KEY PROJECT INFORMATION & PROJECT DESIGN DOCUMENT (PDD)

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VERSION **v. 1.2**
RELATED SUPPORT
- TEMPLATE GUIDE Key Project Information & Project Design Document v.1.2

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KEY PROJECT INFORMATION

GS ID of Project	GS11344
Title of Project	BOR BIOGAS-SOLAR HYBRID PROJECT
Time of First Submission Date	24/01/2022
Date of Design Certification	-
Version number of the PDD	~~06~~07
Completion date of version	~~31/08~~13/12/2023
Project Developer	GTE KARBON SUSTAINABLE ENERJI EGITIM DANISMANLIK VE TICARET A.S.
Project Representative	GTE KARBON SUSTAINABLE ENERJI EGITIM DANISMANLIK VE TICARET A.S.
Project Participants and any communities involved	Flaş Bor Bio Enerji Elektrik Üretim San. ve Tic. A.Ş. (Project Owner, Private Entity)
Host Country (ies)	Turkey
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Scale of the project activity	☐ Micro scale ☐ Small Scale ☒ Large Scale
Other Requirements applied	N/A
Methodology (ies) applied and version number	The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste - Version 1.0
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A
Project Cycle:	☒ Regular ☐ Retroactive

Table 1 – Estimated Sustainable Development Contributions

Sustainable Development Goals Targeted	SDG Impact (defined in B.6.)	Estimated Annual Average	Units or Products
13 Climate Action (mandatory)	13.2.2 Total greenhouse gas emissions per year	The project contributes ~~to 191,916~~to ~~tonnes~~191,916 tonnes/year of CO2e reduction, which represent direct and quantifiable impact on climate security	tCO2 per annum (GS VER)
7 Affordable and Clean Energy	7.2.1 Renewable energy share in the total final energy consumption	40,012.50 MWh	MWh/year
8 Decent Work and Economic Growth	8.5.1 Average hourly earnings of female and male employees, by occupation, age, and persons with disabilities	24 employees will gather H&S and other related trainings	Number of employees
12.Ensure Sustainable Consumption and Production Patterns	12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment	The project provides better management option for wastes as around 335,435 tons/year	Tons/year

SECTION A. DESCRIPTION OF PROJECT

A.1 Purpose and general description of project

>> The owner of Bor Biogas Power Plant project is Flaş Bor Bio Enerji Elektrik Üretim San. ve Tic. A.Ş. In the area reserved for the project, a biogas power plant with a capacity of 5.479 MW_m / 5.335 MW_e (there are three units which have the capacity; 1.526 MW_e as Unit 1, 1.904 MW_e as Unit 2, 1.905 MW_e as Unit 3) and a greenhouse will be constructed for agricultural purposes in same project site.

The main purpose of the project is to generate energy from manure collected from producers around Niğde province. After animal manure collected will be biodegraded in anaerobic digesters. Homogeneous mix of cattle and poultry manure is obtained prior to be fed into anaerobic digester.

Main goals of the project are;

- Biogas from cattle and poultry excrement will be used to produce clean electrical energy,
- Waste collected from the animal shelters will be decomposed and turned in to more stable state fertilizer, which is environmentally favorable and odorless,
- The obtained fertilizer will have less odor compared to present fertilizers and will contain more free nitrogen (N)

Prior Consideration

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.

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. 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."

Baseline Scenario

In the baseline situation, there is no renewable electricity generation and export to national grid via a biogas plant in the region. In relation to this, project increase the renewable capacity of Turkey as host party via electricity generation using biogas produced by using wastes indicated above. This renewable electricity generation strongly related with Sustainable Development Goal 7 which is mentioned on renewable

energy generation and increasing capacity on that manner. Electricity generated by the project increased the renewable energy generation of Turkey. Moreover, project owner employed 24 employees for the present situation which contributes to the SDG 8 "Decent Work and Economic Growth "since project creates job opportunities. Also, as detailed situation given in paragraph above, project managed 919 tons/day of waste managed with this project which contributes to the sustainable development pathway of Turkey related with SDG 12

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.

In terms of number of animals those waste is handled within project activity; the project receives manure from 18,252 cattle (12,834 dairy cows and 5,418 other cows)[1] which is brought by the nearby 47 cattle farms and 3,200,000 chicken[2] which is brought by the nearby 3 poultry farms that results in a daily organic flow of 919 tons[3].

[1] Farmer's Declaration

[2] Farmer's Declaration

[3] EIA Report, Page 14

There is no activity of this project that might affect services in baseline scenario, which were beneficiary for the local stakeholders and farmers who provide manure to the project. Even, the digestate is provided to the farmers to be used as fertilizer. In that perspective, project add another beneficiary activity to the region.

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. In addition, the excess heat is used to warm up digesters. The project will generate 40,012.50 MWh of electricity annually and reduce 191,916 tCO2e annually and 959,578 tCO2e in total over the crediting period.

Table 1. Milestones for Bor Biogas Project

Milestone	Date
Project Final Technical Feasibility Report	14/02/2020
Construction Agreement*	17/02/2021
Gas Engine 1 Agreement	02/03/2021
Gas Engine 2 Agreement	04/11/2021
Gas Engine 3 Agreement	04/11/2021
License Approvement	25/03/2021
Provisional Acceptance Protocol of Gas Engine 1	29/06/2021
Provisional Acceptance Protocol of Gas Engine 2	28/04/2022
Provisional Acceptance Protocol of Gas Engine 3	09/06/2022
Expected Start Date of First Crediting Period	01/01/2022

*Investment Decision Date

A.1.1. Eligibility of the project under Gold Standard

>> The project ~~consist~~consists of electricity generation, heat generation and corresponding emission reduction values. Section 3.1.1 (titled as 'Eligible Project

Types') of the document of Gold Standard for the Global Goals (GS4GG) Principles & Requirements[4] (Version 1.2.) clearly states that.

"A Project type is automatically eligible for Gold Standard Certification if there are approved Gold Standard Activity Requirements and/or Gold Standard Impact Quantification Methodologies associated with it or as referenced in Gold Standard Product Requirements" (ibid:6)

In line with this statement, the proposed Project's type, as renewable energy production out of manure management via anaerobic digestion through biogas capturing and utilizing, shall be considered as a Renewable Energy Activity. Hence, the document of "GS4GG Renewable Energy Activity Requirements[5] (Version 1.4)" will be used to define whether the proposed Project activity is automatically eligible for Gold Standard Certification.

The Section 1. (Titled as 'Eligible Project Types & Scopes') of the GS4GG Renewable Energy Activity Requirements states that

"In order to be eligible for certification, Gold Standard Renewable Energy Projects must meet the following Eligibility and Criteria:
(a) Project shall generate and deliver energy services (e.g. mechanical work/electricity/heat) from non-fossil and renewable energy sources
(b) Project shall comprise of renewable energy generation units, such as photovoltaic, tidal/wave, wind, hydro, geothermal, waste to energy and renewable biomass:

- Supplying energy to a national or a regional grid; or
- Supplying energy to an identified consumer facility via national/regional grid through a contractual agreement such as wheeling." (ibid.:2)

[4] https://globalgoals.goldstandard.org/101-par-principles-requirements/

[5] https://globalgoals.goldstandard.org/202-ar-renewable-energy-activity-requirements/

In the case of the proposed Project, it generates and delivers energy services from non-fossil and renewable energy sources, comprises of renewable energy units, and supplies electric energy to the national grid. Hence, it meets the Eligibility and Criteria.

As pointed out in the Section A.1. of this PDD, the proposed Project is designed to generate renewable energy, mainly electricity by using untreated cattle manure mainly. The proposed project, as a methane avoidance-based renewable energy activity, also meets the additional eligibility criteria prescribed for its project type, namely, project activity using biogas. Therefore, it is argued that the proposed Project is automatically eligible for Gold Standard Certification.

After reviewing all of the eligibility criteria as per section 3.1.1 of GS4GG Principles & Requirements document, it is argued that the proposed Project is automatically eligible for Gold Standard Certification. It is also important to note that the proposed Project will not benefit from other certification schemes or renewable energy labelling standards. The ways in which the proposed project activity meets eligibility criteria can be summarized as follows:

- The Project is seeking to issue solely GS4GG VER Certification;
- The Project is neither registered nor applied to any other Voluntary Emission Reductions Certification Scheme;
- The Project is a renewable energy installation activity;
- The Project activity includes physical action/implementation on the ground;
- The Project is located in Turkey, which is eligible for VER projects;
- The Project contributes to sustainable development goals;
- The Project is in compliance with GS safeguarding principles;
- Stakeholders are involved in the project implementation and planning during the local consultation meetings and feedback round;
- The Project outcomes are real and will be validated/verified by approved bodies;
- Additionality is demonstrated as per the applicable tools and methodologies.

The project activity meets the eligibility criteria as per section 3.1.1 of GS4GG Principles & Requirements document as described below:

- The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reduction from Manure Management Systems and Municipal Solid Waste
- The project type is power generation using Biogas Energy which is an eligible project type as it is in accordance with 1.1.1 a) and 1.1.1 b) of the Eligible Project Types & Scope under Renewable Energy Activity Requirements.
- The project activity results in displacement of electricity from thermal power plants while contributing to sustainable development of Turkey. Hence, the project contributes to the Gold Standard Vision and Mission.
- Biogas power is an approved project type and does not require approval from Gold Standard.
- This project activity is not associated with geo-engineering or energy generated from fossil fuel or nuclear, fossil fuel switch, nor does it enhance or prolongs such energy generation.
- The project is not registered with any other schemes.

There is no activity of this project that might affect services in baseline scenario, which were beneficiary for the local stakeholders and farmers who provide manure to the project. Even, the digestate is provided to the farmers to be used as fertilizer. In that perspective, project add another beneficiary activity to the region.

A.1.2. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

>>As per the pre-license issued by Energy Market Regulatory Authority (EMRA), all legal rights of the project are given to Flaş Bor Bio Enerji Elektrik Üretim Sanayi ve Ticaret A.Ş (numbered as EÜ/10096-23/04835). The owner of the license is responsible for the construction of the facility, commissioning, production, and sale of the electricity produced. Please see Appendix for legal ownership license.

A.2 Location of project

>> Bor District, Niğde Province, Turkey. The satellite view of the project site is given below with coordinates:

Figure 1. Satellite view of project district in Turkey

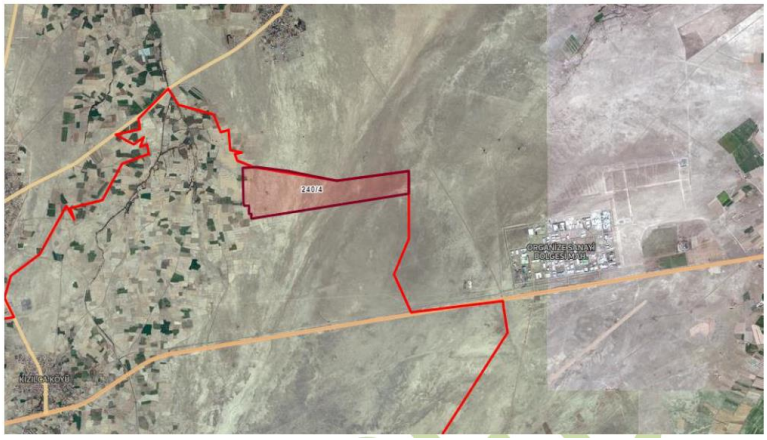

Figure 2. Satellite view of project site_1

Figure 3. Satellite view of project site_2

Nokta No	E	N
1	625692.80	4193032.70
2	625910.68	4193064.14
3	625996.90	4193076.58
4	626000.47	4192940.48
5	626006.66	4192655.40
6	625702.11	4192603.77

Figure 4. The Project's corner coordinates can be seen on the Table above (Ref: License of the project)

A.3 Technologies and/or measures

>> In terms of number of animals those waste is handled within project activity; the project receives manure from 18,252 cattle (12,834 dairy cows and 5,418 other cows) and 3,200,000 chicken that results in a daily organic flow of 919 tons. In the area reserved for the project, a biogas power plant with a capacity of 5.479 MW_m / 5.335 MW_e (there are three units which have the capacity; 1.526 MW_e as Unit 1. 1.904 MW_e as Unit 2, 1.905 MW_e as Unit 3) and a greenhouse will be constructed for agricultural purposes in same project site.

Technology applied will involve use of cattle manure and chicken manure wastes. "Mesophilic" technology will be applied according to the operating temperature in the planned biogas plant. The optimal operating temperatures of these bacteria are 37ºC-41ºC. Manure is mixed and hydrolyzed here to break the bonds and generate biogas. Biogas obtained will be fed to the cogeneration unit to generate heat and electricity whereas final product will be stored and used as fertilizer. Electricity generated will be fed to the national grid and heat will be used in the plant own processes.

Anaerobic digesters with steel or lined concrete or fiberglass digesters and a gas holding system and monolithic construction are using 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[6].

The transport of the collected manure from the farms will be achieved by totally confined trucks. The transported manure will be directly transferred to the raw material pond without any storage time. Collected manure 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 toto warm up anaerobic digesters. 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. Remaining sludge after the biogas extraction is sent to the separator and drier units to produce biologically enriched fertilizer.

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 use waste (cattle manure and chicken manure) to generate biogas,

[6] Project Technical Feasibility Report, page 20

electricity, and heat energy. Prior to the project activity, baseline situation, cattle, chicken manure generated at farms managed by lagoons left in agricultural lands. Applicability of this baseline situation argued detail in Section A.1

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, 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 may be shared with farmers near to project site to be used as fertilizer.

Hydrogen sulfide (H2S) in biogas will be reduced to 150 ppm and lower by biological internal desulfurization. In addition, the condensate path in the biogas line and condensate collection systems will remove 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 will be reduced to the desired level.

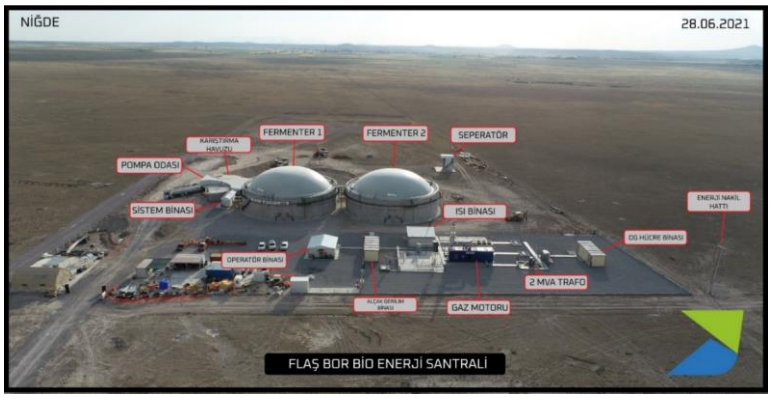

Figure 5. Schematic View of the Process

Waste heat energy gathered from cooling operation of gas engines used to warm up the digesters. As seen in the Project Operation Scheme, the key equipment of the project is;

- Gas engines
- 2 Anaerobic digesters (fermenters)
- Biogas meters
- Electricity meters
- Flare unit

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

Gas Engine 1: TCG 2020V16[7]
Supplier Company: MWM
Electrical Power: 1560 kW (full load)
Voltage: 400 V
Speed: 1500 rpm/min
Electrical Efficiency: 42.7% (full load)
Thermal Efficiency: 42.9% (full load)

[7] ..\18. Gas engine pictures and technical specifications

Total efficiency: 85.6 (%) (full load)
Equipment lifetime: 150,000 hours[8]

Gas Engine 2&3: TCG 2020V20[9]
Supplier Company: MWM
Electrical Power: 2000 kW (full load)
Voltage: 400 V
Speed: 1500 rpm/min
Electrical Efficiency: 43% (full load)
Thermal Efficiency:43.2% (full load)
Total efficiency: 86.2(%) (full load)
Equipment lifetime: 150,000 hours[10]

Figure 6. Site Photo of Gas Engine 1 (Unit 1)

Biogas Meters[11]

[8] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[9] ..\18. Gas engine pictures and technical specifications
[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[11] ..\22. Biogas Flowmeters and Sampling-Calibration and pictures\CSProxyCache.pdf

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 in a room next to anaerobic digesters. The calibration of the flow meters was performed on 13/03/2021 and 16/03/2021.

Flow rate: Typical v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified measuring accuracy
Conductivity: s = 5 to 2000 µS/cm not for sensors without reference electrode (Promag S with brush electrodes)
U = 3 to 30 V DC, Ri = 5 kΩ, galvanically isolated
Current output: Active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s), full scale value adjustable, temperature coefficient: typically 0.005% o.f.s./°C (0.003 % o.f.s./°F)
resolution: 0.5 µA
• Active: 0/4 to 20 mA, RL < 700 Ω (for HART: RL ≥ 250 Ω)
• Passive: 4 to 20 mA; supply voltage VS: 18 to 30 V DC; Ri ≥ 150 Ω

Pulse/frequency output: Active/passive selectable (Ex i version passive only), galvanically isolated
Active: 24 V DC, 25 mA (max. 250 mA over 20 ms), RL > 100 Ω
Passive: open collector, 30 V DC, 250 mA
Frequency output: end frequency 2 to 10000 Hz (fmax = 12500 Hz), on/off ratio 1:1, pulse width max. 10 s
Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.05 to 2000 ms)
Supply voltage: 20 to 260 V AC, 45 to 65 Hz
Equipment lifetime: 15 years[12]

Flare Unit[13]

[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[13] ..\20. Flare pictures and technical specifications

Flare Type: Elevated Flare (open type)

Min flow pressure in front of flare: 20 mbar

Min Methane Ratio: 35%

Combustion temperature (approximately): 800-1200 C

Equipment lifetime: 15 years[14]

Figure 7. Site Photo of Flare Unit

Anaerobic Fermentation Units[15]

*There are 2 main digester units in the plant.

Diameter: 24 m

Height: 24 m.

Volume: 3,500 m3

Temperature: 37-41°C

Input Temperature: 60°C

Output Temperature: 40°C

[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

[15] EIA Report, Page 36

Equipment lifetime: 25 years[16]

Gas Analyzers;

There are 2 identical gas analyzer in the plant:

Power supply: 230V/2A/50 Hz

Ambient temperature: +5-+45 °C

Measuring Range: O2: 25%

H2S:200 ppm

CO2: 100%

CH4: 100%

Electricity meters,

	Main Meter	**Back-up Meter**
Brand	Makel	Landis
Type	C520	ZMG405
Class	0.5	0.5
Serial No	75001746	40303944
First Index date	29/06/2021	29/06/2021
Calibration due dates	29/06/2031	29/06/2031

Technical specifications of the biogas flow meters given below;

Brand	Endress+Hauser	Endress+Hauser
Type	Prosonic Flow B	Prosonic Flow B
Serial No	S30BEA02000	S2208D19000
Installation and calibration date	16/03/2021	13/03/2021

Technical specifications of the gas analyzers given below;

Brand	MRU GmbH	MRU GmbH
Type	SWG-100 BIOGAS	SWG-100 BIOGAS
Serial No	081526	081423

[16] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

Factory approval of conformity	20/05/2014	20/05/2014

In addition, project contribution to SDGs given below briefly;

Sustainable Development Goals	Project Contribution
13 Climate Action (mandatory)	The project contributes to 191,916 tonnes of CO2e reduction, which represent direct and quantifiable impact on climate security.
7 Affordable and Clean Energy	40,012.500 MWh (as per project license).
8 Decent Work and Economic Growth	24 employees will gather H&S and other related trainings.
12.Ensure Sustainable Consumption and Production Patterns	The project provides better management option for wastes as around 919 tonne/day

A.4 Scale of the project

>> The CDM Methodology Booklet[17] (tenth edition) states that the Type (iii) project activities "that result in emission reductions of more than 60 kt CO2 equivalent per year"(pg. 41) shall be considered as "Large-scale" project activities. Since the total estimated emission reduction of the proposed project activity is 191,916 tCO2 equivalent per year, the Project's scale shall be defined as "large-scale".

A.5 Funding sources of project

>> No public funding is used for the project activity.

[17] https://cdm.unfccc.int/methodologies/documentation/1903/CDM-Methodology-Booklet_fullversion

SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

B.1. Reference of approved methodology (ies)

>> The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[18] .

Referred tools:

"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", Version 03.0[19]

"Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", Version 03.0[20]

"Project emissions from flaring", Version 04.0[21]

"Project and leakage emissions from anaerobic digesters", Version 02.0[22]

"Project and leakage emissions from biomass", Version 05.0[23]

"Tool to calculate the emission factor for an electricity system", Version 07.0[24]

"Tool to determine the remaining lifetime of equipment", Version 01[25]

"Combined tool to identify the baseline scenario and demonstrate additionality", Version 07.0[26]

"Emissions from solid waste disposal sites", Version 08.1[27]

"Tool for the demonstration and assessment of additionality" Version 07.0[28]

"Common Practice Tool" Version 3.1[29]

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[18] https://globalgoals.goldstandard.org/421-wm-ghg-emission-reductions-from-manure-management-systems-and-municipal-solid-waste/
[19] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf
[20] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
[21] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v4.0.pdf
[22] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf
[23] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v5.0.pdf
[24] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[25] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[26] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[27] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.1.pdf
[28] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[29] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf

"Project and leakage emissions from road transportation of freight", Version 01.1.0[30]
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream

B.2. Applicability of methodology (ies)

>> The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste is chosen for this project.

This consolidated baseline methodology[31] is based on elements from the following methodologies:

- AM0006: "GHG emission reductions from manure management systems";
- AM0016: "Greenhouse gas mitigation from Animal Waste Management Systems in confined animal feeding operations";
- ACM0022: "Alternative waste treatment processes";
- AM0073: "GHG emission reductions through multi-site manure collection and treatment in a central plant".

The justification of the choice of this methodology is presented in the Table below. In addition, the methodology is also applicable to the activities that involve co-digestion and/or co-composting of multiple organic matters that would have otherwise been left to decay anaerobically-.

The methodology criteria	Applicability justification of the proposed project activity
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	The proposed project activity provided a centralized anaerobic treatment plant which replaced the lagoons of nearby farms to manage animal manure (cattle, poultry, and sheep manure) by collecting

[30] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf
[31] https://globalgoals.goldstandard.org/421-wm-ghg-emission-reductions-from-manure-management-systems-and-municipal-solid-waste/

combination of more than one animal waste management systems (AWMSs) that result in less GHG emissions compared to the existing system. The project activities where manure is collected by tank trucks, canalized and/or pumped from multiple livestock farms and the collected material is subsequently treated in a single central treatment plant may also claim emission reductions. The methodology is applicable to both Greenfield and existing facilities.	this waste with confined truck to achieve biogas and so methane, which is used to gainfully generate electricity, as noted in the Section A.1. of the PDD also. Therefore, this consolidated baseline methodology shall be applied to the proposed project activity.
In addition, the methodology is also applicable to the activities that involve co-digestion and/or co-composting of multiple organic matters that would have otherwise been left to decay anaerobically in an animal waste management system (AWMS) or a solid waste disposal site (SWDS).	The proposed project activity provided an anaerobic treatment plant fed with animal waste which were left to decay and produce uncontrolled methane in the absence of the project. Therefore, this consolidated baseline methodology shall be applied to the proposed project activity.
Farms where livestock populations, comprising of cattle, buffalo, swine, sheep, goats, and/or poultry, is managed under confined conditions.	The Project's primary feedstock, cattle-manure, is supplied mainly by farms of members of the Cooperative. The Cooperative, along with its members' farms, functions under the control of the Ministry of Agriculture and Forestry. The Cooperative's members manage the livestock population in their farms in accordance with the relevant Turkish laws and regulations confining conditions, especially regarding animal

	health, such as Law No. 5996[32], Law No. 3285[33] and Regulation on Livestock Farms[34].
Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries) & Farms where manure is not discharged into natural water resources (e.g. rivers or estuaries)	As shown in the Section A.3. of the PDD (flow scheme), the waste streams after the treatment will not be discharged into natural water resources. The refined and processed fermented product will be sent to the separator and decanter (dehydration unit) to be separated (please see the Section A.5. of the PDD). Both the liquid and solid parts of the residual waste from the digestion will be further used as organic fertilizers. In the baseline scenario, as noted above, the farms where manure is collected for the Project are managed in accordance with the relevant laws and regulations which prohibit manure to directly discharge into natural water resources. Hence, the proposed project activity complies with this criteria/condition.
In case of anaerobic lagoons treatments systems, the depth of the lagoons used for manure management under the baseline scenario should be at least 1 m	In the baseline scenario, cattle manure generated at farms is stored generally in tanks in anaerobic conditions. Tanks' depths, when applicable, are more than 1 m. Therefore, this criteria/condition is compiled by the proposed project activity.

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

The annual average ambient temperature at the site where the anaerobic manure treatment facility in the baseline existed is higher than 5°C	The annual average temperature of baseline site where manure is collected from multiple farms, as members of the Cooperative, is 11.,2°C[35]. Hence, the proposed project activity complies with this criteria/condition.
In the baseline case, the minimum retention time of manure waste in the anaerobic treatment system is greater than 1 month	The retention time of manure waste is greater than one month in the baseline scenario. Therefore, this criteria/condition is compiled by the proposed project activity.
The AWMS(s) in the project case results in no leakage of manure waste into ground water, e.g. the lagoon should have a non-permeable layer at the lagoon bottom	No leakage of manure waste into ground water occurs in the project case since the lagoons have a non-permeable layer at the lagoon bottom. Hence, the proposed project activity complies with this criteria/condition.
If residues are stored in between collection activities, storage tanks shall comprise outdoor open equipment	Not applicable. Since residues collected from the farms are immediately fed into the digesters, this criteria/condition is not applicable to the proposed project activity.
If the manure/treated residue is used as fertilizer in the baseline, project proponents must ensure that this end use remains the same throughout the project activity	Not applicable. In the baseline scenario there is no manure usage by the farmers as fertilizer. The farmers will only be to obtain the fertilizer **after the project activity** which is the treatment of manure by digestion. Fertilizers gathered after the anaerobic digestion are

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

	provided to all the farmers around who is willing to use. This issue is also covered during the site visit under validation progress and local stakeholders clearly stated that the solid and liquid fertilizers provided by this facility (the Project) contributed significantly to the production in their agricultural activities. At this point, the project owner only demands that the fertilizer receiving farms bear the cost of carrying the fertilizer, but does not earn any other financial income in this process.
In case residual waste from the digestion is handled aerobically and/or submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) for storage and transportation and soil application must be ensured	Not applicable. Both the liquid and solid parts of the residual waste from the digestion will be further used as organic fertilizers. Residual wastes from biological treatment are 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 Bor District of Niğde Province) to be used as fertilizer.
In the 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, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-digested substrates	Proposed project activity involves co-digestion of multiple sources of biomass substrates mainly cattle and poultry manure. Since it cannot be demonstrated that these feedstocks would otherwise been left to decay anaerobically, no emission reduction will be claimed for digestion of these secondary substrates. Under the baseline emission calculations agricultural wastes is not taken into account as per methodological criteria;

	however, project emissions due to these wastes are taken into consideration for the project such as emissions caused due transportation of these wastes to the project site. Additionally, MSW is not used as co-substrate in this project and as understood from the methodological statements, The project has an option to not use MSW in the operation of the project and so there is no need to apply ACM022 for applicability condition of MSW perspective.
CERs shall be claimed by the Central Treatment Plant managing person/entity, only. Other parties involved must sign a legally binding declaration that they will not claim CERs from the improved animal waste treatment practices. The DOE shall check such declaration during the validation (during verification if new parties added after project registration) and these documents shall be valid throughout the whole crediting period	Declaration is to be shared which mentions the VERs shall be claimed by Flaş Bor Bio Enerji Elektrik Üretim A.Ş. (project owner) only.

TOOL #	Applicability	Compliance/Justification
TOOL 02: Combined tool to identify the baseline scenario and demonstrate additionality	The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies. This could	The tool is referred by the ACM0018 methodology. Hence, it is applicable. No adjustments or additional explanations are required by the methodology.

	include, inter alia, a listing of relevant alternative scenarios that should be considered in Step 1, any relevant types of barriers other than those presented in this tool and guidance on how common practice should be established.	
TOOL 03: Tool to calculate Project ot leakage CO2 emissions from fossil fuel combustion	This tool provides procedures to calculate project and/or leakage CO2 emissions from the combustion of fossil fuels. It can be used in cases where CO2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties.	Project activity will have small amounts of fossil fuel usage for startup purposes. For that reason, this tool is applicable.
TOOL 06: Project emissions from flaring	This tool is applicable to the flaring of flammable greenhouse gases where: (a) Methane is the component with the highest concentration in the flammable residual gas; and (b) The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas). The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas	(a) Methane is the flammable gas with highest concentration in the residual gas (b)Residual gas is obtained from the decomposition of organic material within project activity. There is no auxiliary fuel use.

	present to sustain combustion. In the case of an enclosed flare, there shall be operating specifications provided by the manufacturer of the flare and These shall be followed by the project participant.	
TOOL 05: Baseline, Project emissions from electricity consumption and monitoring of electricity generation	This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	The baseline emissions from electricity generated and supplied by the project power plant to the grid and/or to the consumers (BEEG,y) is calculated in the methodology that refers to this tool. For that reason tool is applicable.
TOOL 07: Tool to calculate emission factor for an electricity system	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results	Project will substitute electricity from the national grid hence, tool is applicable. The methodology has been applied in a conservative manner. Tools addressed by the applied methodology have been used to calculate

	in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects). Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are	baseline, project and leakage emissions

	primarily due to constraints in generation and not to other aspects such as transmission capacity. In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country. Under this tool, the value applied to the CO2 emission factor of biofuels is zero.	
TOOL 09: Determining the baseline efficiency of thermal electric energy generation systems	This tool is applicable to energy generation systems that: (a) Generate only electricity (and no thermal energy);or (b) Produce only thermal energy (and no electricity); or (c) Produce both electricity and thermal energy (cogeneration) Also, the following conditions apply: (a) The tool is applicable to waste heat recovery systems to calculate efficiency values using options (A) to (E) as provided under paragraph 12 below;	Project activity generates only electricity (and no thermal energy). For this reason, tool is applicable.

	(b) The tool can be applied only if load is the main operating parameter that influences the efficiency of the energy generation system. For cogeneration systems, the heat to power ratio may also be considered a main operating parameter.	
TOOL 12: Project and leakage emissions from transportation of freight	This tool is applicable to project activities which involve freight transportation by road and where transportation is not the main project activity. This tool is not applicable to project activities where transportation is the main source of greenhouse gases emissions. This tool does not provide procedures to estimate baseline emissions from road transportation of freight. The tool only provides to determine CO2 emissions. CH4 and N2O emissions are excluded for simplification as they are small compared to CO2 emissions. In addition, the tool is applicable for the determination of project or leakage emissions from freight transportation by rail in project	The Project will involve certain transportation of biomass to the facility (digesters), but transportation is not the main project activity. **For this reason, the tool is applicable**. The Project will rely on highway transportation and calculation will be based on longest route to have a conservative approach for the project emission from transportation of the biomass to the plant.

	activities where transportation is not the main project activity.	
TOOL 14: Project and leakage emissions from anaerobic digesters	3.The following sources of project emissions are accounted for in this tool: (a) CO2 emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) CO2 emissions from consumption of fossil fuels associated with the operation of the anaerobic digester; (c) CH4 emissions from the digester (emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester); and (d) CH4 emissions from flaring of biogas. 4. The following sources of leakage emissions are accounted for in this tool: (a) CH4 and N2O emission from composting of digestate; (b) CH4 emissions from the anaerobic decay of digestate disposed in a SWDS or subjected to anaerobic storage, such as in a stabilization pond. 5. Emission sources associated with N2O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation,	3. Electricity will be used during the operation of digestion without the use of fossil fuels. Biogas generated during this process will be used for electricity generation and surplus biogas will be flared if there is any. Project activity meets (a) and (c) 4. The (a) CH4 emission from composting of digestate will be accounted for. 5. Emission sources associated with N2O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources. Hence, the tool is applicable.

	piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources or because they are accounted in the methodologies referring to this tool.	
TOOL 16: Project and leakage emissions from biomass	This tool shall be applied in conjunction with the methodology that refers to this tool. The tool is applicable if biomass residues are consumed in a CDM project activity. These could be: (a) Procured by the project proponents; or (b) The result of an agro-industrial process under the control of the project proponents	The tool is referred by the ACM0018 methodology. Hence, it is applicable.
TOOL 24: Common practice	This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", or baseline and monitoring methodologies that	The Project applies "Tool02 – Combined tool to identify the baseline scenario and demonstrate additionality". For this reason, this tool is applicable.

	use the common practice test for the demonstration of additionality. In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.	
TOOL 27: Investment analysis	This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality. In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this	The Project applies "Tool02 – Combined tool to identify the baseline scenario and demonstrate additionality". For this reason, this tool is applicable.

	methodological tool, the requirements contained in the methodology shall prevail.	

B.3. Project boundary

>> The project boundary includes the physical, geographical sites of:

(a) The livestock (farms where the cattle, poultry and sheep manure gathered);
(b) Animal manure management system (This project site)
(c) Facilities which recover and combust or use methane.
- Manure management
- Electricity generation
- Excess heat usage

(d) All power plants connected physically to the electricity system (grid) that the project plant is connected to.
(e) Farms and facilities where the solid and liquid fraction(slurry) of the organic fertilizers transferred
(f) Flare is device for emergency situations where the gas leakage occurs and to be prevented from its explosion.

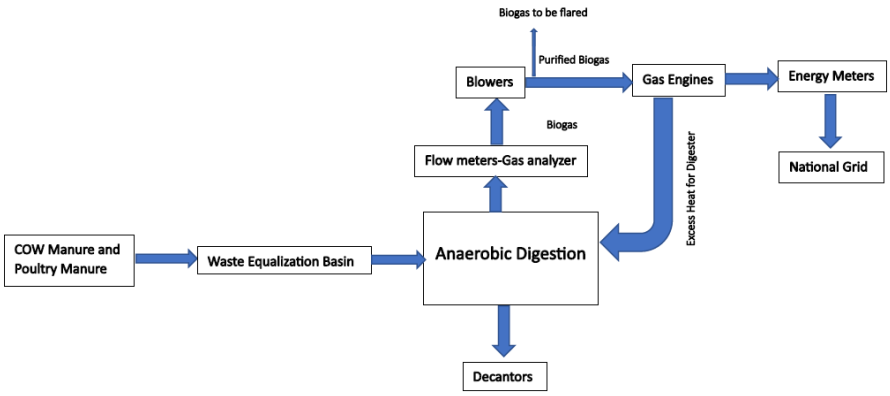


Figure 8. Physical diagram of project activity

Manure Supplier Farms with Name and Coordinates Which Have Agreements Between Project With Annual Animal Number Detail:

FARM	TYPE OF MANURE	ADDRESS	DISTANCE TO THE PLANT	NUMBER OF ANIMALS	TYPE OF ANIMAL
UZMANLAR TARIM	SOLID	Çayır Ünallar Kapı No:1 Bor/Niğde	35 km	1500	Dairy
KAYSERİ TARIM	SOLID	Germir Mah. Sivas Blv. No:15 Melikgazi/Kayseri	150km	750	Mixed
Şükrü ATEŞLİ	SOLID	Soysallı mah. 190 Sk. No:14 Develi/Kayseri	150 km	1000	Dairy
Ali ALBUSTANLIOĞLU	SOLID	Soysallı Kümevler 422 Develi/Kayseri	150 km	600	Dairy
Adem KIRMIZI	SOLID	Yakacık Köyü Atatürk Sk. No:14 Altunhisar/Niğde	25 km	100	Dairy
Metin GENİŞYÜREK	SOLID	Yeşilyurt Kırık Mevkii Altunhisar/Niğde	25 km	100	Dairy
İsrafil YURTSEVEN	SOLID	İstiklal mah. Kır Küme evler Altunhisar/Niğde	25 km	120	Dairy
Mutlu SOYLUGAN	SOLID	Çukurkuyu Bektik mah. No:112 Bor/Niğde	25 km	350	Mixed
Erdem ÇETİN	SOLID	Yeşilyurt Köyü Yukarı Osman mh. Kırık mevki No:1 Altunhisar/Niğde	25 km	100	Mixed
NİĞTAVUK	CHICKEN	Sıralı Mah. Elmacımahmut cd. Merkez/Niğde	55 km	200000	Egg
Mustafa SOYLUĞAN	SOLID-LIQUID	Bektik Mah. Şehit Mustafa Bozkurt Cad. No:7Çukurkuyu-Bor/Niğde	25 km	90	Dairy
YAVUZ HİRA	SOLID	istiklal merkez No:28 Kapı No:2 Altunhisar/Niğde	35 km	135	Dairy
AMİR YALTI	SOLID	İstiklal Mah. Ballı Sok. no27 ALTUNHİSAR/NİĞDE	35 km	110	Mixed
ÖZBAKANLAR	SOLID	Oruçreis Mah. 3416.Sk No:17 Kocasinan/Kayseri	130 km	7500	Mixed
MEHMET ALİ TÜRKBEN	SOLID	Harım Mah. Yağlıca Cad.no 30	20 km	210	Dairy
KENAN YILDIRIM	SOLID	BahçelievlerMah.Yeni yol Bahçeli evler 02 sok. iç kapı 4 Develi/ Kayseri	140 km	50	Dairy
ŞEVKİ KILINÇ	SOLID	Konya-Ereğli	90 km	500	Mixed
EMİN KOÇAK	SOLID	türkmen yurdu mah. Ömer halidemir bulv. No:10 Çukurkuyu/Niğde	25 km	310	Dairy
NAZIM BAŞTÜRK	SOLID	Bor Balcı Gayret Mah. No:131 Niğde	25 km	75	Dairy
ZÜBEYDE KARAKUŞ	SOLID	Zengen Mah. 997/96 no:6 ereğli/konya	25 km	150	Dairy
MUSTAFA DEMİR	LIQUID	İstiklal mah. Altuntaş sk. No:53 Altunhisar/Niğde	35 km	100	Mixed
RAMAZAN SUSUR	SOLID-LIQUID	Yakacık Atatürk Sk. Cumhuriyet Mevkii Altunhisar/ Niğde	45 km	150	Dairy
CUMALİ TURGUT	SOLID	Çukurkuyu Beldesi Türkmen yurdu şehit Ömer Halisdemir Bul. No:3 Bor/N	25 km	50	Dairy

HALİL İBRAHİM SOYLU	SOLID	Yakacık Köyü Atatürk Sk. No:23 Altunhisar/Niğde	45 km	150	Dairy
SİMGE HAYVANCILIK(Yasin Özbek)	SOLID	Sazlıca/Merkez 160/4 parsel simge süt çiftliği	30 km	65	Dairy
HÜSEYİN ŞEHİRLİ	SOLID	türkmen yurdu mah. No:8 çukurkuyu/niğde	25 km	210	Mixed
KEMAL DURUKAN	SOLID	Türkmen Yurdu Mah. No:15 Altunhisar/Niğde	25 km	150	Mixed
MEHMET KARACA	SOLID	türkmen yurdu mah no 35 Çukurkuyu Bor/Niğde	35 km	110	Dairy
MEHMET VURAL	SOLID	Sazlıca Kasabası Atatürk Caddesi No:34 Niğde	25 km	70	Dairy
YASİN GÜNDAĞ	SOLID	Şahin Ali Mah. Yörük Sk. No:78 Merkez/Niğde	45 km	245	Mixed
NURAY YAŞAR	SOLID	Esenbey mah. Olgay Sk. Roket aprt.319 niğde	45 km	96	Dairy
CUMALİ ATÇA	CHICKEN	Kemal Paşa Mah. 2588 Sk. Kapı No:6 Mersin-Tarsus	180 km	1500000	Egg
FARUK ÇELİK	SOLID	Yeşilyurt Köyü Yukarı Asmaz sk. Bayat yolu üzeri	25 km	120	Other
MURAT DOKUCU	SOLID	Niğde Altunhisar Yeşilyurt köyü bayındır sok no 15	25 km	100	Dairy
SİNAN SOYLUĞAN	SOLID	Bahçelievler Mah.No:38 Çukurkuyu-Bor/Niğde	25 km	76	Mixed
ŞABAN YILDIRIM	SOLID	Niğde Altunhisar yakacık köyü Baysal sokak no 24	45 km	350	Dairy
YILDIRAY UYSAL	LIQUID	Altuntaş Mevkii istiklal mah. No:111 altunhisar/Niğde	45 km	525	Dairy
HİCABİ KOÇAK	SOLID	İstiklal Mah. Buğday sk. No96 Altunhisar/Niğde	35 km	95	Dairy
UĞUR EYTEMİŞ	SOLID	Güllüce Köyü No:379 Niğde	40 km	125	Dairy
Bediroğulları	SOLID	Acıgöl Mah. Aliyer Küme Evi No:84 Bor/NİĞDE	10 km	350	Mixed
Yasin Alper	SOLID	Yakacık Köyü Cumhuriyet Mevkii Atatürk Sk.No:17 Altunhisar/Niğde	45 km	250	Dairy
Recep Yurtseven	SOLID	Çukurkuyu Kasabası – Bor/Niğde	25 km	75	Dairy
Mustafa Soylu	SOLID	Yakacık Köyü Cumhuriyet Mah. Baysal Sk. No:25/2 Altunhisar/Niğde	45 km	90	Dairy
Lütfiye TUĞRAL	SOLID	Bağdüz Mah. No23 Bor/Niğde	30 km	120	Dairy
Ziya Kesgin	SOLID	KIZILCA KÖYÜ AZİZLER MEVKİİ BATTAL SK.BOR / NİĞDE	25 km	145	Dairy
Kadir Arıkan	SOLID	Aşağıkayabaşı Mah.Ceren Sk. Gözde Sitesi 2/3 Merkez/Niğde	35 km	155	Mixed
Kemal Eren	SOLID	Ahmet Guddusi Mah.217 sk. Şahlan sitesi N blok no2	20 km	265	Dairy
Mehmet Vural	SOLID	Sazlıca Kasabası Atatürk Caddesi No:34 Niğde	35 Km	145	Dairy
Erkan Emek	SOLID	Yeşilyurt Köyü Köşk Mevkii Harım Sk. 11/1 ALTUNHİSAR/NİĞDE	40 km	120	Dairy
Nurgül KOÇAK	CHICKEN	Reşadiye mahallesi 3049.sok Demirkapı apt 1/16 Tarsus-Mersin	180 km	1500000	Egg

The furthest farm to the project site is as it could be checked from the information given above. To be on the safe side the longest distance used for the project emissions due to transportation of all wastes. As it could be checked the furthest points that waste gathered to project site is taken as 180 km inbaseline emission calculations.

The manure coming to the project site is fed up to reactors within 24 hours. Hence it is thought that there is no loss of volatile solid fraction.

	Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1 Emissions from waste treatment process	CO2	No	CO2 emissions from the decomposition of organic waste are not accounted.
		CH4	Yes	The major source of emissions in the baseline.
		N2O	Yes	Direct and indirect N2O emissions are accounted.
	Source 2: Emissions from electricity generation	CO2	Yes	CO2 emissions from the electricity generation is accounted since project use renewable energy source instead fossil fuel source.
		CH4	No	Excluded for simplification. This is conservative.
		N2O	No	Excluded for simplification. This is conservative.
Project scenario	Source 1:Emissions from waste treatment process	CO2	No	CO2 emissions from the decomposition of organic waste are not accounted.
		CH4	Yes	The emission from anaerobic digesters and aerobic treatment
		N2O	Yes	. Direct and indirect N2O emissions are accounted.
	Source 2: Emissions from electricity consumption	CO2	Yes	These emissions are counted for, since the Project will consume electricity from the National Grid.
		CH4	No	Excluded for simplification. This emission source is assumed to be very small.
		N2O	No	Excluded for simplification. This emission source is assumed to be very small.

Source 3: Emissions due to flare	CO2	Yes	Project emission from flaring of the residual gas stream taken into account as per related methodological calculation pathway.
	CH4	No	Excluded for simplification. This emission source is assumed to be very small.
	N2O	No	Excluded for simplification. This emission source is assumed to be very small.
Source 4: Emissions from manure/ waste residue transportation	CO2	Yes	Project emission from transportation is taken into account as per related methodological calculation pathway.
	CH4	No	Excluded for simplification. This emission source is assumed to be very small.
	N2O	No	Excluded for simplification. This emission source is assumed to be very small.

B.4. Establishment and description of baseline scenario

Baseline scenario for managing the manure

Identify the baseline scenario and demonstrate additionality using the "Combined tool to identify the baseline scenario and demonstrate additionality", following the requirements below

In the baseline situation, there is no renewable electricity generation and export to national grid via a biogas plant in the region. In relation to this, project increase the renewable capacity of Turkey as host party via electricity generation using biogas produced by using wastes indicated above. This renewable electricity generation strongly related with Sustainable Development Goal 7 which is mentioned on renewable energy generation and increasing capacity on that manner. Electricity generated by the project increased the renewable energy generation of Turkey. Moreover, project owner employed 24 employees for the present situation which contributes to the SDG 8 "Decent Work and Economic Growth"since project creates job opportunities. Also, as detailed situation given in paragraph above, project managed 919 tons/day of waste managed with this project which contributes to the sustainable development pathway of Turkey related with SDG 12

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.

(ii) For Greenfield facilities

Baseline scenario for manure management was detail explained in following part "(ii) for greenfield facility", but still in addition to that, the same reference document is also mentioned here for the baseline scenario as "uncovered manure management". In the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4, Chapter 10, Table 10.17), uncovered anaerobic lagoon system and related data to use for baseline consideration and calculations are given in table below. By looking at this table, MFC value of the baseline situation was taken as 68% corresponded to 11.2 Celcius temperature value which is average yearly temperature of the project location.

Chapter 10: Emissions from Livestock and Manure Management

TABLE 10.17 (CONTINUED)
MCF VALUES BY TEMPERATURE FOR MANURE MANAGEMENT SYSTEMS

System[a]		MCFs by average annual temperature (°C)																			Source and comments
		Cool					Temperate											Warm			
		≤ 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	≥ 28	
Uncovered anaerobic lagoon		66%	68%	70%	71%	73%	74%	75%	76%	77%	77%	78%	78%	78%	79%	79%	79%	79%	80%	80%	Judgement of IPCC Expert Group in combination with Mangino *et al.* (2001). Uncovered lagoon MCFs vary based on several factors, including temperature, retention time, and loss of volatile solids from the system (through removal of lagoon effluent and/or solids).
Pit storage below animal confinements	< 1 month	3%					3%											30%			Judgement of IPCC Expert Group in combination with Moller *et al.* (2004) and Zeeman (1994). Note that the ambient temperature, not the stable temperature is to be used for determining the climatic conditions. When pits used as fed-batch storage/digesters, MCF should be calculated according to Formula 1.
	> 1 month	17%	19%	20%	22%	25%	27%	29%	32%	35%	39%	42%	46%	50%	55%	60%	65%	71%	78%	80%	Judgement of IPCC Expert Group in combination with Mangino *et al.* (2001). Note that the ambient temperature, not the stable temperature is to be used for determining the climatic conditions. When pits used as fed-batch storage/digesters, MCF should be calculated according to Formula 1.

By implementing anaerobic digesters manure will be digested whilst capturing and utilizing GHGs from them, the proposed project activity will reduce the release to air of methane sourced from uncovered anaerobic animal manure management systems in livestock farms within the region and minimize the adverse impacts of manure on human health and the environment.

The consolidated baseline methodology prescribes the baseline scenario for Greenfield facilities as the situation where, in the absence of the project activity, animal manure is left to decay in uncovered anaerobic lagoons within the project boundary and methane is emitted to the atmosphere.

The Methodology states that, where the baseline scenario is an uncovered anaerobic lagoon, the baseline scenario for managing the manure for Greenfield facilities can be defined by applying the following two steps:

a) "Define several anaerobic lagoon design options for the particular manure stream that meet the relevant regulations and take into consideration local conditions (e.g. environmental legislation, ground water table, land requirement, temperature). Design specifications shall include average depth and surface area of the anaerobic lagoon, residence time of the organic matter, as well as any other key parameters. Document the different design options in a transparent manner and provide transparent and documented evidence of key assumptions and data used, and offer conservative interpretations of this evidence;

b) Carry out an economic assessment of the identified lagoon design option, as per step 3 (investment analysis) of the latest approved version of the "Combined tool to identify the baseline scenario and demonstrate additionality" and additional guidance given below. Choose the least cost anaerobic lagoon design option from the options identified through step (a) above. If several options with comparably low cost exist, choose the one with the lowest lagoon depth as the baseline lagoon design" (pg. 4).

The common practice for the livestock farm owners is to have uncovered anaerobic lagoons/ponds at their farms in Turkey[36][37]. In terms of the residence time of the manure at the lagoons, it is possible to say that since the uncovered lagoons are also fed by rain waters, the lagoons are reaching their full capacities faster than usual in rainy seasons. Nevertheless, the minimum retention time of manure waste in the uncovered anaerobic lagoons is greater than one and half and/or two months through the implementation of the proposed project activity, the manure collected at these lagoons/ponds will be collected daily via special manure trucks and fed into the digesters at the biogas plants.

For step a, proposed project activity meets relevant regulations and take into consideration local conditions since it already has gathered EIA approval/permissions. Moreover, pre-project situation is defined above which has negative impact on human health and environment.

[36] Türkiye'de Biyogaz Yatırımları için Gerekli Koşulların ve Potansiyelin Değerlendirilmesi. Yazar: DBFZ - Deutsches Biomasse Forschungs Zentrum gemeinnützige GmbH, Torgauer StraBe 116, 04347 Leipzig. Çeviri: Funda Cansu Ertem. Aralık, 2011

[37] https://www.yatirimadestek.gov.tr/pdf/assets/upload/fizibiliteler/elazig-ili-biyogaz-tesisi-on-fizibilite-raporu2020.pdf

For step b, investment analysis is revised due to capacity extension and given in following parts.

According to Turkish Electricity Transmission Corporation (TEİAŞ) statistics, the fossil-fuel based electricity generation share in total electricity generation in Turkey is over 50 % by 2020(latest published statistics)[38].

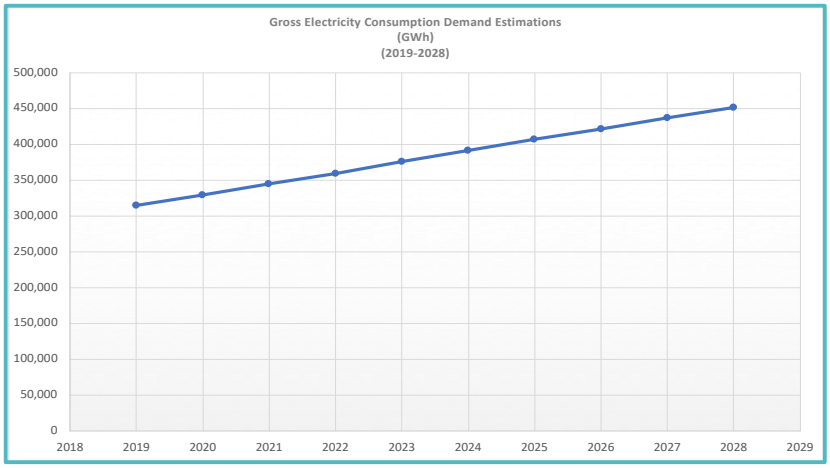
2020 Generation Capacity (Unit: MW)	**Coal**	**Fossil Liquid Fuels**	**Natural Gas**	**Waste Heat +Atık+Atık Isı**	**Combined Fuel**	**Hydro**	**Geothermal**	**Wind**	**Solar**
2020	19,613.00	189.4	21,599.40	1,502.80	4,889.10	30,983.90	1,613.20	8,832.40	6,667.40
%	20.45	0.2	22.53	1.57	5.1	32.31	1.68	9.21	6.95

Total (MW)	**Total of Renewables(MW)**	**% Share of Renewables**
95,890.60	48,096.90	50%
100	50.15	

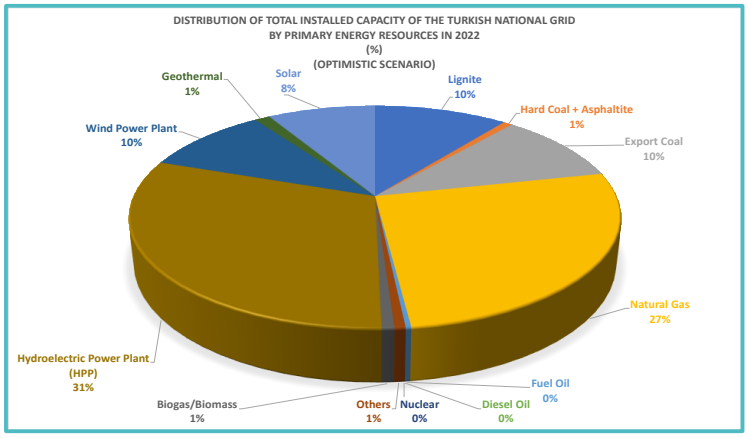
Moreover, Turkey's energy demand is rapidly increasing in line mainly with the increases in its population and its economy. TEİAŞ's estimations on the demand of gross electricity consumption in Turkey between 2019 and 2028 can be seen in the Chart below[39].

[38] https://webapi.teias.gov.tr/file/946097f0-335e-4ad4-a970-fb60cde3d512?download

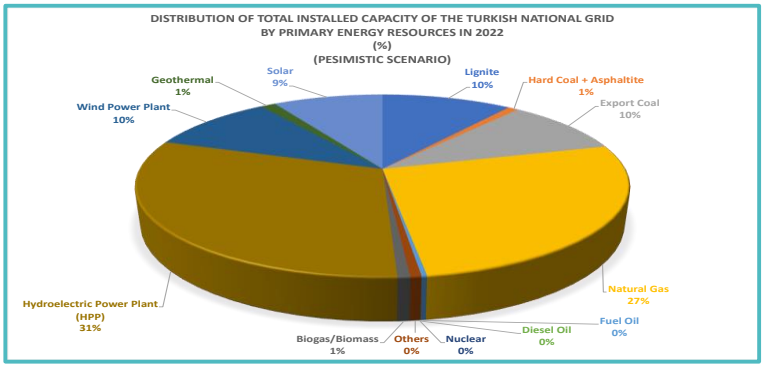
[39] TEİAŞ Report on Demand Estimations in 10 Years, Table 71, pg. 56
https://www.teias.gov.tr/sites/default/files/2019-06/taleprapor_2019-2028.pdf



Moreover, TEİAŞ, in its report on "The Projections on Capacity Generation[40]", analyses the estimations on changes in electricity generation capacities in Turkey between 2018 and 2022, based on two main scenarios, 'optimistic' and 'pesimistic'. The distribution of total installed capacity of the Turkish national grid by primary energy resources in 2022 both in optimistic and pessimistic scenarios can be seen on the two charts below, respectively.



[40] https://www.teias.gov.tr/sites/default/files/2018-09/Kapasite_Projeksiyonu_2018_2022.pdf



As seen in these two charts, although it is estimated that the share of renewable energy sources in the total installed capacity of the Turkish national grid would reach almost 50% by 2022, the share of biogas and biomass energy sources would remain the same, only 1%, combined. That means that the share of biogas- and biomass-based renewable energy sources in the Turkish national grid is estimated to show no changes from 2017 to 2022, despite their potential pointed out by the 'Bioenergy and Food Security (BEFS) Assessment for Turkey: Sustainable bioenergy options from crop and livestock residues[41]' published by Food and Agriculture Organization of the United Nations (FAO) and European Bank for Reconstruction and Development (EBRD) in 2016.

Hence, it is reasonable to claim that it is estimated that whilst the share of biogas- and biomass-based renewable energy sources in the total installed capacity of the Turkish national grid could remain the same as only 1%, combined, by 2022, Turkey's electricity grid would continue to be dominated by fossil fuel burning power plants which are seen as the quickest solutions in short term to meet the demand and to enable energy security in terms of supply.

B.5. Demonstration of additionality

Specify the methodology, activity requirement or product requirement that establishes deemed additionality for the proposed project (including the version	The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste. Ver 07.0.0

[41] http://www.fao.org/3/a-i6480e.pdf

number and the specific paragraph, if applicable).	Tools: "tool to calculate the emission factor for an electricity system, version 7" & "tool for assessment and demonstration of additionality, version 7"
Describe how the proposed project meets the criteria for deemed additionality.	The proposed project activity provided a centralized anaerobic treatment plant which replaced the lagoons of nearby farms to manage animal manure (cattle, poultry, and sheep manure) by collecting this waste with confined truck to achieve biogas and so methane, which is used to gainfully generate electricity. Within this framework, the project is expected to generate about 40,012.50 MWh electricity annually and reduce 191,916 tCO2 per annum emissions through replacing the electricity that would need to be supplied via the national grid in the absence of the project activity.

Demonstration of additionality is carried as per the methodological tool: "Combined tool to identify the baseline scenario and demonstrate additionality", Version 07.0[42], as given below.

Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations

***Sub-step 1a* - Define alternatives to the project activity:**

The most realistic and reliable alternatives to the project activity are:

1. Proposed project is not undertaken as a VER project activity

2. Continuation of the current situation-supply of equal amount of electricity by the newly built grid connected power plants

The first alternative, which is the implementation of the project without carbon revenue is not financially attractive as discussed in investment analysis section below. The Second alternative (Scenario 2) is the baseline scenario and implementation of the

[42] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf

proposed project as a VER activity would be additional to this scenario. Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore new power plants should be constructed which includes mainly thermal power plants. Implementation of the project is additional to the baseline scenario which is alternative 2 above and therefore reduces the emissions.

If it is necessary to follow the steps of the relevant methodology;

Baseline scenario for MSW disposal

To identify baseline alternatives for the treatment of the fresh waste, the following alternatives or combinations of these alternatives shall, inter alia, be considered:

M1: The project activity without being registered as a CDM project activity (i.e. any (combination) of the waste treatment options; Composting, Co-composting or anaerobic digestion);

M2: Disposal of the fresh waste in a SWDS with a partial capture of the LFG and flaring of the captured LFG;

M3: Disposal of the fresh waste in a SWDS without a LFG capture system;

M4: Part of the fresh fraction of the solid waste is recycled and not disposed in the SWDS;

M5: Part of the fresh fraction of the solid waste is treated aerobically and not disposed in the SWDS;

M6: Part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS;

M7: Part of the organic fraction of the solid waste is gasified and not disposed in the SWDS;

M8: Part of the organic fraction of the solid waste is treated in an anaerobic digester and not disposed in the SWDS;

M9: Part of the organic fraction of the solid waste is mechanically or thermally treated to produce RDF/SB and not disposed in the SWDS.

In used methodology it is indicated that:

"*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….. In addition, the methodology **is also applicable** to the activities that involve co-digestion and/or co-composting of multiple organic matters that would have otherwise been left to decay anaerobically in an animal waste management system (AWMS) or a solid waste disposal site (SWDS).*

- ***"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, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-digested substrates"*

Hence, to return our project, MSW is not used in this project as indicated before and as understood from the methodological statements, we have an option (in case of…) to not use MSW in the operation of the project and so there is no need to apply ACM022 for applicability condition of MSW perspective.

Since the project does not use municipal solid waste (MSW), the alternatives given above is not related with this project.

Baseline scenario for electricity and heat generation

In addition to the alternative baseline scenarios identified for managing the manure, alternative scenarios for the use of gas generated from an anaerobic digester (biogas) shall also be identified if this is an aspect of the project activity:

For electricity generation, alternative(s) shall include, inter alia:

E1: Electricity generation from biogas, undertaken without being registered as CDM project activity;

E2: Electricity generation in existing or new renewable based captive power plant(s);

E3: Electricity generation in existing and/or new grid-connected power plant;

E4: Electricity generation in an off-grid fossil fuel fired captive power plant;

E5: Electricity generation in existing and/or new grid-connected power plant and fossil fuel fired

captive power plant(s).

Methodology indicates that baseline emissions due to electricity generation can be accounted for **only** if the baseline scenario is E3, In terms of this project baseline scenario E3 is valid since project provides electricity generation via biogas production from manure management instead of electricity generated from fossil fuels which supplied to national grid. Biogas only use for electricity generation in this project.

Sub-Step 1a: Define alternative scenarios to the proposed CDM project activity

Step 1a: Define alternatives to the project activity

The alternatives to the project activity are defined as per of the applied additionality tool:

a) The tool suggests considering the implementation of the Project without being registered as a CDM Project activity.

S1: The proposed project activity undertaken without being registered as a CDM project activity;

b) As per paragraph 20-b of the applied tool, other realistic and credible scenarios which deliver comparable output services should be considered.

S2: Where applicable, no investment is undertaken by the project participants but third party(ies) undertake(s) investments or actions which provide the same output to users of the project activity, for example

- In the case of a Greenfield power project, an alternative scenario may be that the project participants would not invest in another power plant but that power would be generated in existing and/or new power plants in the electricity grid. Since there is no common practice for profitable commercial activity in waste management, only comparable parameter is the building and operation of a power plant for energy generation.

c) Continuation of the current situation (no project activity or other alternatives undertaken)

S3: Where applicable, the continuation of the current situation, not requiring any investment or expenses to maintain the current situation, such as, inter alia:

- The continued venting of methane from lagoons

d) Other plausible scenarios

S4: Where applicable, the continuation of the current situation, requiring an investment or expenses to maintain the current situation.

S5: Other plausible and credible alternative scenarios to the project activity scenario, including the common practices in the relevant sector, which deliver the same output, taking into account, where relevant, examples of scenarios identified in the underlying methodology.

- The common practice in the sector is the collection of waste in ~~anaerobic lagoons~~uncovered anaerobic lagoons with 1 m depth as defined in 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4, Chapter 10, Table 10.17, which leads to higher methane emissions and fails to deliver the same outputs.

Biçimlendirilmiş: Vurgulu Değil

S6: Where applicable, the "proposed project activity undertaken without being registered as a CDM project activity" to be implemented at a later point in time (e.g. due to existing regulations, end-of-life of existing equipment, financing aspects)

Scenarios 4, 5 and 6 are not applicable as there is no requirement for investment for continuation of the current situation or no reason expected for change in regulations etc. S1, which is the implementation of the project without carbon revenue is not financially attractive as discussed in investment analysis section below. S2 is not also

realistic as the energy demand is increasing and the need for new power plant investment is a must for Turkey. The second and third scenarios partially and jointly form the baseline scenario and implementation of the proposed project as a VER activity would be additional to this scenario in terms of reducing methane venting and meeting increasing energy demand.

Sub-step 1b. Consistency with mandatory laws and regulation

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law[43]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[44]
3. Energy Efficiency Law [45]
4. Forest Law[46]
5. Environment Law[47]
6. Waste Management Regulation[48]

The resultant alternatives to the project as outlined in Step (1a) are in compliance with the applicable laws and regulations.

Outcome of Step 1b

Mandatory legislation and regulations for each alternative are taken into account in sub-step 1b. Based on the above analysis, the proposed project activity is not the only alternative amongst the project participants that is in compliance with mandatory regulations. Therefore, the proposed VER project activity is considered as additional.

B.5.1 Prior Consideration

Project considers VER claims in 2016 and listed in GS system in 2016 also which could be checked via milestone table in Section A.1. The date of LSC meeting of the project

[43] Law number 6446, Published in official gazette No. 28603 on 30/03/2013
http://www.mevzuat.gov.tr/MevzuatMetin/1.5.6446.pdf
[44] Law number 5346, Published in official gazette No. 25819 on 18/05/2005
http://www.mevzuat.gov.tr/MevzuatMetin/1.5.5346.pdf
[45] Law number 5627, Published in official gazette No. 26510 on 02/05/2007
http://www.mevzuat.gov.tr/MevzuatMetin/1.5.5627.pdf
[46] Law number 6831, Published in official gazette No. 9402 on 08/09/1956
http://www.mevzuat.gov.tr/MevzuatMetin/1.3.6831.pdf
[47] Law number 2872. Published in official gazette No. 18132 on 11/08/1983
http://www.mevzuat.gov.tr/MevzuatMetin/1.5.2872.pdf
[48] https://www.resmigazete.gov.tr/eskiler/2015/04/20150402-2.htm

and listing date is before the actual project operation started and this situation is proven with provincial acceptance protocol dates.

B.5.2 Ongoing Financial Need

Step 2 - Investment analysis

The investment analysis has been done in order to make an economic and financial evaluation of the project. No public funding or ODA are available in Turkey for finance of this type of projects. For investment analysis, loan conditions have been determined considering the average market rates/term sheets signed with the banks. In this document, investment analysis follows the recommendations of "Am-tool 27, v.10.0: Investment analysis"[49]

***Sub-step 2a* - Determine appropriate analysis method**

There are three options for the determination of analysis method which are:

- Simple Cost Analysis
- Investment Comparison Analysis and
- Benchmark Analysis

Since Project generates economic benefits from sales of electricity, the simple cost analysis is not applicable. Also, since the baseline of the project is generation of electricity by the grid, no alternative investment is considered at issue. So, it has been decided to use benchmark analysis for evaluation of the project investment.

Sub-step 2b: Option III. Apply benchmark analysis

For benchmark analysis, CAPM method has been applied which uses expected return on equity as benchmark. As per the tool,

[49] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v10.0.pdf

$re = rf + \beta \times (rm - rf)$

Where;

re = Cost of equity (expected return on equity)
rf = Risk-free rate
β = Beta is adjustment factor (levered beta applied as 1.09 for emerging markets)[50]
rm = Expected market return

(rm-rf) in the formula above corresponds to "equity risk premium" and rf is the risk free rate of return which is based on long term average of rates and applied as 12.867% for investment decision date(17/02/2021) as per the figure below[51]. Risk free rate has been chosen over a period of 10 years bond yield in Türkiye.

[50] https://pages.stern.nyu.edu/~adamodar/pc/archives/betaemerg20.xls for Environment&waste services
[51] http://www.worldgovernmentbonds.com/bond-historical-data/turkey/10-years/

Equity risk premium at time of investment decision has been applied as 10.05% based on the reference given in the tool 27 (New York University N.Stern School of Business) available at time of investment decision[52] . Thus, expected return of equity has been calculated as;

re = 13.085 + 1.09×10.05
re = 24.04%

Expected returns on equity for similar type of (energy industries) projects is therefore considered as 24.04% which is also in line with tool. For the proposed project, in order to reach this equity IRR values, average electricity tariff must be above 24.7 $c/kWh[53] in the absence of carbon revenue and assuming that initial investment figures are realized so that the investment will become reasonable.

[52] ITR\Kopya ctryprem20.xls

[53] Benchmark IRR calculated using IRR Calculation Spreadsheet

Sub-step 2c. Calculation and comparison of financial indicators

Parameters	Unit	Data Value
Installed Capacity	MWe	5.335[54]
Grid Connected output	GWh	40.012 [55]
Capital Investment	Million $	7,294[56]
O&M Cost (including annual rental fee of land)	1000 $	1,089 [57]
Income tax rate	%	22,5
Feedi n Tariiff/Market price after 10th years	$ Cents/kWh	13.3
Expected VERs price[58]	$/ tCO_2e	4.73

Table 7. Main financial parameters used for investment analysis

Internal Rate of Return (IRR) of the proposed project has been calculated as 10.50% based on the parameters given above without considering the carbon revenue. Project does not use any ODA or government incentive and bank loan is not intended to be used. Electricity tariff has been used as $13.3[59]. Annual generation has been taken as 40.012 GWh as indicated in generation license. Although detailed analysis show that actual generation will be lower. Considering carbon revenue and the carbon price same (4.73 $/t CO_2e) as during the first crediting period, IRR increases to 10.89 % and becomes more feasible with the expectation that electricity tariff will increase due to

[54] Generation License

[56] IRR Calculation Spreadsheet
[57] IRR Calculation Spreadsheet

[58] https://www.ecosystemmarketplace.com/articles/voluntary-carbon-markets-top-1-billion-in-2021-with-newly-reported-trades-special-ecosystem-marketplace-cop26-bulletin/

increasing electricity demand of Turkey and project will benefit from increasing price at the market.

Acceptable IRR values for energy investments in Turkey are, given the present economic uncertainty, are expected at yields more than 15% per annum. Even if we include the carbon revenue in the cash flow (which is, equity IRR increases to 12.37% which is still lower than the accepted benchmark rates. Considering the market price risk, it can be concluded the extension will make the investment more feasible however, it will still be below the benchmark IRR.

Sub-step 2d - Sensitivity Analysis

Sensitivity analysis had been carried out for three main parameters identified for the first phase of the project. However, since the investment cost for extension is based on signed agreements and operating cost is not changed after extension, which is a conservative approach, only impact of change in tariff has been included in sensitivity analysis.

- Investment Cost
- Operating Cost
- Electricity Sales revenue

For a range of ± 15% fluctuations in parameters above, table below has been obtained. % **Fluctuation**	**-15**	**-10**	**-5**	**0**	**+5**	**+10**	**+15**
Investment Cost	12.37	11.84	11.35	10.89%	10.45	10.04	9.65
Operating Cost	12.53	11.89	11.43	10.89%	10.34	9.80	9.26
Electricity Income	7.95	8.97	9.95	10.89%	11.79	12.66	13.51

Table 8. Sensitivity analysis for Bor Biogas Plant Project (without carbon revenue)

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the Project remarkably. Considering that figures above are based on a higher price rather than the government guaranteed floor price, optimistic estimations for yearly generation and that those figures do not reflect the risk for investment, role of carbon income is a most significant number to enable the project to proceed.

Another important parameter affecting equity IRR is investment cost. However, since the agreements have been made and costs are realized as given in financial model, there is no chance to expect a decrease in the investment cost. Operating costs can also affect the equity IRR however, its impact is not significant and does not cause any significant change in equity IRR and the fluctuation percentage to reach the benchmark is very high and not likely. Based on the above information, it is seen that project is not the most attractive option. Therefore, project is considered as additional to the baseline scenario.

Step 3. Barrier analysis

This step is not applied as per the tool.

Step 4. Common Practice Analysis

According to the "Tool for the demonstration and assessment of additionality", Version 07.0.0", the common practice shall provide an analysis of any other activities that are similar to the Project Activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing etc.

Guidelines on Common Practice version 03.1[60] has been followed.

[60] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf

Step 1: Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity: **The total capacity of the proposed project is 5.335 MWe. Therefore, the applicable output range is from 2.66 MWe to 8 MWe.**

Turkish Renewable Energy Resources Support Mechanism (YEKDEM) [61] from General Directorate of Energy Affairs has been used as a main resource. Therefore, all of the compared renewable energy power plants have been operational before the implementation of the project activity.

Step 2:

(a) The projects are located in the applicable geographical are: **Applicable geographical area has been selected as the whole host country (Turkey) as per paragraph 1 of Guidelines on Common Practice version 03.1**

(b) The projects apply the same measure as the proposed project activity: **Projects that apply the same measure as the proposed project have been determined to be all renewable energy projects and selected as the same type of energy source projects*. All of the selected plants deliver the same service, which is electricity generation are listed including thermal power plants[62].**

***The RE plants that are invested by The Electricity Generation Corporation (EÜAŞ) which is a governmental affiliate. Hence, regarding to definition of "the nature of the investment" in Common Practice Tool para 12, article (e), the RE plants belong to the EÜAŞ are removed from the list[63].**

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity: **No switch measure is implemented in "Bor Biogas Power Plant".**

[61] 2022 Nihai YEK Listesi, https://www.epdk.gov.tr/Detay/Icerik/5-12535/2022-yili-nihai-yek-listesi-duzenlemesi-hakkinda-
[62] ..\4. Common Practice
[63] ..\4. Common Practice

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant: **N/A**

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1: **The applicable output range is from 2.66 MWe to 8.0 MWe.**

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity: **Investment decision date of the project is 17/02/2021 and the first gas engine's provisional acceptance is on 29/06/2021. The earlier date is chosen, 17/02/2021, date of construction agreement.**

Below is a list of operational renewable energy power plants as given by the General Directorate of Energy Affairs, which are in the applicable range of Bor Biogas Power Plant (i.e., 2.66 MW to 8 MW) (counted as 87). Details are given in common practice analysis submitted to VVB and GS

Table 2. Operational renewable energy power plants in range of Bor Biogas Power Plant

No	Plant Name	Type	Source	MWe	Date of Operation
1	2BZ BES Çubuk Biyogaz Santralı	Biomass	Animal waste	4.000	27.10.2020
2	Trabzon Rize Landfill gas Santrali	Biomass	Landfill gas	4.239	25.10.2015
3	3A BES Akyurt Biyogaz Santrali	Biomass	Animal waste	4.000	28.10.2020
4	4B EREĞLİ BİYOKÜTLE ENERJİ SANTRALİ	Biomass	Municipal waste	3.082	20.12.2020
5	Afyon Biyogaz Santrali	Biomass	Animal waste ,Agricultural waste	4.017	24.10.2014
6	Afyon Biogaz Elektrik Üretim Tesisi	Biomass	Landfill Gas	7.800	31.10.2020
7	Ovacık Biyogaz Enerji Santrali	Biomass	Animal waste	4.800	28.10.2015
8	AGT Biyokütle Santrali	Biomass	Forest waste	5.370	30.10.2019
9	BATMAN BİYOKÜTLE ENERJİ SANTRALİ	Biomass	Municipal waste	6.240	30.10.2020
10	Arel Enerji Biyokütle Tesisi	Biomass	Landfill gas	3.810	25.05.2012
11	Arel Enerji Milas Biyokütle Tesisi	Biomass	Landfill gas	2.820	25.10.2019
12	Arel Enerji Çorum Biyokütle Tesisi	Biomass	Municipal waste ,Landfill gas	2.760	26.10.2020
13	Arel Enerji Marmaris Biyokütle Tesisi	Biomass	Municipal waste	2.820	29.10.2018
14	Arel Enerji Fethiye Biyokütle Tesisi	Biomass	Landfill gas	2.820	26.10.2018
15	Arel Enerji Manavgat Biyokütle Tesisi	Biomass	Landfill gas	3.600	21.06.2013
16	Arel Yenilenebilir Enerji Isparta Biyokütle Tesisi	Biomass	Landfill gas	2.826	1.10.2016
17	ARF Ödemiş Biogaz Üretim Tesisi	Biomass	Animal waste ,Agricultural waste	4.868	26.10.2018
18	AS KOÇ BİYOGAZ TESİSİ	Biomass	Animal waste ,Agricultural waste	4.268	13.10.2018

19	Asya Biyogaz Tesisi	Biomass	Plant waste ,Animal waste	6.000	22.10.2020
20	Atlas İnşaat Osmaniye Landfill gas Elektrik Üretim T.	Biomass	Waste ,Landfill gas	3.120	31.10.2016
21	Hatay Gökçegöz Waste Santrali	Biomass	Municipal waste	7.065	28.10.2016
22	Babil Biyogaz Tesisi	Biomass	Animal waste ,Agricultural waste ,Plant waste	4.680	31.10.2020
23	BAYSAK Enerji Santralı	Biomass	Tire	4.192	31.10.2020
24	Ceylanpınar Biyokütle Enerji Santralı	Biomass	Animal waste ,Agricultural waste	2.668	30.10.2018
25	Beyaz Piramit Biyogaz Santrali	Biomass	Animal waste ,Plant waste	6.004	31.10.2020
26	Bientaş Cihanbeyli Elektrik Üretim Tesisi	Biomass	Municipal waste	7.800	31.10.2020
27	Başmakçı Biyokütle Enerji Santrali	Biomass	Animal waste ,Agricultural waste	4.000	23.10.2020
28	BİOPİR PİROLİZ BES	Biomass	Plant waste	3.192	30.10.2020
29	Atlas İnşaat Burdur Biyogaz Tesisi	Biomass	Animal waste	3.012	29.10.2018
30	CEMAK BES	Biomass	Forest waste	6.150	20.12.2020
31	Ceylani Biyogaz	Biomass	Plant waste ,Animal waste	3.120	31.12.2020
32	Kahramankazan BES	Biomass	Animal waste ,Agricultural waste ,Forest waste	5.000	18.10.2019
33	ÇORUM BES	Biomass	Animal waste ,Plant waste	6.020	31.10.2019
34	De Solar 7 BES	Biomass	Animal waste	3.201	26.10.2018
35	Doğal Enerji Biyokütle Enerji Santrali	Biomass	Animal waste ,Agricultural waste	5.200	31.10.2017
36	Senkron Efeler Biyogaz Santrali	Biomass	Agricultural waste	4.800	31.10.2013
37	Kırşehir Biyogaz Tesisi	Biomass	Animal waste ,Agricultural waste	3.002	28.08.2020
38	Enerbes Polatlı Biyogaz Santrali	Biomass	Animal waste	4.000	12.06.2020
39	BALIKESİR BİYOGAZ ENERJİ SANTRALİ	Biomass	Animal waste	3.201	15.10.2020

40	Foça Biyogaz Enerji Santrali	Biomass	Animal waste	3.201	29.10.2019
41	Bingöl Biyogaz Tesisi	Biomass	Animal waste ,Plant waste	6.402	22.10.2020
42	Karacabey 2 Biyogaz Tesisi	Biomass	Animal waste ,Agricultural waste	6.402	25.10.2014
43	Tire Biyogaz Tesisi	Biomass	Animal waste ,Agricultural waste	4.268	14.10.2016
44	Aksaray OSB Biyogaz Tesisi	Biomass	Animal waste	5.335	28.08.2013
45	DÜZCE KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste ,Landfill gas	5.874	31.10.2020
46	ERA Erzincan Biyokütle Santralı	Biomass	Tire	7.020	4.06.2016
47	Halilbeyli Biyogaz Enerji Santrali	Biomass	Animal waste ,Plant waste	6.000	25.10.2019
48	Şanlıurfa Biyokütle Enerji Santrali	Biomass	Landfill gas	6.240	31.10.2015
49	Gözlü Biyogaz Enerji Santrali	Biomass	Animal waste ,Plant waste	3.471	2.10.2020
50	Güney BES	Biomass	Plant waste	3.120	26.10.2020
51	Kınık BES	Biomass	Plant waste ,Forest waste	7.150	19.10.2020
52	Albe-I Biyogaz Santrali	Biomass	Animal waste	3.017	24.10.2014
53	ITC Yumru Enerji Üretim Tesisi	Biomass	Landfill gas	2.830	20.10.2018
54	ITC Alanya Enerji Üretim Tesisi	Biomass	Landfill gas	5.660	29.10.2020
55	Başmakçı Biyokütle Enerji Santrali-2	Biomass	Animal waste	4.000	18.12.2020
56	Tuzla Biyogaz Elektrik Santralı	Biomass	Other waste	3.500	18.10.2019
57	BioStor	Biomass	Forest waste	8.000	30.10.2020
58	Kar Elektrik Üretim Santrali	Biomass	Tire	6.000	31.10.2018
59	Beylikova Biyogaz Enerji Santrali	Biomass	Plant waste ,Animal waste	4.680	4.09.2020
60	Seydibey Biyogaz Elektrik Üretim Tesisi	Biomass	Plant waste	2.729	31.10.2019
61	Kocaeli Waste Biyogaz Santrali	Biomass	Municipal waste	6.510	2.03.2012
62	Nisa BES	Biomass	Forest waste ,Agricultural waste	5.482	9.10.2017
63	Malatya Waste Gazlaştırma-Yakma Tesisi	Biomass	Landfill gas ,Waste	4.000	31.10.2017

64	Modern Biyokütle Enerji Santrali (MOBES)	Biomass	Other Waste	6.000	30.09.2014
65	Nizip Biyogaz Elektrik	Biomass	Animal waste	4.503	24.10.2020
66	Sivas Waste Gaz Elektrik Üretim Tesisi	Biomass	Landfill gas	2.826	24.10.2015
67	İskenderun Waste Gaz Elektrik Üretim Tesisi	Biomass	Landfill gas	4.239	18.12.2015
68	Oğul Enerji Biyokütle Tesisi	Biomass	Forest waste ,Plant waste	7.500	31.10.2019
69	Çorum-Mecitözü BES	Biomass	Agricultural waste	5.000	17.10.2017
70	Akyurt BES	Biomass	Animal waste	3.120	15.10.2020
71	Maraş Biokütle Tesisi	Biomass	Municipal waste	4.800	21.10.2016
72	PADAŞ	Biomass	Animal waste	3.002	18.10.2019
73	Pir Enerji Üretim Tesisi	Biomass	Other waste	6.393	31.10.2017
74	Polatlı BES	Biomass	Animal waste	2.972	24.10.2014
75	AĞRI İLİ KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste	2.824	30.10.2020
76	RESPECT BİYOGAZ	Biomass	Animal waste ,Plant waste	4.578	31.12.2020
77	Sakarya Düzenli Depolama Depo Gazı Tesisi	Biomass	Landfill gas	4.680	30.10.2018
78	TAŞKÖPRÜ BİYOKÜTLE ENERJİ SANTRALI	Biomass	Forest waste	4.500	26.12.2020
79	Demirköy Biyokütle Enerji Santralı	Biomass	Forest waste	3.000	27.12.2020
80	Düzce Biyokütle Enerji Santralı	Biomass	Forest waste	4.500	25.12.2020
81	Kumrular Biyogaz Santralı	Biomass	Animal waste ,Agricultural waste	4.268	5.10.2017
82	Çanakkale Depo Gazından Elektrik Üretim Tesisi	Biomass	Landfill gas ,Waste ,Municipal waste	3.600	30.10.2020
83	Ahi Suluova Biyogaz Tesisleri	Biomass	Animal waste	6.637	25.10.2018
84	Tire Biyogaz Elektrik Santrali	Biomass	Animal waste	4.800	31.10.2017
85	Toros Gönen Biyogaz Tesisi	Biomass	Animal waste ,Agricultural waste	3.621	26.02.2014

86	Toros Meram Biyogaz Tesisi	Biomass	Agricultural waste ,Animal waste	6.004	27.11.2020
87	Uşak Biogaz Elektrik Üretim Tesisi	Biomass	Landfill gas	5.498	29.10.2019

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall

Characteristics of the power plants are also indicated in the Common Practice excel sheet. After excluding the registered VER projects, there exist 33 renewable energy power plants being operated in Turkey, at the time of project start date.

Table 3. Step 3, determining N_{all}

No	Plant Name	Type	Source	MWe	Date of Operation
1	Trabzon Rize Landfill gas Santrali	Biomass	Landfill gas	4.239	25.10.2015
2	AGT Biyokütle Santrali	Biomass	Forest waste	5.37	30.10.2019
3	Atlas İnşaat Osmaniye Landfill gas Elektrik Üretim T.	Biomass	Waste ,Landfill gas	3.12	31.10.2016
4	BAYSAK Enerji Santralı	Biomass	Tire	4.192	31.10.2020
5	Ceylanpınar Biyokütle Enerji Santralı	Biomass	Animal waste ,Agricultural waste	2.668	30.10.2018
6	Bientaş Cihanbeyli Elektrik Üretim Tesisi	Biomass	Municipal waste	7.8	31.10.2020
7	BİOPİR PİROLİZ BES	Biomass	Plant waste	3.192	30.10.2020
8	Atlas İnşaat Burdur Biyogaz Tesisi	Biomass	Animal waste	3.012	29.10.2018
9	CEMAK BES	Biomass	Forest waste	6.15	20.12.2020
10	Ceylani Biyogaz	Biomass	Plant waste ,Animal waste	3.12	31.12.2020
11	Kahramankazan BES	Biomass	Animal waste ,Agricultural waste ,Forest waste	5	18.10.2019
12	DÜZCE KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste ,Landfill gas	5.874	31.10.2020
13	ERA Erzincan Biyokütle Santralı	Biomass	Tire	7.02	4.06.2016
14	Albe-I Biyogaz Santrali	Biomass	Animal waste	3.017	24.10.2014
15	ITC Yumru Enerji Üretim Tesisi	Biomass	Landfill gas	2.83	20.10.2018
16	ITC Alanya Enerji Üretim Tesisi	Biomass	Landfill gas	5.66	29.10.2020
17	Tuzla Biyogaz Elektrik Santralı	Biomass	Other waste	3.5	18.10.2019
18	BioStor	Biomass	Forest waste	8	30.10.2020
19	Kar Elektrik Üretim Santrali	Biomass	Tire	6	31.10.2018
20	Seydibey Biyogaz Elektrik Üretim Tesisi	Biomass	Plant waste	2.729	31.10.2019
21	Nisa BES	Biomass	Forest waste ,Agricultural waste	5.482	9.10.2017

22	Malatya Waste Gazlaştırma-Yakma Tesisi	Biomass	Landfill gas ,Waste	4	31.10.2017
23	Modern Biyokütle Enerji Santrali (MOBES)	Biomass	Other Waste	6	30.09.2014
24	Sivas Waste Gaz Elektrik Üretim Tesisi	Biomass	Landfill gas	2.826	24.10.2015
25	Oğul Enerji Biyokütle Tesisi	Biomass	Forest waste ,Plant waste	7.5	31.10.2019
26	Çorum-Mecitözü BES	Biomass	Agricultural waste	5	17.10.2017
27	Akyurt BES	Biomass	Animal waste	3.12	15.10.2020
28	Maraş Biokütle Tesisi	Biomass	Municipal waste	4.8	21.10.2016
29	Pir Enerji Üretim Tesisi	Biomass	Other waste	6.393	31.10.2017
30	AĞRI İLİ KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste	2.824	30.10.2020
31	RESPECT BİYOGAZ	Biomass	Animal waste ,Plant waste	4.578	31.12.2020
32	TAŞKÖPRÜ BİYOKÜTLE ENERJİ SANTRALI	Biomass	Forest waste	4.5	26.12.2020
33	Demirköy Biyokütle Enerji Santralı	Biomass	Forest waste	3	27.12.2020

Therefore; N_{all} = 33

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}

The projects which have different kind of technology, that burns the biomass to get energy and do not generate biogas such as Bor Project by using animal manure were chosen to be different technology. The rest of them (other four projects) have similar technology with Bor Biogas Project and their list is given below (references of technologies are present in common practice excel document of this project).

Table 4. Step 4, determining N_{diff}

No	Plant Name	Type	Source	MWe	Date of Operation
1	Trabzon Rize Landfill gas Santrali	Biomass	Landfill gas	4.239	25.10.2015
2	AGT Biyokütle Santrali	Biomass	Forest waste	5.37	30.10.2019
3	Atlas İnşaat Osmaniye Landfill gas Elektrik Üretim T.	Biomass	Waste ,Landfill gas	3.12	31.10.2016
4	BAYSAK Enerji Santralı	Biomass	Tire	4.192	31.10.2020
5	Ceylanpınar Biyokütle Enerji Santralı	Biomass	Animal waste ,Agricultural waste	2.668	30.10.2018
6	Bientaş Cihanbeyli Elektrik Üretim Tesisi	Biomass	Municipal waste	7.8	31.10.2020
7	BİOPİR PİROLİZ BES	Biomass	Plant waste	3.192	30.10.2020
8	CEMAK BES	Biomass	Forest waste	6.15	20.12.2020
9	Ceylani Biyogaz	Biomass	Plant waste ,Animal waste	3.12	31.12.2020
10	Kahramankazan BES	Biomass	Animal waste ,Agricultural waste ,Forest waste	5	18.10.2019
11	DÜZCE KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste ,Landfill gas	5.874	31.10.2020
12	ERA Erzincan Biyokütle Santralı	Biomass	Tire	7.02	4.06.2016
13	ITC Yumru Enerji Üretim Tesisi	Biomass	Landfill gas	2.83	20.10.2018
14	ITC Alanya Enerji Üretim Tesisi	Biomass	Landfill gas	5.66	29.10.2020
15	Tuzla Biyogaz Elektrik Santralı	Biomass	Other waste	3.5	18.10.2019
16	BioStor	Biomass	Forest waste	8	30.10.2020
17	Kar Elektrik Üretim Santrali	Biomass	Tire	6	31.10.2018
18	Seydibey Biyogaz Elektrik Üretim Tesisi	Biomass	Plant waste	2.729	31.10.2019
19	Nisa BES	Biomass	Forest waste ,Agricultural waste	5.482	9.10.2017
20	Malatya Waste Gazlaştırma-Yakma Tesisi	Biomass	Landfill gas ,Waste	4	31.10.2017

21	Modern Biyokütle Enerji Santrali (MOBES)	Biomass	Other Waste	6	30.09.2014
22	Sivas Waste Gaz Elektrik Üretim Tesisi	Biomass	Landfill gas	2.826	24.10.2015
23	Oğul Enerji Biyokütle Tesisi	Biomass	Forest waste ,Plant waste	7.5	31.10.2019
24	Çorum-Mecitözü BES	Biomass	Agricultural waste	5	17.10.2017
25	Maraş Biokütle Tesisi	Biomass	Municipal waste	4.8	21.10.2016
26	Pir Enerji Üretim Tesisi	Biomass	Other waste	6.393	31.10.2017
27	AĞRI İLİ KATI ATIK ENERJİ ÜRETİM TESİSİ	Biomass	Municipal waste	2.824	30.10.2020
28	TAŞKÖPRÜ BİYOKÜTLE ENERJİ SANTRALI	Biomass	Forest waste	4.5	26.12.2020
29	Demirköy Biyokütle Enerji Santralı	Biomass	Forest waste	3	27.12.2020

Different technology projects are counted as 29, therefore N_{diff}=29

Step 5: calculate factor F=1-N_{diff}/N_{all} representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F=1-N_{diff}/Nall=1-(29/33) = 0.12 (< 0.20)

N_{all} – N_{diff} = 33-29= 4 (> 3)

Result:

According to "Tool for Common practice", Version 03.1, if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3, then the proposed project is a "common practice".

For the proposed project, N_{all}-N_{diff}=4 (>3) however, F=0.12 (< 0.20) therefore, the proposed project is not a common practice within the applicable geographical area. Hence, the proposed project is additional.

B.6. Sustainable Development Goals (SDG) outcomes

Relevant Target/Indicator for each of the three SDGs

Sustainable Development Goals Targeted	Most relevant SDG Target	SDG Impact Indicator (Proposed or SDG Indicator)
13 Climate Action (mandatory)	13.2 Integrate climate change measures into national policies, strategies and planning	13.2.2 Total greenhouse gas emissions per year
8 Decent Work and Economic	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with	8.5.1 Average hourly earnings of female and male employees, by occupation, age, and persons with disabilities

	disabilities, and equal pay for work of equal value	
12 Affordable and Clean Energy	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment
7 Affordable and Clean Energy	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption

B.6.1 Explanation of methodological choices/approaches for estimating the SDG Impact

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SDG 7: Affordable and Clean Energy (Ensure access to affordable, reliable, sustainable and modern energy for all)

7.2.1 Renewable energy share in the total final energy consumption

The clean energy generated by the project is calculated based on the amount of electricity generated by the project per annum. The project is expected to generate 40,012.50 MWh of clean energy per annum according to the generation license. Hence, contribution of the project could be followed via indicator 7.2.1 "Renewable energy share in the total final energy consumption" and following target: 7.2 ''By 2030, increase substantially the share of renewable energy in the global energy mix". This project increases the renewable energy sharing of global energy mix and contribute to improved air quality by reducing air pollution.

SDG 8: Decent Work and Economic Growth (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)

8.5.1 Average hourly earnings of female and male employees, by occupation, age, and persons with disabilities

The project is to create minimum 24 employment opportunities. It contributes to decent work and economic growth by providing long term job opportunities.

SDG13: Climate Action (Taking urgent action to combat climate change and its impacts)

13.2.2 Total greenhouse gas emissions per year

The grid emission factor revised as latest official emission factor of Turkey that can be used in the projects depending on the project type published by the Ministry of Energy and Natural Resources which is released in 02/09/2022. According to that reference, the combined margin for biogas project could be taken as 0.5552 tCO_2/MWh

SDG 12: Ensure sustainable consumption and production patterns

12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment

The project provides better management option for wastes as around 919 tons/day.

By implementing anaerobic digesters manure will be digested whilst capturing and utilising GHGs from them, the proposed project activity will reduce the release to air of methane sourced from uncovered anaerobic animal manure management systems in livestock farms within the region and minimize the adverse impacts of cattle manures on human health and the environment[64].

B.6.2 Data and parameters fixed ex ante

SDG13

[64] http://www.vivis.de/phocadownload/Download/2015_wm/2015_WM_79-84_Oeztuerk.pdf & https://www.sayistay.gov.tr/En/Upload/files/4-TCA_Waste_Management_Report.pdf

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 refered 68% for the uncovered anaerobic lagoon and this data used by doing corrections as explained in "any comment raw"
Value(s) applied	0.639
Choice of data or Measurement methods and procedures	Uncovered anaerobic lagoon, Value for 11.2°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 Description	Fraction Default emission factor for the fraction of CH4 produced that leak from the anaerobic digester.
Source of data	Project and leakage emissions from anaerobic digesters", Version 02.0[65], 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 Description	t/m^3 Density of CH_4

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

Source of data	The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[66], 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	$W_{default}$
Unit	kg
Description	Default average animal weight of a defined population
Source of data	IPCC 2019[67]
Value(s) applied	550 kg for Eastern Europe
Measurement procedures (if any)	-
Purpose of data	Used in baseline calculations.
Additional comment	Default value from IPCC is used as per the applied methodology (550 kg for Eastern Europe)

[66] https://globalgoals.goldstandard.org/wp-content/uploads/2017/06/401.13-ER-MMS.pdf
[67] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf, page 10.72

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 2019 vol.4, chapter 10, Table10A-9(Chicken-layer)
Value(s) applied	0.02 kg dm/day/animal (for chicken manure) and 7.3 kg dm/year/animal for 365 days
Measurement methods (if any)	-
Purpose of data	Used in baseline calculations.
Additional comment	Applied methodology; "AWMS method 2: IPCC TIER 2 approach (IPCC 2019)" indicates the usage of country specific data under option "b".

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)
Value(s) applied	4.5 kg dm/day/animal (for cattle manure) and 1,642.5 kg dm/year/animal for 365 days
Measurement methods (if any)	-
Purpose of data	Used in baseline calculations.

Additional comment	Applied methodology; "AWMS method 2: IPCC TIER 2 approach (IPCC 2019)" indicates the usage of country specific data under option "b".

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-5(Other Cows eastern Europe)
Value(s) applied	2,7 kg dm/day/animal (for other cows) and 985.5 kg dm/year/animal for 365 days
Measurement methods (if any)	-
Purpose of data	Used in baseline calculations.
Additional comment	Applied methodology; "AWMS method 2: IPCC TIER 2 approach (IPCC 2019)" indicates the usage of country specific data under option "b".

Data/parameter	EF_{grid}
Unit	ton CO2/MWh
Description	Grid emission factor
Source of data	Country specific data
Value(s) applied	0.5552

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 0.7424 and BM is 0.3680 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	$f_{CH4,default}$
Unit	m3 CH4/m3
Description	Default value for the fraction of methane in the biogas (m3 CH4/m3 biogas)
Source of data	Project and leakage emissions from anaerobic digesters https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf
Value(s) applied	0.6
Measurement methods (if any)	Default value
Purpose of data	To calculate project and leakage emissions
Additional comment	f_{CH4},default

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[68].
Additional comment	

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
Source of data	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[69]
Value(s) Applied	0.24
Choice of data or Measurement	-

[68] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v4.0.pdf

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

methods and 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 Other Cow Manure
Unit	m^3CH_4/kg_dm
Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Source of data	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[70]
Value(s) Applied	0.17
Choice of data or Measurement methods and 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 Poultry manure
Unit	m^3CH_4/kg_dm

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

Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Source of data Value(s) Applied	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[71] 0.39
Choice of data or Measurement methods and 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

B.6.3 Ex ante estimation of SDG Impact

>>1 – Affordable and Clean Energy (SDG 7):

The project is expected to generate 40.012 GWh of clean energy per annum and contributes to share of low-cost / must-run sources.

2 – Decent Work and Economic Growth (SDG 8):

The project promotes job opportunities for 24 employees. Social security documents of employees are the certain prove of that issue.

Training (including H&S) & Other Certification processes required by certain necessary professions will be provided to employees to protect human health rights and develop. Hence, project contributes awareness of labour rights and safety precautions. Trainings

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

of employees are done periodically as per national regulations and certifications are kept for the prove of the situation.

All employee s will attend trainings on first aid and health & safety. For positions that require specific skills (such as high voltage equipment) staff will either be trained or certified staff will be recruited. Training details can be found in the monitoring plan.

3- Ensure sustainable consumption and production patterns (SDG 12)

The project provides better management option for wastes as around 919 tonne/day (Project Technical Feasibility Report, page 14)

4 – Climate Action (SDG 13):

As per the tool, the latest official emission factor of Turkey that is used in the projects depending on the project type published by the Ministry of Energy and Natural Resources The ex-ante emission reductions (ERy) are calculated as follows:

The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[72] (pg. 21) states that the emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions (BE_y) and the sum of project emissions (PE_y) and leakage, as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:
ER_y= Emission reductions in year y (tCO_2/yr)
BE_y= Baseline emissions in year y (tCO_2/yr)
PE_y= Project emissions in year y (tCO_2/yr)
LE_y= Leakage emissions in year y (tCO_2/yr)
Accordingly,

ER_y=217,412 tCO_2/yr – 22,695 tCO_2/yr **ER_y= 191,916 tCO_2/yr**

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

As per applied methodology;

The emission reductions achieved in any year are the lowest value of the following:

ERy,ex post = min [(BEy,ex post – PEy,ex post – LEy,ex post), (MDy – PE,y,ex post– LEy,ex post)] (Equation 34 of applied methodology)

Where:

ERy,ex post = Emission reductions achieved by the project activity based on monitored values in year *y* (tCO2/a)
BEy,ex post = Baseline emissions calculated using equations provided by ACM0010 and ACM0022 with *ex post* monitored values in year *y* (tCO2/a)

PEy,ex post = Project emissions calculated using equations provided with *ex post* monitored values in year *y* (tCO2/a)

LEy,ex post = Leakage emissions calculated with ex post monitored values in year *y* (tCO2/a)

MDy = Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO2e/a)

This project does not used methane for any other purpose apart from electricity generation via gas motors. Therefore, Equation 34 could be simplified for this project as follows

ERy,ex post = min [(BEy,ex post – PEy,ex post – LEy,ex post)

In detail:

Baseline Emissions from Animal Waste Treatment

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[73] 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.

(**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 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.

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

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)

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

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

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

$BE_{CH4,y}$ = 195,198 tonnes CO2/year (with GWP 28; after 31/12/2020)

Baseline emissions associated with electricity generation (BEEC,y)

The baseline emissions associated with electricity generation in year *y* (*BEEC,y*) shall be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". When applying the tool:

$$BE_{EG} = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_{EG}	= Baseline emissions associated with electricity generation in year *y* (t CO_2)
$EG_{BL,y}$	= Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	= CO_2 emission factor of the grid in year *y* (t CO_2/MWh)

BE_{EG} = 40.012 GWh x 0.5552 tonnes CO2/GWh

BE_{EG} = **22,215 tCO2e** (details are present in ER calculation sheet of the project)

Total of Baseline Emissions (with GWP 28; after 31/12/2020):

$BE = BE_{EG} + BE_{CH4}$

BE=22,215 tCO2e+195,198 tCO2= 217.412 tCO2e

Project Emissions

The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[74] 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)

$PE_{Comp,y}$= 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

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

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;

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

Project emissions associated with the anaerobic digester in year y (PEAD,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[75], 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)

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

$PE_{FC,y}$= 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 will be 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 will be 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 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.

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)

$EF_{CH4,defaul}$= 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)

$PE_{CH4,y}$= 5,465.5 tonnes CO2/year (details are present in ER calculation sheet of the Project)

***Hence, $PE_{AD,y}$* = 5,465.5 tonnes CO2/year**

Project emissions from use of electricity (PEelec,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[76]' (pg. 17). Accordingly, the methodological tool 'Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity'[77], 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) (40,012.50 MWh/year as assumed %10 of yearly electricity generation)

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

$EF_{EF,j,y}$= Emission factor for electricity generation for source j in year y (tCO_2/MWh) (Combined Margin = 0.5552 tCO2/MWh)

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

Accordingly,

$PE_{EC,y}$ = 2,437 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 emissions from road transportation of freight', Version 01.1.0[78], 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*

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

For this project, average return distance between the origin and the destination is taken as 180 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 919 tonne/day (total of manure) according to finalized EIA (Reference: Project Approved EIA Report, page 14)

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;

$PE_{Tran,y}$ = 14,793 tCO_2/year (details are given in ER calculation sheet)

<u>Accordingly, The Total of Project Emissions</u>

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

PE_y**= 5465.5 tCO_2/yr + 2,437 tCO_2/yr + 14,793 tCO_2/yr= **22,695 tonnes CO2/year

Leakage emissions

The Gold Standard Revised Consolidated Baseline Methodology for GHG Emission Reductions from Manure Management Systems and Municipal Solid Waste[79] calculates leakage emissions as follows:

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

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)

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

$LE_{PJ,CH4,y}$= 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 these 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.

However, since the fertilizer transport is out of the project boundary and not considered to be the project emission, the leakage emission of the transport of the fertilizer will be accounted accordingly the methodological tool 'Project and leakage emissions from road transportation of freight', Version 01.1.0[80].

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

Leakage emissions from waste transportation ($LE_{Tran,y}$)

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 emissions from road transportation of freight', Version 01.1.0[81], 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*

The fertilizer is only taken by the farmers in Kırklareli city, where the farthest point is 40 km away. Reported fertilizer capacity is 783 t/d (EIA Report, page 190) (626.5 t/day is the expected liquid fertilizer production which is the 80% portion of total liquid+solid fertilizer)

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

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;

$LE_{Tran,y}$ = 2,801 tCO_2/year (details are given in ER calculation sheet)

Emission Reduction

In accordance with the Gold Standard consolidated baseline methodology, the emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions (BE_y) and the sum of project emissions (PE_y) and leakage, as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Accordingly,

ER_y=217,412 tCO_2/yr – 22,695 tCO_2/yr-2,801 tCO2/year

ER_y=191,916 tCO_2/yr

B.6.4 Summary of ex ante estimates of each SDG Impact

SDG 13

Year	Baseline estimate	Project estimate	Leakage Emission	Net benefit
1/01/2022-31/12/2022	217,412	22,695	2,801	191,916
2023	217,412	22,695	2,801	191,916
2024	217,412	22,695	2,801	191,916
2025	217,412	22,695	2,801	191,916
01/01/2026 - 31/12/2026	217,412	22,695	2,801	191,916
Total	1,087,060	113,476	14,006	959,578
Total number of crediting years		**5 years**		

Annual average over the crediting period	217,412	22,695	2,801	191,916

SDG 13:

SDG 7

Year	Baseline estimate	Project estimate	Net benefit
1/01/2022-31/12/2022	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy
2023	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy
2024	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy
2025	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy
01/01/2026 - 31/12/2026	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy
Total	0	200,062.5 MWh clean energy	200,062.5 MWh clean energy
Total number of crediting years	5 years		
Annual average over the crediting period	0	40,012.5 MWh clean energy	40,012.5 MWh clean energy

SDG 8

Year	Baseline estimate	Project estimate	Net benefit

1/01/2022-31/12/2022	0	24 employees	24 employees
2023	0	24 employees	24 employees
2024	0	24 employees	24 employees
2025	0	24 employees	24 employees
01/01/2026 - 31/12/2026	0	24 employees	24 employees
Total	0	24 employees	24 employees
Total number of crediting years	5 years		
Annual average over the crediting period	0	24 employees	24 employees

SDG 12

Year	Baseline estimate	Project estimate	Net benefit
1/01/2022-31/12/2022	0	335,435 tons/year	335,435 tons/year
2023	0	335,435 tons/year	335,435 tons/year
2024	0	335,435 tons/year	335,435 tons/year
2025	0	335,435 tons/year	335,435 tons/year
01/01/2026 - 31/12/2026	0	335,435 tons/year	335,435 tons/year
Total	0	1,677,175 tons	1,677,175 tons
Total number of crediting years	5 years		
Annual average over	0	335,435 tons/year	335,435 tons/year

the crediting period			

B.7. Monitoring plan

B.7.1 Data and parameters to be monitored

1 – Affordable and Clean Energy (SDG 7):

The project is expected to generate 40,012.5 MWh of clean energy per annum and contributes to share of low-cost / must-run sources.

2 – Decent Work and Economic Growth (SDG 8):

The project promotes job opportunities for 24 employees. Social security documents of employees are the certain prove of that issue.

Training (including H&S) & Other Certification processes required by certain necessary professions will be provided to employees to protect human health rights and develop. Hence, project contributes awareness of labour rights and safety precautions. Trainings of employees are done periodically as per national regulations and certifications are kept for the prove of the situation.

3- Ensure sustainable consumption and production patterns (SDG 12)

The project provides better management option for wastes as around 919 tonne/day (Project Technical Feasibility Report, page 14)

4- Take urgent action to combat climate change and its impacts (SDG 13)

The project contributes to 191,916 tons of CO2e reduction, which represent direct and quantifiable impact on climate security.

>> **SDG 13 and SDG 7**

Data / Parameter	$EG_{d,y}$
Unit	MWh
Description	Electricity generated using biogas in year y
Source of data	Project proponent
Value(s) Applied	40,012.50 MWh

Measurement procedures (if any):	Archive electronically during project plus five years
Monitoring frequency	Annual
QA/QC procedures	Two calibrated meters backup each other. Maintenance and calibration of the metering devices are made by TEIAS. 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 will be taken in consideration while calculating $EG_{facility, y}$. After the first calibration of meters , calibration of meters is valid for ten years due to related legislation. Link of related regulation given below. "ÖLÇÜ VE ÖLÇÜ ALETLERİ MUAYENE YÖNETMELİĞİ" / Article 9 https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5 Calibration information of the meters will be shared.
Purpose of data	Calculation of Baseline Emissions
Additional comment	Estimated annual generation forming the basis for emission reduction calculation is 40,012.50 MWh as indicated in electricity generation license.

SDG 13

Data / Parameter	Emissions Reductions in tCO_2
Unit	tCO_2

Description	Reduction of CO_2 emissions due to the proposed project activity's implementation.
Source of data	Project proponent. Annual baseline and project emissions, along with relevant parameters, such as combined margin (CM), will be used as reference in calculation of the emission reduction.
Value(s) Applied	191,916 tonnes of CO2eq/year.
Measurement procedures (if any):	-
Monitoring frequency	Combined Margin is fixed through the crediting period and the value is taken from official paper of Ministry of Natural Resources and Energy of Turkey (0.5552 tCO_2/MWh). https://enerji.gov.tr//Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/TUESEmisyonFktr/Belgeler/Bform2020.pdf
QA/QC procedures	-
Purpose of data	To monitor the contribution to SDG 13
Any comment	Estimated annual emission reduction is 191,916 tonnes of CO2eq/year.

Data / Parameter	Vf
Unit	m3
Description	Biogas (total biogas goes to gas engines)
Source of data	Project proponent.
Value(s) Applied	Project owner will provide during monitoring
Measurement procedures (if any):	
Monitoring 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 will be archived electronically during the crediting period plus 2 years. Computerized monitoring for the whole system is

	available to keep track of pressure and temperature of the gas, gas meters will be calibrated as per the relevant industry standard. Equipment will be subject to regular maintenance. After the first calibration of ~~meters ,~~meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. "ÖLÇÜ VE ÖLÇÜ ALETLERİ MUAYENE YÖNETMELİĞİ" / Article 9 https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5 Accuracy class of meters will be +/-1.5% of reading (gas & steam)
Purpose of data	To monitor the contribution to SDG 13
Any comment	-

Data / Parameter	$F_{RG,m}$
Unit	m^3
Description	The flow rate of the residual gas to the flare
Source of data	Project owner
Value(s) Applied	Project owner will provide during monitoring if the flare unit is used
Measurement procedures (if any):	Calibrated meter of flare equipment
Monitoring frequency	Continuously
QA/QC procedures	After the first calibration of ~~meters ,~~meters, calibration of meters are valid for ten years due to related legislation. Link of related regulation given below. "ÖLÇÜ VE ÖLÇÜ ALETLERİ MUAYENE YÖNETMELİĞİ" / Article 9

	https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5 Calibration document is to be provided in first monitoring period.
Purpose of data	-
Any comment	Option A is selected via Methodological tool "Project emissions from flaring Version 04.0"

Data / Parameter	Status of biogas destruction device
Unit	-
Description	Operational status of biogas destruction devices
Source of data	Project owner
Value(s) Applied	-
Measurement procedures (if any):	Monitoring and documenting is to be undertaken by recording the energy production from methane captured by gas engines on project site
Monitoring frequency	Continuous
QA/QC procedures	-
Purpose of data	-
Any comment	Project owner is to be 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 to determine the mass flow of a greenhouse gas in a gaseous stream Version 03.0

Data / Parameter	$V_{i,\ t,db}$
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
Source of data	Project and leakage emissions from anaerobic digesters

	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf
Value(s) Applied	59%
Measurement procedures (if any):	-
Monitoring frequency	Continuously
QA/QC procedures	After the first calibration of ~~meters ,~~meters, calibration of meters is valid for ten years due to related legislation. Link of related regulation given below. "ÖLÇÜ VE ÖLÇÜ ALETLERİ MUAYENE YÖNETMELİĞİ" / Article 9 https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5 calibration document is to be provided in first monitoring period.
Purpose of data	Project emission calculations
Any comment	Details are present in "baseline emission" tab of ER excel calculation document

Data / Parameter Unit	$SPEC_{flare}$ 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
Source of data	Flare manufacturer
Value(s) Applied	Project proponent will provide during monitoring if the flare unit is used
Measurement methods and procedures	Monitoring by flow meter on project site
Monitoring frequency	Continuously by flow meter 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	-
Any comment	Option A is selected via Methodological tool Project emissions from flaring Version 04.0

Data / Parameter	$FC_{i,j,y}$
Unit	liter/yr
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Recording on the amount of diesel oil consumed by sewage trucks whilst transporting manure from farms to the plant
Value(s) applied	Annual consumption of diesel
Measurement methods and procedures	It will be yearly measured as per the applied Gold Standard's consolidated baseline methodology by recording the amount of diesel oil consumed throughout manure transportation via sewage trucks.
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	To calculate $PE_{Tran,y}$, as Project and leakage emissions from transportation of freight, as well as to calculate the project emission value and to monitor the contribution of the proposed Project's contribution to SDG 13.
Additional comment	The trucks used for transporting manure are all run by diesel oil. If any changes in the type of fuel used in them, $PE_{Tran,y}$

	equation, along with the parameters in it, is going to change accordingly. In this regard, PP commits herself/himself to inform DoE and GS immediately if any changes occur.

Data/parameter	Qdm
Unit	kg
Description	Mass of manure disposed outside project boundary
Source of data	Project proponent (owner).
Value(s) Applied	0
Measurement procedures (if any):	-
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	-
Any comment	No manure disposal to outside the project boundary since all the manure transported to project site is source of energy for the project owner. Hence there is no such disposal on project site. Moreover, the solid and liquid digestate (outputs of anaerobic digesters) provided to farmers as free who has agricultural lands near to project site. These materials are not used/stored in any other conditions on land by project owner. Hence there is no need to monitor treated manure for this project.

Biçimlendirilmiş Tablo

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

Biçimlendirilmiş Tablo

Description	Daily stock of animals in the farm, discounting dead and discarded animals
Source of data	Daily counting of a live animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock.
Value(s) Applied	18,252 cattle (12,834 dairy cows and 5,418 other cows)
Measurement procedures (if any): Monitoring frequency	- Daily
QA/QC procedures	-
Purpose of data	Baseline emission calculations
Any comment	Many cattle farms (details and name of the farms are given in section B.3 and contract with each farm will be provided during monitoring) which has manure supply agreement with this project and farm provides animal number with signed document to the project. These farms totally have 29,288 cattle/year in average which 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
Source of data	Daily counting of a live animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock

Biçimlendirilmiş Tablo

Value(s) Applied	3,200,000 poultry
Measurement procedures (if any)	-
Monitoring frequency	Daily
QA/QC procedures	-
Purpose of data	Baseline emission calculations
Any comment	Related poultry farm which has manure supply agreement with this project and farm provides animal number with signed document to the project. This farm has 3,200,000 poultry/year in average which 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	Annual average temperature
Unit	Celcius
Description	Annual Average ambient temperature at project site
Source of data	Turkish State Meteorological Service. The value "11.2[82] Celcius" is taken for this project estimated emission reduction calculations.
Value(s) Applied	11.2
Measurement procedures (if any):	-
Monitoring frequency	Monthly

Biçimlendirilmiş Tablo

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

QA/QC procedures	-
Purpose of data	In order to decide the MCFj which is the annual methane conversion factor for the baseline, hence it is used in baseline and project emission calculations.
Any comment	-

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
Source of data	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[83]
Value(s) Applied	0.24
Measurement procedures (if any):	-
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	Baseline and project emission calculations
Any comment	The value is taken from published sources. The parameter value should be updated on latest available public data source

Biçimlendirilmiş Tablo

Data/parameter	$B_{0,LT}$ for Poultry manure
Unit	$m^3CH_4/kg.dm$

Biçimlendirilmiş Tablo

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

Description	Maximum methane producing potential of the volatile solid generated by animal type LT
Source of data Value(s) Applied	IPCC 2019 Refinement, Chapter 10, Volume 4 Table 10.16, Eastern Europe Data is taken[84] 0.36
Measurement procedures (if any):	-
Monitoring frequency	Annually
QA/QC procedures	Used in project emission/baseline calculations.
Purpose of data Any comment	Baseline and project emission calculations The value is taken from published sources. The parameter value should be updated on latest available public data source

Data/parameter	N
Unit	-
Description Source of data Value(s) Applied	Total number of farms Project proponent 50
Measurement procedures (if any):	-
Monitoring frequency	Annually
QA/QC procedures	-

Biçimlendirilmiş Tablo

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

Purpose of data	To monitor the contribution to SDG 13
Any comment	-

SDG 8

Data / Parameter	Quantitative employment and income generation
Unit	-
Description	Number of employments
Source of data	Through evaluation of social security documents
Value(s) applied	At least 24 job opportunities are created.
Measurement methods and procedures	All employees will attend trainings on first aid and health & safety. For positions that require specific skills (such as high voltage equipment) staff will either be trained or certified staff will be recruited.
Monitoring frequency	Annually
QA/QC procedures	The training programmes 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 and Principle 6.1 Labor Rights**
Additional comment	

Biçimlendirilmiş Tablo

Biçimlendirilmiş: Yazı tipi: Kalın

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
Source of data	Training Records (including H&S) & Other Certificates required by certain professions, if necessary

Biçimlendirilmiş Tablo

Value(s) applied	At present situation there are 24 staff working in the project and all the is to have H&S training.
Measurement methods and procedures	All employees will attend trainings on first aid and health & safety. For positions that require specific skills (such as high voltage equipment) staff will either be trained or certified staff will be recruited.
Monitoring frequency	Annually
QA/QC procedures	The training programmes 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. And Principle 6.1 Labour Rights**
Additional comment	-

Biçimlendirilmiş: Yazı tipi: Kalın

Biçimlendirilmiş: Yazı tipi: Kalın

Biçimlendirilmiş: Yazı tipi: Kalın

SDG 12

Data/parameter	FRf,m
Unit	tons
Description	Total mass of freight transported in freight transportation activity f in monitoring period m
Source of data	Project owner (project technical feasibility report, page 8)
Value(s) Applied	919 tonne/day ~~(Transportation~~(Transportation of cattle and chicken manure)
Measurement procedures (if any):	Calibrated weight bridge
Monitoring frequency	Continuously
QA/QC procedures	After the first calibration of ~~meters ,~~meters, calibration of meters is valid for ten years due to related legislation. Link of related regulation given below. "ÖLÇÜ VE ÖLÇÜ ALETLERİ MUAYENE YÖNETMELİĞİ" / Article 9

Biçimlendirilmiş Tablo

	https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5 calibration document is to be provided in first monitoring period.
Purpose of data	Project emission calculations which is due to the transportation activity
Any comment	-

~~**Principle 4.3.5 Hazardous and Non-Hazardous Waste**~~

Data / Parameter	Other Pollutants
Unit	-
Description	Proper management of waste oil- Amount of waste oil generated and disposed during operation
Source of data	Assessing disposal methods during site visits and checking waste oil disposal records.
Value(s) Applied	Project proponents will provide during monitoring periods
Measurement methods and procedures	Waste oil from equipment will be collected properly in line with the relevant regulation and disposed via accredited abatement companies.
Monitoring frequency	Annually
QA/QC procedures	Waste oil will be disposed in line with regulation # 26952 on control of waste oils.
Purpose of data	**To monitor the contribution to Principle 9.5 Hazardous and Non-hazardous Waste-**
Additional comment	-

Biçimlendirilmiş Tablo

Data / Parameter	Release of Sulphurous Compound
Unit	-
Description	Moreover, to prevent the release of any sulphurous compound from the digestors a desulphurization unit has

Biçimlendirilmiş Tablo

	been installed. This unit both provides clean biogas to prevent any clogging or damage.
Source of data	Periodic examination of desulphurization units
Value(s) Applied	Project proponents will provide during monitoring periods
Measurement methods and procedures	The effective working conditions will be checked regularly to ensure that desulphurisation unit is working to prevent equipment damage and undesired sulphurous compound release to the atmosphere.
Monitoring frequency QA/QC procedures	At each verification -
Purpose of data	**To monitor the contribution to Principle 9.4 Release of Pollutants**
Additional comment	-

B.7.2 Sampling plan

N/A

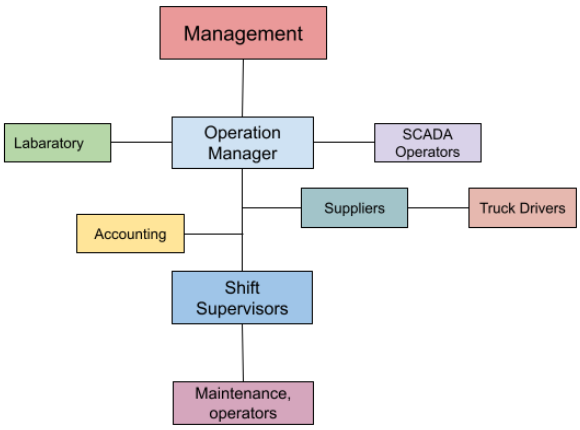
B.7.3 Other elements of monitoring plan

>> 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 TEIAS and sealed before the commissioning of the power plant. As per the local regulations, meters should not require calibration at least ten years. The meters were be calibrated by TEIAS 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 weighbridge to measure the weight of the manure. Dry matter content of the manure is analysed periodically to monitor the efficiency of digesters by plant personnel.

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

Organizational chart, relevant roles and responsibilities given below chart.



Operation Manager (Operations Head Engineer): Operations head technician has been assigned as the overall responsible of compliance with VER monitoring plan. He is responsible for day to day running of plant, recording, and monitoring of relevant data.

SCADA Operators: Assisting Operation manager with the gathering, recording and reporting of the data thru SCADA system.

Laboratory: The unit where the incoming manure is tested for many parameters such as temperature, pH, dry matter and organic matter content.

Maintenance: The engineer is responsible for performing of the periodic equipment inspections, sensor calibration, cleaning, and unscheduled repairs of malfunctioning components.

Shift Supervisors: The employee is responsible for planning and coordinating the work. Moreover, they are needed to determine which machines will be used or purchased, the extra shifts, and development method for the production processes.

Accounting Management (Headquarters Operations Department): Since the company is a part of larger group, financial matters are managed from the headquarters. Operations Department is responsible for accounting, handling data about power sales, social security documents, invoicing, and other personnel affairs.

GTE Carbon: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

The primary source for emission reduction calculation will be EPIAS records, meter readings will be used for cross check.
TEDAŞ is the governmental energy distribution institution in Turkey. However, it gives authorization to several local distribution companies in specific regions to manage local energy distribution works. Calibration of the meters is done by the distribution company every ten years.

	Main Meter	**Back-up Meter**
Brand	Makel	Landis
Type	C520	ZMG405
Class	0.5	0.5
Serial No	75001746	40303944
First Index date	29/06/2021	29/06/2021
Calibration due dates	29/06/2031	29/06/2031

Technical specifications of the biogas flow meters given below;

Brand	Endress+Hauser	Endress+Hauser
Type	Prosonic Flow B	Prosonic Flow B
Serial No	S30BEA02000	S2208D19000
Installation and calibration date	16/03/2021	13/03/2021

Technical specifications of the gas analyzers given below;

Brand	MRU GmbH	MRU GmbH
Type	SWG-100 BIOGAS	SWG-100 BIOGAS
Serial No	081526	081423

Factory approval of conformity	20/05/2014	20/05/2014

SECTION C. DURATION AND CREDITING PERIOD

C.1. Duration of project

C.1.1 Start date of project

>> The Project Start Date for the proposed project activity is 17/02/2021 which is date of construction agreement.

C.1.2 Expected operational lifetime of project

>> Operational lifetime of the project is estimated as 49 years afterwards the date 25/03/2021 as indicated in license.

C.2. Crediting period of project

C.2.1 Start date of crediting period

>> The start day of the first crediting period is 01/01/2022. Due to the provisional acceptance date of the gas engines, the CP is changed to be 01/01/2022 in order to cover all the gas engine's acceptance.

C.2.2 Total length of crediting period

>> The total length of the first crediting period is 5 years (01/01/2022-31/12/2026).

SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

D.1 Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in Appendix 1, ongoing monitoring is ~~summarised~~summarized below.

Principles	Mitigation Measures added to the Monitoring Plan
Principle 9.4 Release of pollutants	Excavation soil, domestic wastewater, waste oil and solid waste is expected to be generated. However, they will not result in adverse effects on the environment since they will be managed as per the requirements of national legislation. Assessment of

	cumulative noise impact for the Project summarize that the operation of wind farms will have no cumulative noise effect on the settlements. Details ~~analysed~~analyzed in EIAS report of the Project[85]. Moreover, to prevent the release of any sulphurous compound from the digestors a desulphurization unit has been installed. This unit both provides clean biogas to prevent any clogging or damage. —The effective working conditions will be checked regularly to ensure that desulphurisation unit is working to prevent equipment damage and undesired sulphurous compound release to the atmosphere.
Principle 6.1 Labour Rights	1. Social security records will be checked for employment as per law. 2. Workers/employees can join labor organizations, as there are no restrictions from the Project Owner and as per Project Owner's internal procedures. 3. Working agreements with workers/employees specifying working hours, job responsibilities, details of overtime compensations, health insurance details, leave aspects, termination of contract rules. The social security records and contracts will be provided. 4. Social security records will be checked for employment of any child labor in site. 5. Staff will be trained during construction and operation phases, such as general HSE, risk, first aid, etc. Accident/incident records, emergency response procures and trainings given related to it, which are provided to workers/employees. The records of the trainings will be provided.

[85] Project Introductory Document (PID) page 13

Principle 9.5 Hazardous and Non-hazardous Waste	Other Pollutants - Proper management of waste oil. Handling, ~~storage~~storage, and disposal of these wastes will be done according to the Turkish regulations.
Principle 9.2 Vulnerability to Natural Disaster	Bor province and the project site are in the 4th Degree Seismic Zone according to the earthquake zones determined by the General Directorate of Disaster Affairs. Hence construction of the project ~~have~~has been carried out accordingly[86].

D.2. Assessment that project complies with GS4GG Gender Sensitive requirements

Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy?	As stated in Gold Standard Gender Policy document, "foundational gender sensitive certification" which is mandatory for every project requires compliance with the gender 'do no harm' safeguard, gender-gap analysis and gender sensitive stakeholder consultations. Although the project is a renewable energy project and does not have negative impacts on men and women, it complies with the criteria mentioned. Moreover, Turkey has ratified ILO convention 100 and 111[87] and discrimination based on gender is illegal in Turkey. The project try to align with the national gender strategy. So, the project does not involve and is not complicit in any form of discrimination based on gender difference.
Question 2 - Explain how the project aligns with existing country policies, strategies and best practices	The project aims to create new employment and income opportunities within the scope of SDG 8. While doing this, a gender-equal strategy is implemented by creating employment opportunities for both man and woman without discrimination. According to the Woman Empowerment Strategy Paper and Action Plan prepared by the Ministry of Family and Social Policies (2018), there are 21 targets classified under 5 main fields in order to enhance participation of women to the

[86] Bor Biogas Plant EIA Report, page 141-145, Appendix 2, Appendix 4
[87] https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-ankara/documents/genericdocument/wcms_645630.pdf

	society.[88] In this action plan regarding the years 2018 – 2023, economy and employment-oriented strategies are represented for women since the labor force activity of women is not at desired level compared to the EU countries. According to 2017 statistics tabulated in the report, labor force activity of women is declared as 33.6%[89] and it is aimed that this percentage will be 41% in 2023.[90] Accordingly, the project shows parallelism with the national strategies developed for women.
Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements?	No
Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	No

SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

The below is a summary of the 2 step GS4GG Consultation for monitoring purposes. Please refer to the separate Stakeholder Consultation Report for a complete report on the initial consultation and stakeholder feedback round.

E.1 Summary of stakeholder mitigation measures

>> A physical meeting took place on 09/01/2020 in Bor District in Niğde Province, Çukurkuyu Town Hall Meeting Room. In the physical meeting, ~~in order to~~to inform the public about the project; Visual presentations about the project were made with a projector using the Power Point program. The local people were both provided with information and their opinions and suggestions about the activity were received. Questions about the project were answered by Flaş Bor Bio Enerji Elektrik Üretim San.

[88] http://www.sp.gov.tr/upload/xSPTemelBelge/files/RySPo+KADININ_GUCLENMESI_STRATEJI_BELGESI_VE_EYLEM_PLANI_2018-2023_.pdf, Page 17

[89] http://www.sp.gov.tr/upload/xSPTemelBelge/files/RySPo+KADININ_GUCLENMESI_STRATEJI_BELGESI_VE_EYLEM_PLANI_2018-2023_.pdf, Page 76

[90] http://www.sp.gov.tr/upload/xSPTemelBelge/files/RySPo+KADININ_GUCLENMESI_STRATEJI_BELGESI_VE_EYLEM_PLANI_2018-2023_.pdf, Page 79

Ve Tic. A.Ş. and Ekoçed Çevre ve Mühendislik Hizmetleri Ltd. Şti.. Detailed information was given about the importance of the project, its necessity, the reasons for choosing the location and the procedures to be carried out in the next stages. During the public participation meeting, issues such as employment, types of waste to be accepted at the facility, where to obtain waste, sample facilities, emissions, waste disposal were discussed.

In the presentations made during the local stakeholder meeting, the necessity of the project and possible environmental effects and the measures to be taken for these effects were explained to the public in detail. The people of the region did not express any negative opinion about the project and focused on the employment opportunities that will be provided by the realization of the project. As a result, the people of the region found answers to the questions they were wondering about the project.

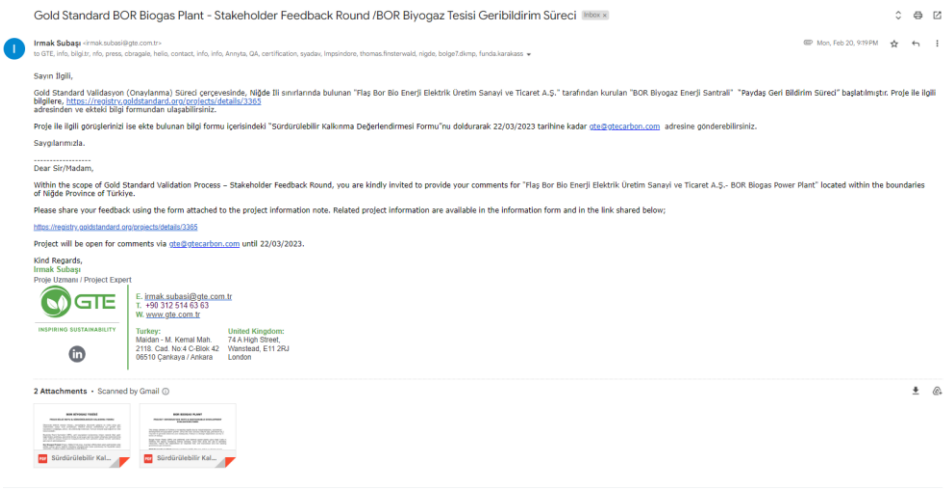
It was emphasized that with the help of BOR BIOGAS-SOLAR HYBRID PROJECT, solar and biogas can be used for the generation of electricity and methane (CH_4) and carbon dioxide (CO_2) emissions will be reduced which are the one of the most important greenhouse gases which causes climate change.

~~Meeting~~The meeting was held in accordance with the previously announced schedule and the agenda, as stated in the Gold Standard Toolkit v2.2 was followed. Attendance to the meeting was high and a pleasing hospitality was shown by the locals.

The meeting started with the introduction of the project and explanation of the purpose of the meeting. Through presentations, the locals were enlightened in key subjects, one of the main focuses being the importance of continuous input/grievance mechanism. The meeting was concluded with a question-and-answer session which also has been very ~~productive~~productive, especially for the evaluations by the locals.

The stakeholder feedback round has been started on 20/02/2023 for two months for the stakeholders to re-convey their grievances to the project owners. For that reason, an information form has been used. The form included ~~the informative~~informative details related to the project and a form for the stakeholders to fill.

For the feedback round, no comments were received yet between 20/02/2023-15/03/2023. After 15/03/2023 till 24/08/2023 no comments were received.


Gold Standard BOR Biogas Plant - Stakeholder Feedback Round /BOR Biyogaz Tesisi Geribildirim Süreci

Irmak Subaşı <irmak.subasi@gte.com.tr> Mon, Feb 20, 9:19 PM
to GTE, info, bilgi.tr, info, press, cbragale, helio, contact, info, info, Annyta, QA, certification, syadav, lmpsindore, thomas.finsterwald, nigde, bolge7.dkmp, funda.karakass

Sayın İlgili,

Gold Standard Validasyon (Onaylanma) Süreci çerçevesinde, Niğde İli sınırlarında bulunan "Flaş Bor Bio Enerji Elektrik Üretim Sanayi ve Ticaret A.Ş." tarafından kurulan "BOR Biyogaz Enerji Santrali" "Paydaş Geri Bildirim Süreci" başlatılmıştır. Proje ile ilgili bilgilere, https://registry.goldstandard.org/projects/details/3365 adresinden ve ekteki bilgi formundan ulaşabilirsiniz.

Proje ile ilgili görüşlerinizi ise ekte bulunan bilgi formu içerisindeki "Sürdürülebilir Kalkınma Değerlendirmesi Formu"nu doldurarak 22/03/2023 tarihine kadar gte@gtecarbon.com adresine gönderebilirsiniz.

Saygılarımızla.

Dear Sir/Madam,

Within the scope of Gold Standard Validation Process – Stakeholder Feedback Round, you are kindly invited to provide your comments for "Flaş Bor Bio Enerji Elektrik Üretim Sanayi ve Ticaret A.Ş.- BOR Biogas Power Plant" located within the boundaries of Niğde Province of Türkiye.

Please share your feedback using the form attached to the project information note. Related project information are available in the information form and in the link shared below;

https://registry.goldstandard.org/projects/details/3365

Project will be open for comments via gte@gtecarbon.com until 22/03/2023.

Kind Regards,
Irmak Subaşı
Proje Uzmanı / Project Expert

GTE
INSPIRING SUSTAINABILITY

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Wanstead, E11 2RJ
London

2 Attachments • Scanned by Gmail

Sürdürülebilir Kal...
Sürdürülebilir Kal...

Figure 1. E-mail pictures sent to Stakeholders and Gold Standard Team to initiate SFR

- Local people, communities and or representatives who are directly or indirectly affected by the project: As per the email shown below the local stakeholders are invited (through gte@gte.com.tr)
- Local policy makers and representatives of local authorities. As seen in the emails, the ministry authorities, municipality authorities and security forces from Konya were called to join the SFR (through: nigde@icisleri.gov.tr, bolge7.dkmp@tarimorman.gov.tr)
- National government officials or National focal bodies responsible for the project in the host country, for example, Designated National Authority (DNA): Authorities from municipalities such as ministry of agriculture and forestry, ministry of health and ministry of environment and urbanisation were invited (through: nigde@icisleri.gov.tr, bolge7.dkmp@tarimorman.gov.tr)
- Local non-governmental organizations (NGOs), Women Groups working on topics relevant to the project or working with communities who are likely to be affected by the project: NGOs such as "Sustainable Environment" were called for SFR (through: funda.karakass@gmail.com)

- A Gold Standard representative at help@goldstandard.org. The gold standard representatives were also informed(
- Relevant international Gold Standard NGO Supporters with representation in your region and all Gold Standard NGO Supporters located in the host country of the project: (emails through: ,info@wwf.org.tr, bilgi.tr@greenpeace.org nfo@uk.mercycorps.org, press@mercycorps.org, cbragale@mercycorps.org, helio@helio-international.org, contact@helio-international.org, info@reeep.org, info@rec.org.tr)

For the feedback round, no comments were received yet between 20/02/2023-15/03/2023. Hence, no design change was performed.

E.2 Final continuous input / grievance mechanism

Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	There is a process book on site and local stakeholders could write their opinion on it. The notebook is in mukhtar's office in Ali Hasan Harım Mahallesi, BOR district as seen in the below picture: Also, ~~However, l~~local stakeholders and project owner has good relationship and stakeholders could easily reach to project owner if they had any problem with the project. This situation is mentioned by directly stakeholders during the online site interview

Biçimlendirilmiş: Normal, Sola, Sağ: 0 cm, Aralık Önce: 0 nk

Biçimlendirilmiş: Aralık Önce: 0 nk

GS Contact (mandatory)	help@goldstandard.org

Other

APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

Complete the Assessment below and copy all Mitigation Measures for each Principle into SECTION D above. Please refer to the instructions in the Guide to Completing this Form.

Assessment Questions/ Requirements	Justification of Relevance (Yes/potentially/no)	How Project will achieve Requirements through design, management or risk mitigation.	Mitigation Measures added to the Monitoring Plan (if required)
Principle 1. Human Rights			
1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights 2. The Project shall not discriminate with	Yes	Turkey has ratified European Convention on Human Right on 10/03/1954[91]. Therefore, the project is not expected to violate the rules regarding human rights.	No mitigation measure is required for this indicator.

[91] https://www.echr.coe.int/Documents/CP_Turkey_ENG.pdf

regards to participation and inclusion			
Principle 2. Gender Equality			
1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women 2. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work 3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks 4. (where required) Summary of opinions	Yes	Turkey has ratified ILO convention 100, 111, 122 and 142, which provides gender equality and promotes women's employment[92.] It also shows parallelism with national strategies prepared for women employment by creating opportunities for all. Moreover, the project outputs serve everyone without regarding gender. It provides electricity for all.	No mitigation measure is required for this indicator.

[92] http://www.ilo.org/ankara/areas-of-work/equality-discrimination/lang--tr/index.htm

and recommendations of an Expert Stakeholder(s)			
Principle 3. Community Health, Safety and Working Conditions			
1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	Yes	Turkey has ratified ILO convention 155 and about work safety and precautions[93]	No mitigation is required for this indicator.
Principle 4.1 Sites of Cultural and Historical Heritage			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	(a) No sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture were observed in the project area Project area is in an organized industrial zone area. Institutional opinion was asked to Provincial Directorate of	
>>			

[93] https://www.ilo.org/global/standards/subjects-covered-by-international-labour-standards/occupational-safety-and-health/WCMS_356966/lang--en/index.htm

		Food, Agriculture and Livestock. In the letter of 19.04.2016 and numbered 67970180/16757, within the scope of Soil Conservation and Land Use Law No.5403 of the 1271 island parcel no.14 It was stated that there is no problem in the implementation of the project (See EIA Report / Annex-12.8).[94] Considering that the closest settlement to the project site is the Bahçesaray Quarter located at 3,500 meters north-west, it will not be affected by negative noise conditions. The planned project area is located within the borders of Bor	

[94] Bor Biogas Plant EIA Report, page 125-130

		Organized Industrial Zone and related analysis were done.[95]	
Principle 4.2 Forced Eviction and Displacement			
Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	The planned project area is located within the borders of Bor Organized Industrial Zone. There were no settlement on project site on baseline scenario[96].	Land acquisition was done according to the Turkish Expropriation Laws and Regulations. No mitigation is needed for this indicator.
>>			
Principle 4.3 Land Tenure and Other Rights			
a. Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership? b. For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership?	No	The planned project area is located within the borders of Bor Organized Industrial Zone. There were no settlement on project site on baseline scenario or not any private ownership.[97]	No mitigation is needed for this indicator.

[95] Bor Biogas Plant EIA Report, page 1, 2, Appendix 10.9
[96] Bor Biogas Plant EIA Report, page 1, 2, Appendix 10.9
[97] Bor Biogas Plant EIA Report, page 1, 2, Appendix 10.9

>>			
Principle 4.4 - Indigenous people			
Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No indigenous people was identified. And so no one will be affected by negative noise conditions[98]. Details of analysis given in EIA report of the project.	No mitigation is needed for this indicator.
>>			
Principle 5. Corruption			
1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	No	Turkey has ratified several conventions on bribery and corruption including OECD and UN conventions[99]	No mitigation is needed for this indicator.
Principle 6.1 Labour Rights			

[98] Bor Biogas Plant EIA Report, page 1, 2, Appendix 10.9
[99] http://www.masak.gov.tr/en/LaunderingProceedsofCrime/Chronology.htm

1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions 2. Workers shall be able to establish and join labour organisations 3. Working agreements with all individual workers shall be documented and implemented and include: a) Working hours (must not exceed 48 hours	Yes Yes Yes No Yes	1. Project owner ensures that all employment and HSE activities will be done according to the Law of Health And Safety.[100] 2. Turkey has ratified ILO 87 and 98 conventions. 3. All employee will be recruited according to the national legislations. 4. Turkey is a party of IPEC[101],[102] since 1992 and ratified ILO convention 138 and 182[103].	1. Social security records will be checked for employment as per law. 2. Workers/employees can join labor organizations, as there are no restrictions from the Project Owner and as per Project Owner's internal procedures. 3. Working agreements with workers/employees specifying working hours, job responsibilities, details of overtime compensations, health insurance details, leave aspects, termination of

[100] https://www.mevzuat.gov.tr/MevzuatMetin/1.5.6331.pdf
[101] http://www.ilo.org/ipec/programme/lang--en/index.htm
[102] http://www.ilo.org/ipec/Regionsandcountries/lang--en/index.htm
[103] http://www.ilo.org/public/turkish/region/eurpro/ankara/about/sozlesmeler.htm

per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave. 4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) 5. The Project Developer shall ensure the use of		5. Turkey has ratified ILO convention 155 and about work safety and precautions.	contract rules. The social security records and contracts will be provided. 4. Social security records can be checked for employment of any child labor in site. 5. Staff will be trained during construction and operation phases, such as general HSE, risk, first aid, etc. Accident/incident records, emergency response procures and trainings given related to it, which are provided to workers/employees. The records of the trainings will be provided.

appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures			
Principle 6.2 Negative Economic Consequences			
6. Does the project cause negative economic consequences during and after project implementation?	No	The investment is capital intensive but operating as low cost plant. VER revenues help in shorter return periods for investment. Details are given in sensitivity analysis part of this report and IRR calculation sheet of the project for the justification.	No mitigation needed for this indicator.
>>			
Principle 7.1 Emissions			
Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No	Since it is a biogas power plant, the project is expected to have a positive impact on Climate Change by eliminating fossil fuels with renewable sources. Expected amount of CO2e: 172,397 tonnes (as	No mitigation measure is required for this indicator.
>>			

		indicated in emission reduction calculation sheet detaily).	
Principle 7.2 Energy Supply			
Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users? >>	No	Project does not use any local fuel resource. It is connected to the national grid and supply 40.012 GWh additional energy to the grid (as indicated in genetration licence of the project).	No mitigation measure is required for this indicator.
Principle 8.1 Impact on Natural Water Patterns/Flows			
Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity? >>	No	1) The liquid digestate coming from the anaerobic digester is mainly given to the farmers to be used as fertilizer and the small portion of it is sent back to the digester. Hence,~~T~~ the project does not have any expected effects on the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) since there is no underground or other kind of water source on	No mitigation measure is required for this indicator.

Biçimlendirilmiş: Liste Paragraf;MBZ Bullet Points, İki Yana Yasla, Satır aralığı: tek, Numaralı + Düzey: 1 + Numaralandırma Stili: 1, 2, 3, … + Başlangıç: 1 + Hizalama: Soldan + Hizalandığı yer: 0 cm + Girinti yeri: 0,63 cm, Tek kalan satırları önleme, Latince ve Asya metni arasında boşluk ayarlama, Asya metni ve sayıları arasında boşluk ayarlama

		project site[104]	
Principle 8.2 Erosion and/or Water Body Instability			
a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? b. Is the Project's area of influence susceptible to excessive erosion and/or water body instability?	No	The project does not directly or indirectly cause harm on soil and water. During the operation phase of the project, wastewater management will be carried out in accordance with the provisions of the "Water Pollution Control Regulation" (and all changes made in the regulation), which entered into force by publishing in the Official Gazette dated 31.12.2004 and numbered 25687. Moreover project will not need process water during the operation phase based on its technical configuration[105].	No mitigation measure is required for this indicator.
>>			

[104] Bor Biogas Plant EIA Report, pages 14-24-36-36
[105] Bor Biogas Plant EIA Report, page 35

		The planned project area is located within the borders of Bor Organized Industrial Zone. There were no settlement or agricultural activities on project site on baseline scenario or not any private ownership.[106]	
Principle 9.1 Landscape Modification and Soil			
Does the Project involve the use of land and soil for production of crops or other products? >>	No	The planned project area is located within the borders of Bor Organized Industrial Zone. There were no settlement or agricultural activities on project site on baseline scenario or not any private ownership.[107]	No mitigation measure is required for this indicator.
Principle 9.2 Vulnerability to Natural Disaster			
Will the Project be susceptible to or lead to increased vulnerability to wind,	Yes	Bor province and the project site are in the 4th Degree Seismic Zone according to the	All the design and construction works was

[106] Bor Biogas Plant EIA Report, Appendix 10.8
[107] Bor Biogas Plant EIA Report, Appendix 10.8

earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?		earthquake zones determined by the General Directorate of Disaster Affairs. Hence construction of the project have been carried out accordingly[108].	performed in accordance with relevant regulation.
>>			
Principle 9.3 Genetic Resources			
Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)?	No	The project is not relevant since it is a renewable energy project.	No mitigation measure is required for this indicator.
>>			
Principle 9.4 Release of pollutants			
Could the Project potentially result in the release of pollutants to the environment?	Yes	Excavation soil, domestic wastewater, waste oil and solid	Project will not have any adverse impact on water

[108] Bor Biogas Plant EIA Report, page 141-145, Appendix 2, Appendix 4

>>		waste is expected to be generated. However, they will not result in adverse effects on the environment since they will be managed as per the requirements of national legislation. Assessment of cumulative noise impact for the Project summarize that the operation of wind farms will have no cumulative noise effect on the settlements. Details analysed in EIAS report of the Project[109].	quality and quantity. Domestic wastewater will be collected and disposed to the sewage system. Domestic solid waste handled in accordance with related regulation26 and disposed to nearest garbage container of the municipality. All the other generated waste will be handled according to the national regulation "Turkish Water Pollution Control Regulation". All excavation soils used for road construction, turbine platform area, cable channel, foundation backfill.

[109] Project Introductory Document (PID) page 13

			Excavation was used in levelling of the land. The project does not have any point or fugitive Emission and heating source emissions during operation other than an emergency diesel generator. Moreover, no mitigation measure is required for noise pollution due to related justification. Moreover, to prevent the release of any sulphurous compound from the digestors a desulphurization unit has been installed. This unit both provides clean biogas to prevent any clogging or damage. The effective working conditions will be checked regularly to ensure that desulphurisation unit is

			working to prevent equipment damage and undesired sulphurous compound release to the atmosphere.
Principle 9.5 Hazardous and Non-hazardous Waste			
Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	Yes	Hazardous wastes are expected such as waste oils in the operation period[110].	Handling, storage and disposal of these wastes will be done according to the Turkish regulations.
>>			
Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers?	No	The project is not relevant since it is a renewable energy project.	No mitigation measure is required for this indicator.
>>			

[110] Bor Biogas Plant EIA Report, page 114

Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests? >>	No	There is no forest area in and in the close vicinity of the project area.[111] Project area is in an organized industrial zone	No mitigation measure is required for this indicator.
Principle 9.8 Food			
Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives? >>	No	The project is not relevant since it is a renewable energy project.	No mitigation measure is required for this indicator.
Principle 9.9 Animal husbandry			
Will the Project involve animal husbandry? >>	No	The project is not relevant since it is a renewable energy project.	No mitigation measure is required for this indicator.
Principle 9.10 High Conservation Value Areas and Critical Habitats			
Does the Project physically affect or alter largely intact or	No	No endemic, endangered and or threatened flora and fauna	No mitigation measure is required for this indicator.

[111] Bor Biogas Plant EIA Report, page 5, 125, 131

High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?		species were identified in the project site and its vicinity. [112]	
>>			
Principle 9.11 Endangered Species			
a. Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)? b. Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	No	No endemic, endangered and or threatened flora and fauna species were identified in the project site and its vicinity. [113]	No mitigation measure is required for this indicator.
>>			

[112] Bor Biogas Plant EIA Report, page 5, 125, 131
[113] Bor Biogas Plant EIA Report, page 5, 125, 131

APPENDIX 2- CONTACT INFORMATION OF PROJECT PARTICIPANTS

Organization name	Flaş Bor Bio Enerji Elektrik Üretim A.Ş. (Project Owner)
Registration number with relevant authority	-
Street/P.O. Box	Osmangazi Mah. Kavacık Caddesi No: 16 Sancaktepe, İstanbul
Building	Management Building.
City	İstanbul
State/Region	Sancaktepe
Postcode	16700
Country	TURKEY
Telephone	+90 533 704 75 49
E-mail	e.teke@flashenergy.com
Website	http://www.flasenergy.com/
Contact person	-
Title	Manager
Salutation	Mr
Last name	-
Middle name	-
First name	-
Department	Management
Mobile	-
Direct tel.	+90 216 573 45 41
Personal e-mail	e.teke@flashenergy.com

Organization name	GTE KARBON SUSTAINABLE ENERJI EGITIM DANISMANLIK VE TICARET A.S.

Registration number with relevant authority	-
Street/P.O. Box	2118. Cadde No:4
Building	Maidan C Blok 42
City	Ankara
State/Region	N/A
Postcode	06510
Country	Turkey
Telephone	+90 312 514 63 63
E-mail	gte@gte.com.tr
Website	www.gte.com.tr
Contact person	M. Kemal Demirkol
Title	Director
Salutation	Mr
Last name	Demirkol
Middle name	Kemal
First name	Mehmet
Department	Management
Mobile	-
Direct tel.	+90 312 514 63 63
Personal e-mail	kemal@gte.com.tr

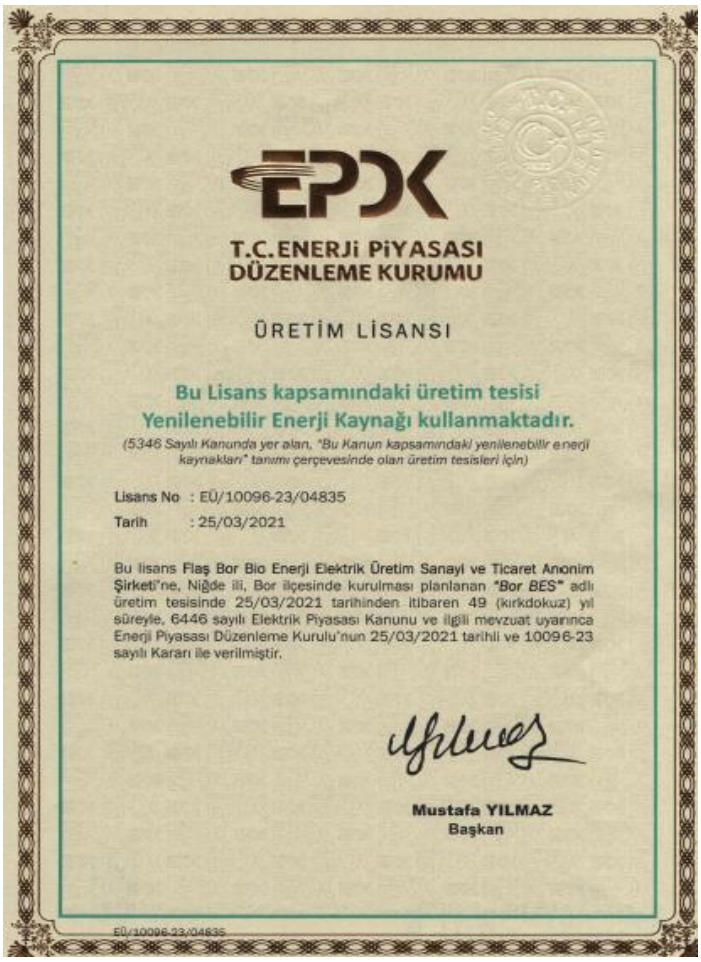
APPENDIX 3- LUF ADDITIONAL INFORMATION

N/A

APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

N/A

APPENDIX 5-GENERATION LICENSE



EPDK

T.C. ENERJİ PİYASASI DÜZENLEME KURUMU

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır.

(5346 Sayılı Kanunda yer alan, "Bu Kanun kapsamındaki yenilenebilir enerji kaynakları" tanımı çerçevesinde olan üretim tesisleri için)

Lisans No : EÜ/10096-23/04835

Tarih : 25/03/2021

Bu lisans Flaş Bor Bio Enerji Elektrik Üretim Sanayi ve Ticaret Anonim Şirketi'ne, Niğde ili, Bor ilçesinde kurulması planlanan "Bor BES" adlı üretim tesisinde 25/03/2021 tarihinden itibaren 49 (kırkdokuz) yıl süreyle, 6446 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 25/03/2021 tarihli ve 10096-23 sayılı Kararı ile verilmiştir.

Mustafa YILMAZ
Başkan

EÜ/10096-23/04835

ÖZEL HÜKÜMLER

Bu lisans **Flaş Bor Bio Enerji Elektrik Üretim Sanayi ve Ticaret Anonim Şirketi**'ne aşağıda bilgileri verilen üretim tesisi için aşağıda belirtilen koşullarda verilmiştir.

1- Üretim tesisine ilişkin bilgiler

Proje/Tesis Adı	: Bor BES
İli	: Niğde
İlçesi	: Bor
Mevkii	: -
Tesis tipi	: Yenilenebilir enerji
Ünite sayısı	: 3 adet
Ünite kurulu güçleri	: (1,568+1,955+1,956) MWm / (1,526+1,904+1,905) MWe
Tesis toplam kurulu gücü	: 5,479 MWm / 5,335 MWe
Yakıt türü veya türleri	: Biyokütle (hayvansal atık - biyometanizasyon)
Yıllık elektrik enerjisi üretim miktarı	: 40.012,500 (kırkmilyononikibinbeşyüz) kWh
Sisteme bağlantı noktası ve gerilim seviyeleri	: Karatepe DM üzerinden Bor TM'nin OG barası
Tesis tamamlanma tarihi	: 25/03/2023

2- Bildirim adresi: Osmangazi Mah. Kavacık Cad. No:16 Sancaktepe/İSTANBUL

3- Lisansın yürürlüğe girmesi ve süresi

Bu lisans, 25/03/2021 tarihinde yürürlüğe girer ve lisans sahibinin bu lisans kapsamındaki hak ve yükümlülükleri, lisansın yürürlük tarihinden itibaren geçerlilik kazanır. Bu lisans, yürürlük tarihinden itibaren 49 (kırkdokuz) yıl için geçerlidir.

4- Tesis yerine ait pafta adı/adları ile santral sahası köşe koordinatları ve/veya ünite koordinatları
Tesis yerine ait pafta adı/adları ile santral sahası köşe koordinatları ve/veya ünite koordinatları

1/25.000 lik pafta adı: Karaman-M32-b3

Üretim Tesisi Sahası Köşe Koordinatları:

Nokta No	E	N
1	625692.80	4193032.70
2	625910.68	4193064.14
3	625996.90	4193076.58
4	626000.47	4192940.48
5	626006.66	4192655.40
6	625702.11	4192603.77

Sıra No	Tadilin	
	Kapsamı	Tarihi ve Sayısı

EÜ/10096-23/04835 1/2

Revision History

Version	Date	Remarks
1.2	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Inclusion criteria table added Gender sensitive requirements added Prior consideration (1 yr rule) and Ongoing Financial Need added Safeguard Principles Assessment as annex and a new section to include applicable safeguards for clarity Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on Stakeholder Consultation information required Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.1	24 August 2017	Updated to include section A.8 on 'gender sensitive' requirements
1.0	10 July 2017	Initial adoption