safety equipment to the monitoring plan.

Response: Project provided related documents to DOE during validation progress

Forward Action Request #2: The validating DOE shall make sure that the project emissions and leakage emissions (if any) are taken into account in accordance with the applicable methodology related with the composting process. The PP shall further include management of wastewater (as an output of the digester) into the monitoring plan.

Response: As indicated in leakage emissions part of this document the proposed project activity does not involve composting, LEComp,y shall be accounted as zero. Moreover, the solid and liquid digestate (output of the digester) used as fertilizer in nearby agricultural land as free

Forward Action Request #3: The EIA and associated references in the LSC report shall be checked by the DOE during validation and provide their opinion in detail.
Response: EIA Report of the Project and other necessary documentations/online references such as IPCC related with both calculations and baseline situation provided to DOE during validation progress.

B.2. Post-Design Certification changes

B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline
No temporary deviations from registered monitoring plan or applied methodology is reported during the monitoring period.

B.2.2. Corrections
N/A
B.2.3. Changes to start date of crediting period
Start date of the crediting period of 5 years had been stated as 01/06/2022 however this date is postponed to 22/08/2022, which is 2 years before the site visit held in 22/08/2024 and 23/08/2024. The postponement can be conducted as per Design Change Requirements par. 3.3.1.b.
B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline
N/A
B.2.5. Changes to project design of approved project
N/A

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

Net electricity generation is being measured and recorded by both TEIAS and project owners for billing purposes for monitoring emission reduction. Plant Manager, is responsible for the electricity generated, gathering all relevant data and keeping the records. Calibration of the electricity metering devices are made by Tire Organized Industrial Zone and sealed before the commissioning of the power plant. As per the

local regulations, meters should not require calibration at least ten years[13]. The meters were calibrated by Tire Organized Industrial Zone when there is an inconsistency between two devices.

Manure transported to project site arrived at the point of waste equalization basin. However, just before the equalization basin there is a weightbridge to measure the weight of the manure. Dry matter content of the manure is analyzed periodically to monitor the efficiency of digesters by plant personnel.

Data stored in excel documents (biogas production, electricity site records, and heat generation records) by plant manager more than 2 years.

Project owners use the heat generated in their own dairy facility instead of using fossil fuel; therefore the used heat measured in the facility inlet. Amount of heat energy transferred to the dairy facility is monitored via computerized system which is connected to the heat boilers. Data stored in excel documents by plant manager more than 2 years.
In addition, biogas obtained from wastewater treatment plant is to be excluded while calculation of baseline emission for this project. Project has monitoring equipments "a biogas meter" on WWTP line. The biogas records of this meter and related electricity generation is to be excluded from the emission reduction calculations. In detail, since the Project monitors the total biogas amount and corresponding electricity and heat generation, the ratio of "Biogas from WWTP/total biogas" could multiply the total electricity and heat generation data to find out and exclude the electricity and heat generated belonged to biogas from WWTP line and corresponding CO_2 amount.

VER Team Members is expected to include the following staff of the plant:

Plant Manager: Responsibility for running the plant and compliance with VER monitoring plan

[13] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5

Environmental engineer: Responsible for keeping data about generation and consumption.
GTE: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of electricity meters and data monitoring are carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) are used for monitoring the electricity generated by the power plant. Readings are done using main metering devices and spare metering device are used for comparison only. Data from metering devices is recorded by TEIAS monthly. In addition to the two metering devices, generation of the plant can be cross checked from EPIAS web site (https://www.epias.com.tr/_) which is accessible using a password provided to electricity generation companies. Net electricity fed to the grid is calculated as the difference between consumption from the grid and net electricity fed to the grid. Consumption from the grid occurs only when there is no electricity generated by the proposed project activity and is met by the plant's own generation when electricity is generated by the project activity.

The net electricity fed to the grid is measured continuously and recorded monthly by the TEIAS and plant staff. All data is kept for at least two years after the crediting period for QA/QC purposes.

Calibration of the electricity metering devices is made by Tire Organized Industrial Zone management and sealed before the commissioning of the power plant. As per the local regulations, meters should not require calibration for at least ten years. The meters are calibrated by Tire Organized Industrial Zone when there is an inconsistency between two devices. All other measuring equipment are calibrated at least once in ten years as per the related regulation on measurement and inspection of measurement devices[14].

[14] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/parameter	GWP_{CH4}
Unit	t CO_2e/t CH_4
Description	Global Warming Potential for CH_4
Source of data	IPCC
Value(s) applied	28
Choice of data or Measurement methods and procedures	Default value from IPCC is used as per the applied methodology.
Purpose of data	Used in project emission/baseline calculations.
Additional comment	-

Data/parameter	MCF_j
Unit	N/A
Description	Methane conversion factor
Source of data	2019 IPCC Refinement, Table 10.17, p. 10.74 referred 76% for the uncovered anaerobic lagoon and this data used by doing corrections as explained in "any comment row"
Value(s) applied	0.71
Choice of data or Measurement methods and procedures	Uncovered anaerobic lagoon, Value for 17.9°C.
Purpose of data	Used in project emission/baseline calculations.
Additional comment	As per the methodology, A conservativeness factor applied by multiplying MCF with a value of 0.94, to account for the 20% uncertainty in the MCF

Data/parameter	$EF_{CH4,default}$
Unit	t CH4 leaked / t CH4 produced

Description	Default emission factor for the fraction of CH_4 produced that leak from the anaerobic digester.
Source of data	Project and leakage emissions from anaerobic digesters", Version 02.0[15], pg. 11-12
Value(s) applied	0.028
Choice of data or Measurement methods and procedures	Digesters with steel or lined concrete or fiberglass digesters and a gas holding system and monolithic construction.
Purpose of data	Used in project emission calculation.
Additional comment	-

Data/parameter	D_{CH4}
Unit	t/m^3
Description	Density of CH_4
Source of data	The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[16], pg. 25.
Value(s) applied	0.00067
Choice of data or Measurement methods and procedures	0.00067 t/m^3 at room temperature (20 °C) and 1 atm pressure
Purpose of data	Used in project emission/baseline calculations.
Additional comment	-

Data/parameter	VS_{LT}
Unit	kg dm/animal/year
Description	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis

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

[16] https://globalgoals.goldstandard.org/wp-content/uploads/2017/06/401.13-ER-MMS.pdf

Source of data	IPCC 2006 vol.4, chapter 10, Table10A-9(Chicken-layer) (0.02 kg/hd/day)
Value(s) applied	7.30 (for chicken manure)
Choice of data or Measurement methods and procedures	
Purpose of data	Used in baseline calculations.
Additional comment	For the calculation of $VS_{LT,y}$ Option 4 is chosen and default and regional IPCC data is used.

Data/parameter	VS_{LT}
Unit	kg dm/animal/year
Description	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis
Source of data	IPCC 2006 vol.4, chapter 10, Table10A-4(Dairy Cows eastern Europe) (4.5 kg/hd/day)
Value(s) applied	1,642.5 (for cattle manure)
Choice of data or Measurement methods and procedures	-
Purpose of data	Used in baseline calculations.
Additional comment	For the calculation of $VS_{LT,y}$ Option 4 is chosen and default and regional IPCC data is used.

Data/parameter	$EF_{grid,CM,y}$
Unit	ton CO2/MWh
Description	Grid emission factor
Source of data	Country specific data
Value(s) applied	0.5706
Measurement methods (if any)	-

Purpose of data	Used in emission reduction calculations
Additional comment	Latest official emission factor of Turkey used in the projects depending on the project type published by the Ministry of Energy and Natural Resources. As per this reference, OM is 0.7258 and BM is 0.4153 tCO2/MWh for Turkey National Grid. During CM calculation as per related tool, these values were taken into consideration. Details are present in "CM" tab of project excel ER calculation file.

Data/parameter	$\eta_{BL,thermal}$
Unit	%
Description	The efficiency of boilers
Source of data	TOOL09: Determining the baseline efficiency of thermal or electric energy generation systems, Version 03.
Value(s) applied	92
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Baseline emission calculation
Additional comment	-

Data/parameter	$\eta_{flare,m}$
Unit	%
Description	Flare efficiency
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	%50
Choice of data or Measurement methods and procedures	Used in project emission calculations

Purpose of data	Default value for open flare provided that it can be demonstrated that the flare is operational.[17]
Additional comment	

Data/parameter	$EF_{CO2,BL,HG,k}$
Unit	tCO_2/TJ
Description	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC 2006 Table 2.2 Lower Limit Value for Natural Gas
Value(s) applied	54.30
Choice of data or Measurement methods and procedures	Default emission factors per energy basis
Purpose of data	Baseline/project emission calculation
Additional comment	-

D.2 Data and parameters monitored

Data / Parameter	$EG_{d,y}$
Unit	MWh
Description	Electricity generated using biogas in year y
Measured/ Calculated / Default:	Measured
Source of data	Project proponent
Value(s) of monitored parameter	22/08/2022-31/12/2022: 5,496 MWh 2023: 17,907 MWh 01/01/2024 - 31/05/2024: 7,648 MWh Total: 31,051 MWh

[17] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v1.pdf (footnote 3)

<table>
<tr><td>Monitoring equipment:</td><td>The plant records are provided by calibrated metering devices. Archive electronically during project plus five years.
<table>
<tr><th></th><th>Main Meter</th><th>Spare Meter</th></tr>
<tr><td>Serial No.</td><td>480922</td><td>480923</td></tr>
<tr><td>Brand</td><td>Elster</td><td>Elster</td></tr>
<tr><td>Class</td><td>0.5S</td><td>0.5S</td></tr>
<tr><td>Type</td><td>A1500</td><td>A1500</td></tr>
<tr><td>Calibration Date</td><td>14/10/2016</td><td>14/10/2016</td></tr>
</table></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Annual</td></tr>
<tr><td>Calculation method (if applicable):</td><td>-</td></tr>
<tr><td>QA/QC procedures</td><td>Two calibrated meters backup each other. Maintenance and calibration of the metering devices are made by TOSBI If there is a significant difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment are done before waiting for the periodical maintenance. The meters should comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit as given in document in link (http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44). Generation of the plant is cross checked from TEIAS – EPIAS web site which is accessible using a password provided to electricity generation companies. EPIAS records is taken in consideration while calculating $EGd_{,y}$.

Maintenance and calibration of the metering devices are made by Tire Organized Industrial Zone (TOSBI) which plant is operated in, every 10 years according to the</td></tr>
</table>

	Electricity, Water and Gas Meters Inspection Regulation[18]. The last calibration was conducted during the provisional acceptance of the plant.
Additional comment	-

Data / Parameter	HGpj,k,y
Unit	TJ/y
Description	Net quantity of heat with biogas by equipment type *k* in the project t in year *y*
Measured/ Calculated / Default:	Measured/Calculated
Source of data	The measurement was done with calibrated steam meter on site. Calculated on the basis of measurement of the volume of biogas captured and used for heat generation by each heat generation equipment type k multiplied by the methane content of the gas, net calorific value of methane, and the efficiency of heat generation equipment type k during the project (i.e. with biogas).
Value(s) of monitored parameter:	22/08/2022-31/12/2022: 11.28 TJ 2023: 34.81 TJ 01/01/2024 - 31/05/2024: 14.07 TJ Total: 60.17 TJ
Monitoring equipment:	Calibrated steam meters (Inlet to SÜTAŞ Dairy Factory)

Brand	Serial No	Calibration Date
Endress+Hauser	M603B119000	08/06/2017

[18] https://www.resmigazete.gov.tr/eskiler/2023/11/20231123.pdf

Measuring/ Reading/ Recording frequency:	Daily
Calculation method (if applicable):	Steam and proportionally heat energy produced by registered units. Enthalpy of output steam at 11.5barg and 190C: 2,793 kj/kg[19] Enthalpy at boiler inlet (at 102 °C feed water temperature to boiler as per PO): 427.5 kj/kg[20]HGpj,k,y =Produced Steam (ton/y)*(2,793 kj/kg - 427.5 kj/kg)*10^{-6}
QA/QC procedures	Project owners use the heat in their own dairy facility, therefore the heat used is measured in the facility inlet. Amount of heat energy transferred to the dairy facility is monitored via computerized system which is connected to the CHP unit. Temperature or pressure is not needed to be monitored as the system gives a normalized measurement. After the first calibration of steam meter, calibration of meter is valid for ten years due to related legislation. Link of related regulation given below. Electricity, Water and Gas Meters Inspection Regulation (https://www.resmigazete.gov.tr/eskiler/2023/11/20231123.pdf)

[19] http://www.steamtablesonline.com/steam97web.aspx

[20] http://www.thermexcel.com/english/tables/eau_boui.htm

Purpose of data:	Emission reduction calculations
Any comment	Enthalpies are determined based on the mass (or volume) flows, the temperatures and the pressure. Steam tables or appropriate thermodynamic equations is used to calculate the enthalpy as a function of temperature and pressure. Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and condensate returns.

Data / Parameter	Emissions Reductions in tCO_2
Unit	tCO_2
Description	Reduction of CO_2 emissions due to the proposed project activity's implementation.
Measured/ Calculated / Default:	Calculated
Source of data	Project proponent. Annual baseline and project emissions, along with relevant parameters, such as combined margin (CM), is used as reference in calculation of the emission reduction.
Value(s) of monitored parameter:	22/08/2022-31/12/2022: 63,549 tCO2 2023: 104,583 tCO2 01/01/2024 - 31/05/2024: 29,689 tCO2 Total: 197,821 tCO2
Calculation method (if applicable):	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency:	Annually
QA/QC procedures	-
Purpose of data	To monitoring the contribution to the SDG13

Any comment	-

Data/parameter	$B_{0,LT}$ for Poultry manure
Unit	m^3CH_4/kg_dm
Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Measured/ Calculated / Default:	Default
Source of data	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[21]
Value(s) of monitored parameter:	0.39
Calculation method (if applicable):	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency:	In each crediting period
QA/QC procedures	-
Purpose of data	Used in project emission/baseline calculations.
Any comment	The value is taken from published sources. The parameter value should be updated on latest available public data source

Data/parameter	$B_{0,LT}$ for Dairy Cow Manure
Unit	m^3CH_4/kg_dm
Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Measured/	Default

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

Calculated / Default:	
Source of data	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[22]
Value(s) of monitored parameter:	0.24
Calculation method (if applicable):	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency:	In each crediting period
QA/QC procedures	-
Purpose of data	Used in project emission/baseline calculations.
Any comment	The value is taken from published sources. The parameter value should be updated on latest available public data source

Data / Parameter	Vf (coming from wastewater treatment plant)
Unit	m^3
Description	Biogas flow
Measured/ Calculated / Default:	Measured
Source of data	Project proponent
Value(s) of monitored parameter:	22/08/2022-31/12/2022: 422,607 m3 2023: 1,235,202 m3 01/01/2024 - 31/05/2024: 508,692 m3
Calculation method (if applicable):	-

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

<table>
<tr><td>Monitoring equipment</td><td>Flow meters

<table><tr><td>Brand</td><td>Serial No</td><td>Calibration Date</td></tr><tr><td>Endress+Hauser</td><td>L711FB02000</td><td>24/08/2016</td></tr></table></td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>Continuously by flow meter and reported cumulatively on weekly basis</td></tr>
<tr><td>QA/QC procedures</td><td>The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. Data is archived electronically during the crediting period plus 2 years. Computerized monitoring for the whole system is available in order to keep track of pressure and temperature of the gas, gas meters are calibrated as per the relevant industry standard. Equipment is subject to regular maintenance.
After the first calibration of meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. Electricity, Water and Gas Meters Inspection Regulation (https://www.resmigazete.gov.tr/eskiler/2023/11/20231123.pdf)
Accuracy class of meters is;
+/-1.5% of reading (gas & steam)</td></tr>
<tr><td>Purpose of data</td><td>Monitoring net biogas recovery from manure digesters.</td></tr>
<tr><td>Any comment</td><td>Biogas amount coming from WWTP line is measured via measurement of read biogas amount from flowmeters after anaerobic digesters and before cogeneration units. In fact, biogas volume recovered from WWTP is excluded from baseline emission calculations. Briefly, this value is monitored with calibrated gas meters on site and is not included in emission reduction calculations above (excluded).</td></tr>
</table>

	Since the Project Owner monitors the total biogas amount and corresponding electricity and heat generation, the ratio of "Biogas from WWTP/total biogas" could multiply the total electricity and heat generation data to find out and exclude the electricity and heat generated belonged to biogas from WWTP line and corresponding CO2 amount.

Data / Parameter	Vf
Unit	m^3
Description	Biogas (total biogas goes to gas engines)
Measured/ Calculated / Default:	Measured
Source of data	Project proponent
Value(s) of monitored parameter:	22/08/2022-31/12/2022: 3,076,832 m3 2023: 10,522,853 m3 01/01/2024 - 31/05/2024: 4,377,740 m3
Calculation method (if applicable):	-
Monitoring equipment	Flow meters Anerobic Digesters Brand: Endress+Hauser; Serial No: L80E2D02000; Calibration Date: 22/05/2019 WWTP Line Brand: Endress+Hauser; Serial No: L711FB02000; Calibration Date: 24/08/2016
Measuring/ Reading/ Recording frequency:	Continuously by flow meter and reported cumulatively on weekly basis
QA/QC procedures	The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. Data is archived electronically during the crediting period plus 2 years. Computerized monitoring for the whole system is

	available in order to keep track of pressure and temperature of the gas, gas meters are calibrated as per the relevant industry standard. Equipment is subject to regular maintenance. After the first calibration of meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. Electricity, Water and Gas Meters Inspection Regulation (https://www.resmigazete.gov.tr/eskiler/2023/11/20231123.pdf) Accuracy class of meters is; +/-1.5% of reading (gas & steam)
Purpose of data	Monitoring net biogas recovery from manure digesters
Any comment	Total biogas amount measured via flow meters on WWTP line and anaerobic digesters line.

Data / Parameter	$F_{RG,m}$
Unit	m^3
Description	the flow rate of the residual gas to the flare
Measured/ Calculated / Default:	Measured
Source of data	Project owner
Value(s) of monitored parameter	0
Calculation method (if applicable)	-
Monitoring equipment	Calibrated meter of flare equipment
Monitoring frequency	Continuously
QA/QC procedures	After the first calibration of meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. Electricity, Water and Gas Meters Inspection Regulation (https://www.resmigazete.gov.tr/eskiler/2023/11/202311

	23.pdf)Calibration document is to be provided in first monitoring period.
Purpose of data	To calculate project emissions
Any comment	Option A is selected via Methodological tool "Project emissions from flaring Version 03.0"

Data / Parameter	Status of biogas destruction device
Unit	-
Description	Operational status of biogas destruction devices
Measured/ Calculated / Default:	-
Source of data	Project owner
Value(s) of monitored parameter:	Available for operation
Calculation method (if applicable):	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency:	Continuously
QA/QC procedures	-
Purpose of data	Monitoring mass of flow greenhouse gas
Any comment	Project owner is to report if there is any operational period the gas engines is not under operation for biogas/methane destruction for electricity generation. As per, Methodological tool Tool to determine the mass flow of a greenhouse gas in a gaseous stream Version 03.0

Data / Parameter	Vi, t, db
Unit	m^3 gas i/m^3 dry gas

Description	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis
Measured/ Calculated / Default	Measured
Source of data	Gas analyzer records
Value(s) of monitored parameter	2022: 58.16% 2023: 59.35% 2024: 59.80%
Calculation method (if applicable)	-
Monitoring equipment	Gas analyser Brand: Optima Model: Optima 7 Serial Number: 323641 Last Calibration Date: 18/10/2022 First Calibration Date: 17/06/2021
Measuring/ Reading/ Recording frequency	Continuously
QA/QC procedures	After the first calibration of meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. Electricity, Water and Gas Meters Inspection Regulation (https://www.resmigazete.gov.tr/eskiler/2023/11/20231123.pdf) Calibration document is provided.
Purpose of data	Calculate project and leakage emissions from anaerobic digesters
Any comment	-

Data / Parameter	SPECflare
Unit	Temperature - °C Flow rate or heat flux - kg/h or m3 /h Maintenance schedule - number of days

Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule
Measured/ Calculated / Default	Measured
Source of data	Flare manufacturer
Value(s) of monitored parameter	Project proponent provided during monitoring if the flare unit is used (a) Minimum and maximum inlet flow rate, if necessary converted to flow rate at reference conditions or heat flux: Flow rate is 0 m3 during the MP since the flare has not been needed since the installation of it. (b) Minimum and maximum operating temperature: Flare has not been operated during the MP since the flare has not been needed since the installation of it. (c) Maximum duration in days between maintenance events: Maintenance has not been realized during the MP since the flare has not been needed since the installation of it.
Calculation method (if applicable)	-
Monitoring equipment	Flare records
Measuring/ Reading/ Recording frequency	Continuously and reported cumulatively on weekly basis
QA/QC procedures	Document in the CDM-PDD the flare specifications set by the manufacturer for the correct operation of the flare for the following parameters: (a) Minimum and maximum inlet flow rate, if necessary converted to flow rate at reference conditions or heat flux; (b) Minimum and maximum operating temperature; and (c) Maximum duration in days between maintenance events
Purpose of data	Calculate project emissions

Any comment	Flare has not been operated since installation of it because, the plant has more than enough number of engines as can be seen from the electricity generation values of each engine, some of the engines had not been operated during the monitoring period. Therefore, all monitored parameters regarding the flare has been actualized as 0. Option A is selected via Methodological tool Project emissions from flaring Version 03.0

Data / Parameter	Air Quality
Unit	tons
Description	Reduction of SO2 and NOx emissions due to implementation of project activity that would otherwise be emitted by thermal power plants
Measured/ Calculated / Default	Calculated
Source of data	Project proponent.
Value(s) of monitored parameter	2022: SO2 emission reduction is 31.95 tons. NOx emission reduction is 6.17 tons. 2023: SO2 emission reduction is 103.22 tons. NOx emission reduction is 19.94 tons. 2024: SO2 emission reduction is 44.27 tons. NOx emission reduction is 8.55 tons.
Calculation method (if applicable)	Total SO2 emission related to electricity generation is about 1908.82 kt for 2022 according to National Inventory of Turkey. Considering that electricity generation in 2022 is 328,379.3 GWh and in 2023 is 331,148.9 SO2 emission per MWh is calculated as 5.81 kg/MWh for 2022, 5.76 kg/MWh for 2023 and 5.79 kg/MWh for 2024.

	Total NOx emission related to electricity generation is about 368.67 Gg for 2022 according to National Inventory of Turkey. Considering that electricity generation in 2022 is 328,379.3 GWh and in 2023 is 331,148.9 GWh NOx emission per MWh is calculated as 1.12 kg/MWh for 2022, 1.11 kg/MWh for 2023 and 1.12 kg/MWh for 2024. Details are given in ER sheet.
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	Monitoring the contributions to SDG 7.
Any comment	

Data / Parameter	Other Pollutants
Unit	-
Description	Proper management of waste oil
Measured/ Calculated / Default:	Measured
Source of data	Assessing disposal methods during site visits and checking waste oil disposal records.
Value(s) of monitored parameter:	Amount of waste oil generated and disposed during operation
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	-
QA/QC procedures	Waste oil is disposed in line with regulation # 26952 on control of waste oils. Waste oil from equipment will be

	collected properly in line with the relevant regulation and disposed via accredited abatement companies.
Purpose of data	This parameter is not used in any calculations, monitoring is implemented in accordance with Safeguarding Principle 9.5 Hazardous and Non-hazardous Waste.
Additional comment	-

SDG 8

Data / Parameter	Quality of Employment
Unit	Number of personnel certified/trained during operation phase
Description	Contribution to quality of employment by ensuring that the staff is trained and certified for the required positions
Measured/ Calculated / Default	Measured
Source of data	Training Records (including H&S) & Other Certificates required by certain professions, if necessary
Value(s) of monitored parameter	2022: 3 different training programs OHS Training: 22 staff Fire Emergency: 14 staff First Aid: 4 staff 2023: 5 different training programs OHS Fundamentals Training: 22 staff ADR General Awareness/ Job Specific Training: 5 staff Job Related Diseases: 1 staff Environmental Training: 14 staff Energy Training: 7 staff 2024: 6 different training programs OHS Training: 22 staff Hygiene Training: 5 staff

	Energy Training: 16 staff Job Related Diseases: 16 staff Environmental Training: 15 staff Emergency Situation Training: 15 staff
Calculation method (if applicable)	-
Monitoring equipment	All employees attended trainings on first aid and health & safety. For positions that require specific skills (such as high voltage equipment) staff was either trained or certified staff was recruited.
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	The training programs help increase the efficiency of the workforce and provides employees skilled at their job. This not only helps the company but to self-improvement of individual employees.
Purpose of data	To monitor the contribution to SDG 8 and Principle 3.6.1.
Additional comment	-

Data / Parameter	Quantitative employment and income generation
Unit	Number of personnel employed
Description	Personnel working in the project are employed in accordance with the legal regulations and that the social security insurance fees are paid
Measured/ Calculated / Default	Measured
Source of data	Social security list of the project gathered from official governmental records.
Value(s) of monitored parameter	At present situation there are 23 staff working in the project.

Calculation method (if applicable)	-
Monitoring equipment	Social security list of the project gathered from official governmental records.
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	To monitor the contribution to SDG 8 and Principle 3.6.1.
Additional comment	-

SDG 12 and Principle 4.3.5 Hazardous and Non-Hazardous Waste

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock.
Value(s) of monitored parameter	2022:1200 2023:1000 2024:1000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily

QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Hatice Güler a cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project. The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock.
Value(s) of monitored parameter	2022:2900 2023:2500 2024:2000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-

Purpose of data	To calculate baseline emissions
Any comment	Şerif Demir cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project. The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2023:2200 2024:2190
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions

Any comment	Omega Milk Agriculture cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 1200
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Cactus cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project

	The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 1000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Ragyu cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals

	discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022:250 2023:230
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Kamil Doğan cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant

	animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022:3500 2023:3500
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Defne Agriculture cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 3796 2023: 4273 2024: 3027
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Migros cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 500
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	İzmir Province brood cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$

Unit	number
Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 2190 2023: 2230 2024: 2440
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Çetinel Kardeşler cattle farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number

Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 1,500,000 2023: 160,000 2024: 330,000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Ercanlar poultry farm which has manure supply agreement with this project and farm provides animal number with signed document to the project. The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number

Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 99,500 2023: 105,300 2024: 94,700
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	İzmir Pasteurized Egg Ind. poultry farm which has manure supply agreement with this project and farm provides animal number with signed document to the project. The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number

Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 155,000 2023: 153,000 2024: 162,000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Volkan Güler poultry farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data / Parameter	$N_{AA,LT}$
Unit	number

Description	Daily stock of animals in the farm, discounting dead and discarded animals
Measured/ Calculated / Default	Measured
Source of data	Daily counting of alive animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock
Value(s) of monitored parameter	2022: 700,000 2023: 310,000
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Daily
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Any comment	Işık Yumurta poultry farm which has manure supply agreement with this project and farm provides animal number with signed document to the project The animal numbers have gathered via daily monitored animal number discounting dead animals and animals discarded from the productive process and the resultant animal number provided with signed document to the project

Data/parameter	N
Unit	-
Description	Total number of farms
Measured/	Measured

Calculated / Default	
Source of data	Project proponent
Value(s) of monitored parameter	13 (9cattle farm and 4 chicken farm) (2022) 11 (7 cattle farm and 4 chicken farm) (2023) 8 (5 cattle farm and 3 chicken farm) (2024)
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	To monitor contracted farm number
Any comment	-

Data / Parameter	ndy
Unit	number
Description	Number of days treatment plant was operational in year y
Measured/ Calculated / Default	Calculated
Source of data	Project owner
Value(s) of monitored parameter	365
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Additional comment	-

Data / Parameter	MS%j

Unit	%
Description	Fraction of manure handled in system j in the project activity
Measured/ Calculated / Default	Measured
Source of data	Project proponent. %100 is taken for estimated emission reduction calculations
Value(s) of monitored parameter	100%
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	To calculate baseline emissions
Additional comment	-

Data / Parameter	T
Unit	Celcius
Description	Annual Average ambient temperature at project site
Measured/ Calculated / Default	Measured
Source of data	Turkish State Meteorological Service. The average temperature is taken as "18.0 Celcius[23] for this project estimated emission reduction calculations.
Value(s) of monitored parameter	18.0
Calculation method (if applicable)	-
Monitoring equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Any comment	-

Data/parameter	FRf,m
Unit	tonnes
Description	Total mass of freight transported in freight transportation activity f in monitoring period m
Measured/ Calculated / Default	Measured
Source of data	Project owner

[23] https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?m=IZMIR

<table>
<tr><td>Value(s) of monitored parameter</td><td>22/08/2022-31/12/2022: 19,595 tonnes
2023: 74,239 tonnes
01/01/2024-31/05/2024: 17,681 tonnes</td></tr>
<tr><td>Calculation method (if applicable)</td><td>-</td></tr>
<tr><td>Monitoring Equipment</td><td>Calibrated weighbridge<table><tr><td>Brand</td><td>Production Year</td><td>Serial No</td><td>Calibration Date</td></tr><tr><td>Baykon</td><td>2013</td><td>UB00817649</td><td>23/02/2024</td></tr></table></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency</td><td>Continuously</td></tr>
<tr><td>QA/QC procedures</td><td>"The periodic inspection period of weighing instruments is two years. The inspection period is calculated in years, starting from the year the weighing instrument was stamped.” (https://www.resmigazete.gov.tr/eskiler/2013/09/20130904-5.htm) Calibration document is provided.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of project emissions</td></tr>
<tr><td>Any comment</td><td>Transportation of cattle manure</td></tr>
</table>

Data/parameter	FRf,m
Unit	tonnes
Description	Total mass of freight transported in freight transportation activity f in monitoring period m
Measured/ Calculated / Default	Measured
Source of data	Project owner
Value(s) of monitored parameter	22/08/2022-31/12/2022: 9,953 tonnes

<table>
<tr><td></td><td>2023: 26,596 tonnes
01/01/2024-31/05-2024: 8,832 tonnes</td></tr>
<tr><td>Calculation method (if applicable)</td><td>-</td></tr>
<tr><td>Monitoring Equipment</td><td>Calibrated weighbridge<table><tr><td>Brand</td><td>Production Year</td><td>Serial No</td><td>Calibration Date</td></tr><tr><td>Baykon</td><td>2013</td><td>UB00817649</td><td>23/02/2024</td></tr></table></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency</td><td>Continuously</td></tr>
<tr><td>QA/QC procedures</td><td>As per Regulation on Inspection of Weighing Instruments, "The periodic inspection period of weighing instruments is two years. The inspection period is calculated in years, starting from the year the weighing instrument was stamped.” (https://www.resmigazete.gov.tr/eskiler/2013/09/20130904-5.htm) Calibration document is provided.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of project emissions</td></tr>
<tr><td>Any comment</td><td>Transportation of poultry manure</td></tr>
</table>

Principle 9.5 Hazardous and Non-Hazardous Waste

Data/parameter	Qdm
Unit	kg
Description	Mass of manure (manure taken from animal farms to fed-up the anaerobic digesters) disposed outside project boundary
Measured/ Calculated / Default	Measured
Source of data	Project proponent.

Value(s) of monitored parameter	0
Calculation method (if applicable)	-
Monitoring Equipment	-
Measuring/ Reading/ Recording frequency	Annually
QA/QC procedures	-
Purpose of data	Calculate project and leakage emissions
Any comment	No manure disposal to outside the project boundary.

Data / Parameter	Organic fertilizer
Unit	ton/year
Description	Digestate of anaerobic digestors
Measured/ Calculated / Default	Calculated
Source of data	Project owner
Value(s) of monitored parameter	2022: 56,588 tonnes 2023: 143,139 tonnes 2024: 39,399 tonnes
Calculation method (if applicable)	Amount of digestate is calculated by using the yearly feedstock data of digesters.
Monitoring Equipment	Calibrated Weighbridge

Brand	Production Year	Serial No	Calibration Date
Baykon	2013	UB00817649	23/02/2024

Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	To be in compliance with principle 9.6
Additional comment	Digestate of anaerobic digestors are provided to nearby farmers to be used as fertilizer on agricultural lands. It

	is transported with confined trucks to prevent any leakage. Moreover, the comment on the future situation of local stakeholders is a prove.

D.3. Comparison of monitored parameters with last monitoring period

This is the first monitoring period of the first crediting period; thus, there is no other data to compare for monitoring periods.

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period

D.4. Implementation of sampling plan

No sampling has been applied.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

As stated and justified earlier in the PDD, the Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[24] is applied to the proposed project activity via followed formula (equation 1 in applied methodology);

$$BE_y = BE_{MSW,y} + BE_{manure,y}$$

Since project does not use municipal solid waste the baseline emission calculations could be on-going as follows.

$$BE_{Manure} = BE_{CH4,y} + BE_{N2O,y} + BE_{elec/heat,y}$$

(**Equation 2** from The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December 2013)

Where:

$BE_{manure,y}$ = Baseline emissions in year y (tCO_2/yr)

$BE_{CH4,y}$ = Baseline CH_4 emissions in year y (tCO_2/yr)

$BE_{N2O,y}$ = Baseline N_2O emissions in year y (tCO_2/yr)

$BE_{elec/heat,y}$ = Baseline CO_2 emissions from electricity and/or heat used in the baseline (tCO_2/yr)

NOTE: $E_{N2O,D,y}$ and $E_{N2O,ID,y}$ emissions equations for the baseline emissions ($BE_{N2O,y}$ page 11 of The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December

[24] https://globalgoals.goldstandard.org/wp-content/uploads/2017/06/401.13-ER-MMS.pdf

2013) and project emissions ($PE_{N2O,y}$ page 15 of The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December 2013) calculation equations are given same in the Gold Standard's consolidated baseline methodology. Same situation is present in CDM Methodology ACM0010 (ver.08) that consolidated GS Methodology is based on. This would led emission calculations as zero since baseline and project emissions become equal within this calculation pathway.

Throught note stated above $BE_{Manure,y}$ becomes:

$BE_{Manure,\ y} = BE_{CH4,\ y} + BE_{elec\ /\ heat,\ y}$

Baseline CH_4 emissions from manure treatment ($BE_{CH4,y}$):

The manure management system in the baseline could be based on different livestock, treatment systems and on one or more stages. Therefore:

$$BE_{CH4,y} = GWP_{CH4} \times D_{CH4} \times \sum_{j,LT} (MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j})$$

(**Equation 3,** from The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December 2013)

Where:

$BE_{CH4,y}$ = Baseline emissions in year y (t CO_2)

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

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

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

$VS_{LT,y}$ = Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)

LT = Index for all types of livestock

j = Index for animal manure management system

MCF_j = Annual methane conversion factor (MCF) for the baseline Animal Manure Management System (AWMS) j

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

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

For the calculation of $N_{LT,y}$ Option 2 is chosen from applied methodology.

$$N_{LT} = \frac{\sum_{1}^{365} N_{AA,LT}}{365} \quad \textbf{(5.b)}$$

Where:

N_{LT} = Annual average number of animals of type LT for the year *y* (number)

$N_{AA,LT}$ = Daily stock of animals of type LT in the farm, discounting dead and discarded animals (number)

Project has signed aggrements with annual average live animal number with farms. Hence these data used for $N_{LT,y}$ calculation. Details of animal number are given in Section B.3 and emission reduction calculation excel document.

For the calculation of $VS_{LT,y}$ Option 4 is chosen and default and regional IPCC data is used (both for cattle manure and chicken layer).

As a result of explained calculation pathway (details given in ER calculation sheet):

$BE_{CH4,2022}$ = 65,463 tonnes CO2/year (with GWP 28; after 31/12/2020)

$BE_{CH4,2023}$ = 111,965 tonnes CO2/year

$BE_{CH4,2024}$ = 32,679 tonnes CO2/year

<u>Baseline emissions sourced from electricity generation and heat generation</u>

$BE_{elec/heat,y} = BE_{EC,y} + BE_{HG,y,}$

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

The baseline emissions associated with electricity generation in year *y* ($BE_{EC,y}$) shall be calculated using the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation ". When applying the tool:

$$BE_{EC,y} = \sum EC_{BL,k,y} \times EF_{EF,k,y} \times (1 + TDL_{k,y})$$

Where:

$BE_{EC,y}$ = Baseline emissions associated with electricity generation in year *y* (t CO_2)

$EC_{BL,k,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{EF,k,y}$	= CO_2 emission factor of the grid in year *y* (t CO_2/MWh). It is calculated via "Tool to calculate the emission factor for an electricity system" v7 Scenario A Option A.1 as $EF_{grid,CM,y}$
$TDL_{k,y}$	= Average technical transmission and distribution losses for providing electricity to source k in year y

$BE_{EG,2022}$ = 5,496 MWh x 0.5706 tonnes CO2/MWh x (1+0.13)

=3,543 tCO2

$BE_{EG,2023}$ = 17,907 MWh x 0.5706 tonnes CO2/MWh x (1+0.13)

=11,545 tCO2

$BE_{EG,2024}$ = 9,251 MWh x 0.5706 tonnes CO2/MWh x (1+0.13)

=4,931 tCO2

(details are present in ER calculation sheet of the project)

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

The baseline emissions associated with heat generation in year *y* (*BEHG,y*) are determined based on the amount of biogas which is sent to the heat generation equipment in the project activity (boiler or air heater), as follows:

$$BE_{HG,y} = \sum_{k=1}^{n} \frac{HG_{PJ,k,y} \times EF_{CO2,BL,HG,k}}{\eta_{HG,BL,k}} \quad (11)$$

Where:

$BE_{HG,y}$	=	Baseline emissions associated with heat generation in year *y* (tCO_2/yr)
$HG_{PJ,k,y}$	=	Net quantity of heat generated with biogas by equipment type k in the project in year *y* (TJ/yr)
$EF_{CO2,BL,HG,k}$	=	CO_2 emission factor of the fossil fuel type used for heat generation by equipment type *k* in the baseline (t CO_2/TJ)
$\eta_{HG,BL,k}$	=	Efficiency of the heat generation equipment type *k* used in the baseline
k	=	Heat generation equipment (boiler or air heater or kiln)

$BE_{HG,2022}$= **666 tCO2e**

$BE_{HG,2023}$= **2,054 tCO2e**

$BE_{HG,2024}$= **831 tCO2e**

(details are present in ER calculation sheet of the project)

Total of Baseline Emissions

$$BE_{MP} = BE_{CH4,y} + BE_{/heat,y} + BE_{elec}$$

$$BE_{2022} = 65{,}463 + 666 + 3{,}543 = \mathbf{69{,}672\ tonnes\ CO2/year}$$

$$BE_{2023} = 111{,}965 + 2{,}054 + 11{,}545 = \mathbf{125{,}565\ tonnes\ CO2/year}$$

$$BE_{2024} = 32{,}679 + 831 + 4{,}931 = \mathbf{38{,}441\ tonnes\ CO2/year}$$

E.2. Calculation of project value or estimation of project situation of each SDG Impact

The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[25] states that project emissions in year y are calculated for alternative waste treatment option implemented in the project activity as follows:

$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{Comp,y} + PE_{N2O,y} + PE_{EC/FC,y} + PE_{Tran,y} + PE_{Storage,y}$

Where:

PE_y = Project emission in year y (t CO_2)

$PE_{AD,y}$ = Project emissions associated with the anaerobic digester / co-digestion in year t (tCO_2e/yr)

$PE_{Aer,y}$ = Project CH_4 emissions from aerobic AWMS treatment (tCO_2e/yr)

[25] https://globalgoals.goldstandard.org/wp-content/uploads/2017/06/401.13-ER-MMS.pdf

$PE_{Comp,y}$ = Project CH_4 emissions from composting/ co-composting (tCO_2e/yr)

$PE_{N2O,y}$ = Project N_2O emissions in year y (tCO_2/yr)

$PE_{EC/FC,y}$ = Project emissions from electricity consumption and fossil fuel combustion (tCO_2/yr)

$PE_{Tran,y}$ = Project emissions from manure transportation in the year y (tCO_2/yr)

$PE_{Storage,\ y}$ = Project emissions from manure storage (tCO_2e/yr)

Since the proposed project activity does not consist of aerobic AWMS treatment, $PE_{Aer,y}$ shall be accounted as zero. In addition, for the Project does not involve composting, $PE_{Comp,y}$ shall be accounted as zero too. Moreover, the proposed project activity does not consume fossil fuel for heat purposes, since the heat power generated as a by-product is used within the Project site. Thus, $PE_{FC,y}$ shall be accounted as zero. Furthermore, since the manure is not stored in outdoor open storage tanks more than 24 hours, $PE_{Storage,y}$ shall be accounted as zero. Moreover, since $E_{N2O,D,y}$ and $E_{N2O,ID,y}$ emissions equations for the baseline emissions ($BE_{N2O,y}$ page 11 of The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December 2013) and project emissions ($PE_{N2O,y}$ page 15 of The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste, December 2013) calculation equations are given same in the Gold Standard's consolidated baseline methodology, this would led emission calculations net emissions based on N2O as zero as also explained in baseline emissions calculation part of this document. Hence, the project emission equation could be simplified as;

$$\boldsymbol{PE_y = PE_{AD,y} + PE_{EC,y} + PE_{Tran,y}}$$

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

The consolidated baseline methodology states that $PE_{AD,y}$ is determined using the methodological tool 'Project and leakage emissions from anaerobic digesters' (pg. 13).

As per this, the methodological tool, Version 02.0[26], as its latest approved version, shall apply to the proposed project activity.

The paragraph 13 of the Tool determines $PE_{AD,y}$ as follows:

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

Where:

$PE_{AD,y}$ = *Project emissions associated with the anaerobic digester in year y* (tCO_2e)

$PE_{EC,y}$ = *Project emissions from electricity consumption associated with the anaerobic digester in year y* (tCO_2e)

$PE_{FC,y}$ = *Project emissions from fossil fuel consumption associated with the anaerobic digester in year y* (tCO_2e)

$PE_{CH4,y}$ = *Project emissions of methane from the anaerobic digester in year y* (tCO_2e)

$PE_{flare,y}$ = *Project emissions from flaring of biogas in year y* (tCO_2e)

Although, energy requirement for the plant is supplied from national grid, possible emissions caused by the generator could be calculated and added to the project emission in related year when it is needed. There are two ways to calculate $PE_{,FC,y}$ which are Option A and Option B stated in "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion version 03. Option A should be the preferred approach, if the necessary data is available. In addition, the emissions are negligible when the emission reductions from the Diesel Generator are lower than 1% of the total emission reductions; otherwise, the emissions is calculated. But for now, since the anaerobic digester facility does not use fossil fuels, $PE_{FC,y}$ shall be accounted as zero for estimated calculations.

Moreover, In this equation, $PE_{EC,y}$ shall be accounted as zero since project emissions from electricity consumption associated with the anaerobic digester is going to be accounted separately. For the proposed project activity will consume electricity from

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

the national grid for internal consumption of electricity at the plant, including the digesters, $PE_{EC,y}$ in this equation shall be regarded as zero since the calculation of project emissions from electricity consumption and fossil fuel combustion ($PE_{EC/FC,y}$) that will be made below is going to consist of $PE_{EC,y}$. This action is taken by the project developer in order to avoid double-counting.

Moreover, since the anaerobic digester facility does not use fossil fuels, $PE_{FC,y}$ shall be accounted as zero.

In addition, since the flare device is equipped for emergency situations only, $PE_{flare,y}$ shall also be accounted as zero.

Project emissions from flaring is calculated as per Tool 6 Project emissions from flaring v2. Related formulas are given below;

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

Where:

$PEflare,y$ = Project emissions from flaring of the residual gas in year y (tCO2e)

$GWPCH4$ = Global warming potential of methane valid for the commitment period (tCO2e/tCH4)

$FCH4,RG,m$ = Mass flow of methane in the residual gas in the minute m (kg)

$\eta flare,m$ = Flare efficiency in minute m

Determination of mass flow of the residual gas below formula is used as per referred tool;

$$MRG,m = \rho RG,ref,m \times VRG,m$$

Where: MRG,m = Mass flow of the residual gas on a dry basis at reference conditions in minute m (kg)

$\rho RG,ref,m$ = Density of the residual gas at reference conditions in minute m (kg/m3)

VRG,m = Volumetric flow of the residual gas on a dry basis at reference conditions in the minute m (m3)

Since in the Monitoring period the flare has not been used MRG,m is 0 for this MP. Thus, $PEflare,y$ is resulted as 0 through this MP.

Accordingly, project emissions associated with the anaerobic digester in year y ($PE_{AD,y}$) is equivalent to project emissions of methane from the anaerobic digester in year y ($PE_{CH4,y}$) as follows:

$$PE_{AD,y} = PE_{CH4,y}$$

As per the paragraph 23 of the Tool, $PE_{CH4,y}$ is calculates as follows:

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

Where:

$PE_{CH4,y}$ = Project emissions of methane from the anaerobic digester in year y (tCO_2e)

$Q_{CH4,y}$ = Quantity of methane produced in the anaerobic digester in year y (tCH_4)

$EF_{CH4,default}$ = Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)

GWP_{CH4}= Global warming potential of CH_4 (28 tCO_2/tCH_4) (IPCC Fifth Assessment Report)

The quantity of methane produced in the AD in year y is calculated via below formula:

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t}$$

Where:

Fi,t = Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)

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

vi,t,db = Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m^3 gas i/m^3 dry gas)

ρi,t = Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m^3 gas i)

***Hence, $PE_{AD,2022}$* = 4,490 tonnes CO2/year**

***$PE_{AD,2023}$* = 16,132 tonnes CO2/year**

***$PE_{AD,2024}$* = 6,771 tonnes CO2/year**

Project emissions from use of electricity ($PE_{EC,y}$)

In accordance with the Gold Standard's consolidated baseline methodology, the project emissions from electricity consumption will be calculated following the latest version of 'Baseline, project and/or leakage emissions from electricity consumption and

monitoring of electricity generation ver.03.0[27]' (pg. 17). Accordingly, the methodological tool 'Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity'[28], Version 03.0, is applied to the proposed project activity to calculate $PE_{elec,y}$.

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

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in year y (tCO_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 (tCO_2/MWh) (Combined Margin = 0.5706 tCO2/MWh). It is calculated via "Tool to calculate the emission factor for an electricity system" v7 Scenario A Option A.1

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

Accordingly,

$PE_{EC,2022}$ = 3.44 tCO_2/year

$PE_{EC,2023}$ = 0.36 tCO_2/year

$PE_{EC,2024}$ = 0.04 tCO_2/year

(details are present in ER calculation sheet of the Project)

Project emissions from waste transportation ($PE_{Tran,y}$)

The Gold Standard consolidated baseline methodology states that the project emissions from manure transportation from collection points to the central treatment plant shall be calculated according to the Methodological tool *"Project and leakage emissions from transportation of freight"* Accordingly the methodological tool *"Project and leakage*

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

emissions from road transportation of freight", Version 01.1.0[29], is applied to the proposed project activity.

As per the paragraph 20 of the Tool, $PE_{Tran,y}$,

$$\left.\begin{matrix} PE_{TR,m} \\ LE_{TR,m} \end{matrix}\right\} = \sum_{f} D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6} \qquad \text{Equation (1)}$$

Where:

$PE_{TR,m}$	=	Project emissions from transportation of freight monitoring period *m* (t CO_2)
$LE_{TR,m}$	=	Leakage emissions from transportation of freight monitoring period *m* (t CO_2)
$D_{f,m}$	=	Return trip distance between the origin and destination of freight transportation activity *f* in monitoring period *m* (km)
$FR_{f,m}$	=	Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
$EF_{CO2,f}$	=	Default CO_2 emission factor for freight transportation activity *f* (g CO_2/t km)
f	=	Freight transportation activities conducted in the project activity in monitoring period *m*

For this project; average return distance between the origin and the destination is taken as 129 km which is the distance to farthest farm to project site. By taking this distance the most conservative approach is taken for the emission due to transportation of wastes. Daily waste amount taken by project is 95tonne/day (total of manure and agricultural wastes)according to finalized EIA (Reference: Project Approved EIA Report,

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

page 8) Hence yearly amount of total waste becomes 34,675 tonne. Emissions due to agricultural waste is also taken into account

Default CO_2 emission factor for freight transportation is chosen as 245 g CO2/t.km since light trucks will be used which could carry 20 tonnes in a round (each).

Hence;

$PE_{Tran,2022}$ = 1,629 tCO_2/year

$PE_{Tran,2023}$ = 4,850 tCO_2/year

$PE_{Tran,2024}$ = 1,980 tCO_2/year

(details are given in ER calculation sheet)

Accordingly, The Total of Project Emissions

$PE_y = PE_{AD,y} + PE_{EC/FC,y} + PE_{Tran,y}$

PE_{2022}= 4,490 tCO_2/yr + 3.44 tCO_2/yr + 1,630 tCO_2/yr = 6,123 tonnes CO2/year

PE_{2023}= 16,132 tCO_2/yr + 0.36 tCO_2/yr + 4,849 tCO_2/yr = 20,982 tonnes CO2/year

PE_{2024}= 6,771 tCO_2/yr + 0.04 tCO_2/yr + 1,980 tCO_2/yr = 8,752 tonnes CO2/year

E.3. Calculation of leakage

$$LE_y = \left(LE_{PJ,N2O,y} - LE_{BL,N2O,y}\right) + \left(LE_{PJ,CH4,y} - LE_{BL,CH4,y}\right) + LE_{Comp,y} + LE_{AD,y} + LE_{Trans,y}$$

Where:

$LE_{PJ,N2O,y}$ = Leakage N_2O emissions released during project activity from land application of the treated manure in year y (tCO_2e/yr)

$LE_{BL,N2O,y}$ = Leakage N_2O emissions released during baseline scenario from land application of the treated manure in year y (tCO_2e/yr)

$LE_{PJ,CH4,y}$ = Leakage CH_4 emissions released during project activity from land application of the treated manure in year y (tCO_2e/yr)

$LE_{BL,CH4,y}$ = Leakage CH_4 emissions released during baseline scenario from land application of the treated manure in year y (tCO_2e/yr)

$LE_{Comp,y}$ = Leakage emissions associated with the storage and disposal of compost in year y (tCO_2e)

$LE_{AD,y}$ = Leakage emissions associated with the anaerobic digester in year y (tCO_2e)

$LE_{Trans,y}$ = Emissions from incremental distance travelled for waste/final compost/residue transportation in tCO_2e/yr

As noted earlier, since the proposed project activity does not involve composting, $LE_{Comp,y}$ shall be accounted as zero. Moreover, the solid and liquid digestate used as fertilizer in nearby agricultural land as free and this materials are not used/stored in any other conditions on land. Hence, $LE_{PJ,N2O,y}$, $LE_{PJ,CH4,y}$ shall be zero. Before the project activity farm owners bought the inorganic fertilizer from related market which is costly.

In addition, as per the statement made by the Gold Standard consolidated baseline methodology as "leakage covers the emissions from land application of treated manure as well as the emissions related to anaerobic digestion in a digester, occurring outside the project boundary" (pg. 18), leakage emissions associated with the anaerobic digester ($LE_{AD,y}$) and emissions from incremental distance travelled for waste/final compost/residue transportation ($LE_{Trans,y}$) shall also be accounted as zero since these emissions are occurring within the project boundary and already accounted as project emissions.

Accordingly, net leakage shall be negative. As per the statement made by the Gold Standard consolidated baseline methodology as "net leakage is only considered if they are positive" (pg. 18), LE_y shall be accounted as zero.

LE_y = 0 tCO_2/yr

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
SDG 7	Production of Clean Energy (MWh)	-	31,051	31,051
SDG 8	Creating Employment Opportunities (people)	-	23	23
SDG 12	Ensure Sustainable Consumption and Production Patterns (tonnes)	267,666	-	267,666
SDG 13	CO_2 Emission Reductions (tCO2)	233,678	35,857	197,821

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values[30] achieved during this monitoring period
13	206,361 tCO_2	197,821 tCO_2
12	34,675 tonnes/ year	267,666 tonnes/ year
7	29,876 MWh/year	17,252 MWh/year
8	22 People	23 people

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

For the ER calculations of 2023 (for one full year) the expected ER value is 116,133 tCO2. This value is multiplied with 132/365 to calculate the estimated emission between 22/08/2022-31/12/2022 and multiplied by 152/366 to calculate the estimated emission between 01/01/2024-31/05/2024.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

SDG-8:

The project has been expected to employ 22 people. In 2024, 23 people are employed.

SDG-12:

Since the EIA report of the plant has been prepared before the plant operation, waste amount has been underestimated, and the plant can operate with waste more than estimated in the EIA.

[30] Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

SECTION F. SAFEGUARDS REPORTING

Principles	Mitigation Measures added to the Monitoring Plan
Principle 9.4 Release of Pollutants	Air Quality - Reduction of SO2 and NOx emissions due to implementation of project activity that would otherwise be emitted by thermal power plants There is no wastewater disposal from the digestion. After digestion there is a de-watering unit and effluent of digesters separated into solid and liquid parts which are called solid and liquid digestates. In fact, these digestates are a kind of organic fertilizers and distributed to nearby farmers to use in agricultural lands. On the other hand, odor was a problem of baseline situation not the project since manure/waste collected from the animal shelters/farms decomposed and turned into more stable state fertilizer, which is environmentally favorable and odorless than the lagoon storage. In addition, this project is within the boundary of "organized industrial zone" not in public areas where problems such as odor are likely to occur
Principle 6.1: Labor Rights	Quality of Employment - Contribution to quality of employment by ensuring that the staff is trained and certified for the required positions
Principle 6.1: Labor Rights	Fair wage, working hours and occupational Injuries Within the framework of the project activities, compliance with national and international labor rights is demonstrated. As stated in Appendix 1, these rights are within the framework of regulations/applications that must be complied with within the borders of Turkey.
Principle 9.5 Hazardous and Non-hazardous Waste	Other Pollutants - Proper management of waste oil
Principle 9.6:	One of the project outputs is organic fertilizer as liquid and solid digestate. This fertilizer supplied/distributed to the nearby farmers for use on agricultural lands.

Pesticides & Fertilizers

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

No inputs or grievance received during this monitoring period.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

No such demand was made in this monitoring period.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

No legal contest had arisen with the project in this monitoring period.

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption