

TEMPLATE

1.1 | Monitoring Report

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

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

This document contains the following Sections

Key Project Information

0 - Description of project

0 - Implementation of project

0 - Description of monitoring system applied by the project

0 - Data and parameters

0 - Calculation of SDG Impacts

0 - Safeguards Reporting

0 - Stakeholder inputs and legal disputes

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS4238
Title of the project (s) covered by monitoring report	"Methane Gas Capture and Electricity Production at Kubratovo Wastewater Treatment Plant, Sofia, Bulgaria"
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	PDD ver.06 dated 23/06/2021
Version number of the monitoring report	04
Completion date of the monitoring report	28/12/2023
Date of project design certification	03/08/2021
Date of Last Annual Report	26/02/2022
Monitoring period number	1 st for CP2
Duration of this monitoring period	01/04/2021-31/03/2023
Project Representative	Sofiyska voda AD (Project owner)
Host Country	Bulgaria
Activity Requirements applied	☒ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	AMS-III.H/Version 19: Methane recovery in wastewater treatment,dated14 Jun 2019; AMS-I.F/Version 3.0 " Renewable electricity generation for captive use and mini-grid ",dated 24 Nov 2014; AMS-I.C./Version 21: Thermal energy production with or without electricity, dated 14 June 2019;
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
13 Climate action	13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	132,485	tCO _{2e}
6 Clean water and sanitation	6.3.1 Impact on natural water patterns and flow	Outlet water COD:19.25 BOD ₅ :9.83	mgO ₂ /l mgO ₂ /l
11 Sustainable cities and communities	11.6: Release of pollutants	NOx Unit 1 - 306 mg/Nm ³ Unit 2 - 375 mg/Nm ³ Unit 3 - 326 mg/Nm ³	mg/Nm ³ mg/Nm ³ mg/Nm ³

Table 2 – Product Vintages

		Amount Achieved		
Start Dates	End Dates	VERs	Quality of outlet water	NOx gasses content in flue gas
01/04/2021	31/12/2021	51,694	COD:22.11 mgO ₂ /l BOD ₅ :10.17 mgO ₂ /l	Unit 1 - 306 mg/Nm ³ Unit 2 - 375 mg/Nm ³ Unit 3 - 326 mg/Nm ³
01/01/2022	31/12/2022	61,652	COD:27.26 mgO ₂ /l BOD ₅ :10.49 mgO ₂ /l	Unit 1 - 306 mg/Nm ³ Unit 2 - 375 mg/Nm ³ Unit 3 - 326 mg/Nm ³
01/01/2023	31/03/2023	19,149	COD:19.25 mgO ₂ /l BOD ₅ :9.83 mgO ₂ /l	Unit 1 - 306 mg/Nm ³ Unit 2 - 375 mg/Nm ³ Unit 3 - 326 mg/Nm ³

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

The project is both a methane emissions reduction and energy production project.

Methane produced in Kubratovo wastewater treatment plant is captured in common methane tanks serving as a buffer and then supplied to the newly installed CHP gas engines for electricity and heat production, which in turn will substitute both the plant's electricity purchases from the grid and diesel fuel usage. Excess electricity is supplied to the grid.

The main purpose of the project is to transform the existing low tech sludge treatment process at Kubratovo that existed before implementation of the project into a modern advanced treatment process matching the best sludge treatment practice available in Western Europe. This transformation has a major effect on the environment through dramatically reducing the existing methane gas emissions at the plant while also reducing the volume of sludge that needs to be transported, hence reducing GHG emissions from transportation as well (not included in GHG abatement calculations).

The overall objective of the project is to provide environmentally friendly sludge treatment process reducing methane and carbon dioxide emissions that – under a business-as-usual scenario – would have continued.

The project had been implemented in several stages:

- Erection of a new digester system consisting of 4 digesters, 7,000 m³ each, designed, supplied and erected by PASSAVANT ROEDIGER Anlagenbau (see Section A.5).

For destroying of the excess methane in case of emergency a flaring system have been implemented, consisting of 2 x DN150 flares, type ZA1-F2-0/N0 designed and manufactured by HEGWEIN GmbH, Germany.

- Erection of 3 new co-generation sets GE JMS 320 GS-B.LC with 1,063 kW electric capacity each and 1,088 kW thermal capacity, for generation of electric and thermal energy by combusting biogas from digesters;
- Implementation of CHP exhaust gasses heat recovery system in 2017.

This system has not been accounted for during the first crediting period.

The 4 digesters were commissioned at the end of 2006 and started operation on 01 January 2007 but due to some technical problems in the adjustment of the biological process the generation of biogas was interrupted in the end of June 2007 and resumed on 01 May 2008, so the first industrial quantities of biogas were registered in May, 2008.

- Erection of Digester # 5. Commissioned and started operation in the end of March, 2021.

A.2. Location of project

The project activity is situated at the site of Sofia central waste-water treatment plant near the village of Kubratovo, located some 20 km outside the centre of Sofia, the capital of Bulgaria, near the Iskar river.

The geographic coordinates of the project site are as follows:

Table 1: Geographic coordinates of the project.

Latitude	Longitude
42°45'13.25"N	23°22'11.15"E

Fig.1: Location of the project site.

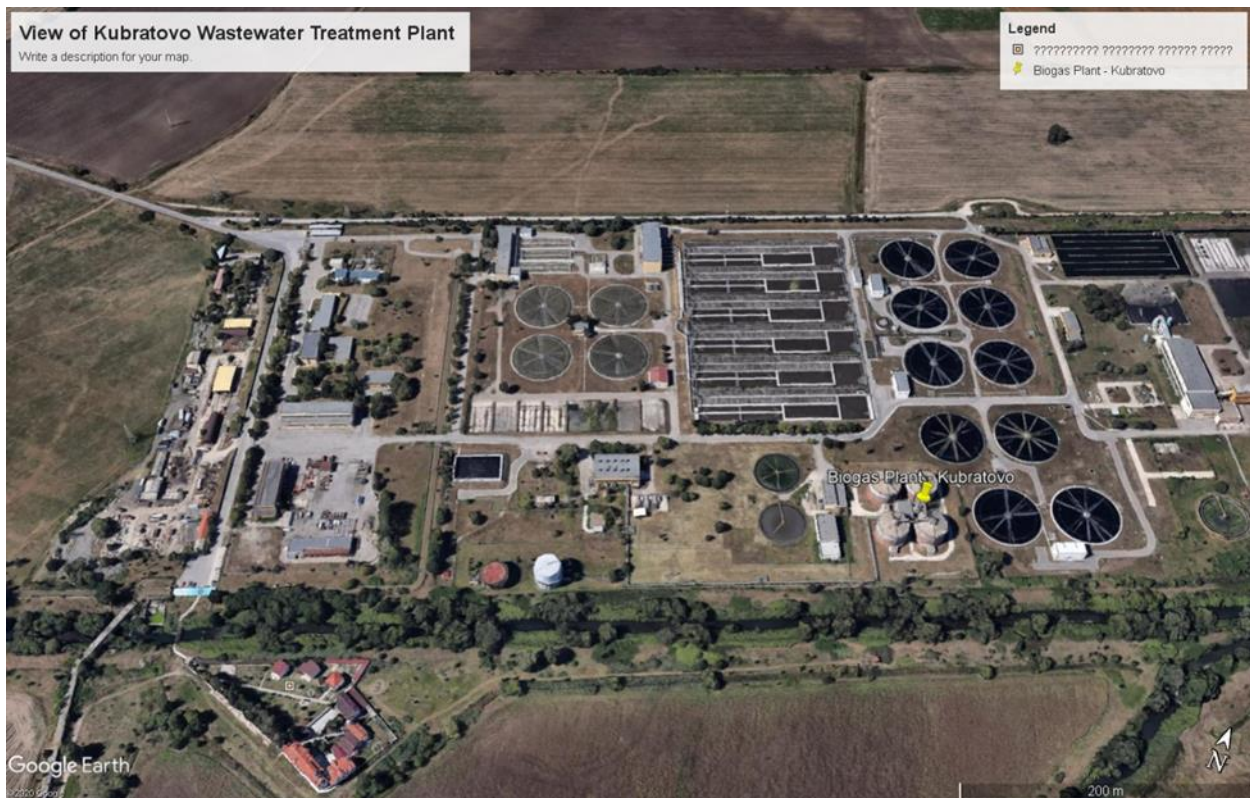


Fig.2: Location of the town of Sofia in Bulgaria



A.3. Reference of applied methodology

For determination of the baseline, the methodology AMS-III.H: Methane recovery in wastewater treatment (Version 19.0),AMS-I.C: Thermal energy production with or without electricity", {Version 21.0) and AMS-I.F: "Renewable electricity generation for captive use and mini-grid" (Version 3.0) , approved by the CDM Executive Board, are applied, using conservative options and data as presented in the following section.

The project has been approved as additional by VVB and GS.To demonstrate additionality during the initial certification in 2014, the official methodologies: "Guidelines on the Demonstration of Additionality of Small-scale Project Activities", Ver.09.0 (previously known as "Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities version 08") were used.

In addition, the following methodological tools were applied in the PDD:

- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation",Version 03;
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" Version 03.0;
- "Emissions from solid waste disposal site", Version 08.0;
- "Project emissions from flaring", Version 03.0;
- Tool to determine the remaining lifetime of equipment", Version 01;
- "Project and leakage emissions from anaerobic digesters", Version 02.0;
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", Version 03.0.1.

A.4. Crediting period of project

As per GS TAC decision from September 2014 the crediting period is a renewable 3*7 year period with a maximum of 21 years overall. The starting date of the first crediting period under JI and under a Green Investment Scheme is 1 January 2007. The baseline will get renewed retroactively 2 years prior to the date of registration of the project under Gold Standard.

The 6-week review by the Gold Standard expired on 31/03/2016 and the project is considered registered on 01/04/2016. According to the GS regulations the start date of the GS crediting period is 01/04/2014 (2 years prior GS registration).

The project was transferred to GS4GG standard after Annex 1 to the PDD has been approved on 09/03/2020.

As per the above GS TAC decision dated September 2014 the total crediting period of the project activity is 21 years for the period 01/01/2007 - 31/12/2028.

This period includes the following schemes:

01/01/2007 – 31/12/2007 – Green Investment Scheme;

01/01/2008 – 31/12/2012 – Joint Implementation Scheme;

01/04/2014 – 31/03/2021 – 1st 7-years GS crediting period;

01/04/2021 – 31/03/2028 – 2nd 7-years GS crediting period (the project was approved by GS4GG for the second crediting period on 03/08/2021).

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

The project supplies Kubratovo waste-water treatment plant with thermal and electrical energy by combusting the bio-gas generated in anaerobic reactors for treatment of waste-water sludge.

The following overall measures have been implemented by the project in order to achieve its goals:

- Digesters for anaerobic sludge treatment

The project activity aimed the erection of a new digester system consisting of 5 digesters, 7,000 m³ each, designed, supplied and erected by PASSAVANT ROEDIGER Anlagenbau.

The anaerobic sludge treatment plant stabilises the sludge anaerobically. With this procedure the organic part of the sludge is reduced which also effects a reduction on the dry solid mass of the total sludge. This process has a positive influence on the sizing of the sludge treatment units following digestion and also on the properties of sludge regarding the ability to dewater and elimination of odour nuisance. The goal of anaerobic digestion is the stabilization of the sewage sludge in order to prevent odour nuisance and improve dewatering.

After the process of digestion the sludge is dewatered and afterwards transported to the temporary pits and then transported for land use as fertiliser.

The maximal biogas generating capacity of the digesters is 1,816 Nm³/h.

Fig.3: Digesters 1 to 5





- Raw Sludge Pumping Station
As part of the project 5 new raw sludge pumps have been installed in the existing raw sludge pumping station.
- Sludge Circulation System
For heating up the raw sludge and maintaining the process temperature at mesophilic conditions (35°C), a new combined heating and sludge circulation system is provided within the basement of the new service building. 6 volute-casing pumps for dry-well

installation have been installed, whereas 4 pumps are in operation and 2 are standby for emergency cases.

Fig.4: Dewatering house



- Heat Exchanger

The anaerobic digestion process takes place under mesophilic conditions, which means within a temperature range of about 33 to 37°C. The fresh incoming raw sludge has to be heated up to the required temperature conditions. Also the heat loss of the digester has to be compensated. For this purposes a double tube heat exchanger is installed for each digester.

The mixture of raw sludge and seeding sludge is transported from the seeding mixer via the heat exchanger where the sludge is indirectly heated in the counter-current flow with hot water. The heated sludge mixture is transported via the feeding line back into the digester.

- Combined Heat and Power Plant

The CHP comprises of 3 new co-generation sets GE JMS 320 GS-B.LC with 1,063 kW electric capacity and 1,088 kW thermal capacity each, for generation of electric and thermal energy by combusting biogas from digesters. The electric energy generated is used to cover the plant's need of electricity and replaces the energy supplied from the grid in the baseline. The CHP plant is equipped with exhaust gasses heat recovery system.

The thermal energy generated by the CHP is also used for internal needs and replaces the thermal energy that would have been generated by the on-site fossil-fuelled hot water boilers.

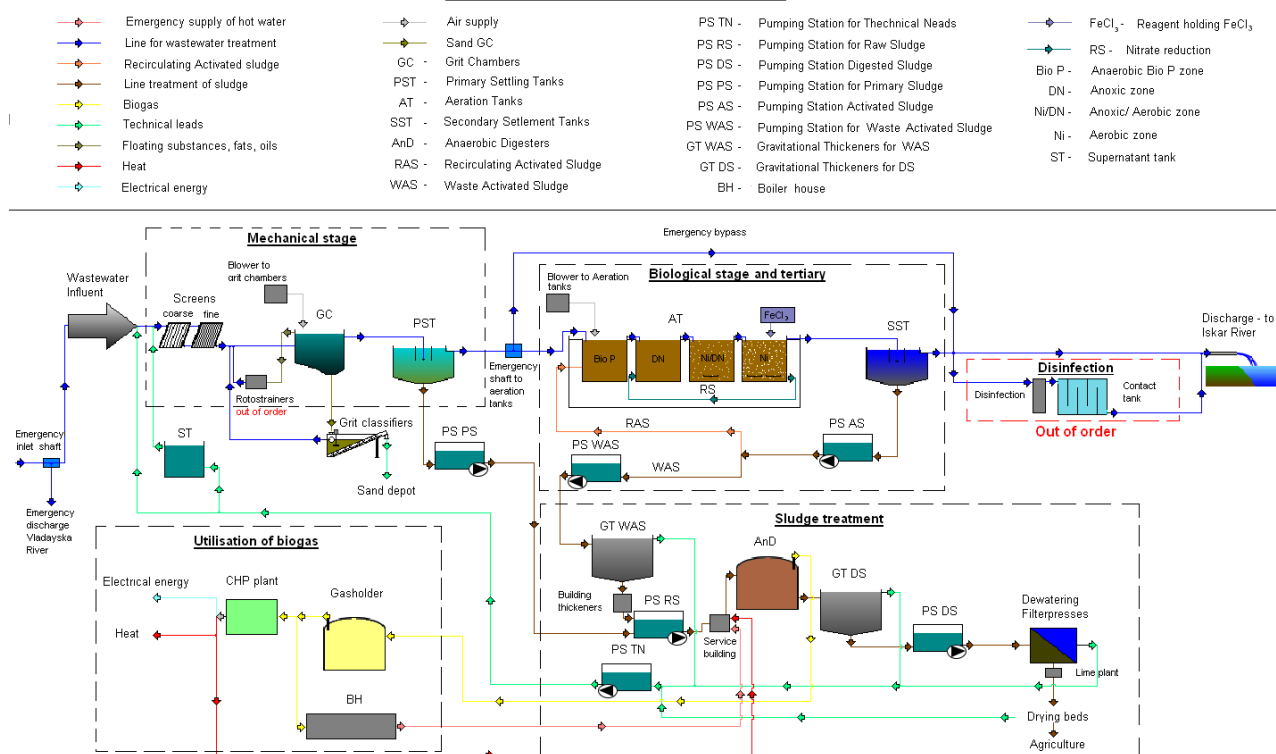
- Emergency flare system

An emergency flaring system have been implemented, consisting of 2 x DN150 flares, type Passavant-Roediger FAVAE.

The full up-to-date flow diagram of the WwTP is listed below:

Fig.5: Flow diagram

Flow diagram - WWTP Kubratovo



B.1.1 Forward Action Requests

No Forward Actions Requests have been registered in the previous Monitoring Report.

B.2. Post-Design Certification changes

B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

No deviations from the approved Monitoring & Reporting Plan and methodologies have been registered.

B.2.2. Corrections

No corrections have been made.

B.2.3. Changes to start date of crediting period

There are no changes to the start date of the crediting period.

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

No permanent changes have been registered.

B.2.5. Changes to project design of approved project

No changes to the project design have been made.

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

As an integral part of Sofiyska voda AD, Kubratovo WwTP is certified under ISO 14001:2015 ,, ISO 45001:2018 and ISO 9001:2015.

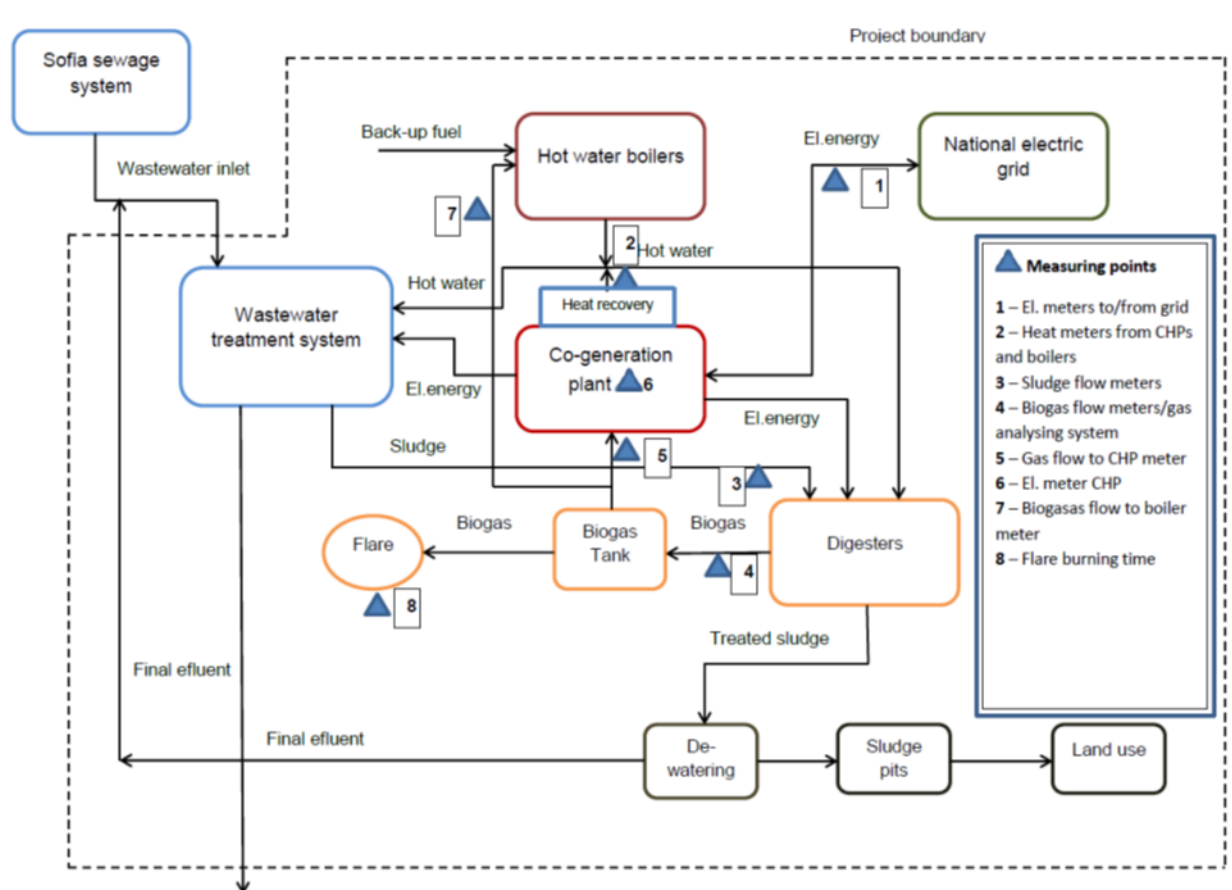
The scope of services of Sofiyska voda is:

“Management and maintenance of water supply and sewerage systems on the territory of Sofia Municipality. Water supply, sewerage and treatment of waste waters services on the territory of Sofia Municipality.”

The operator of the Waste water Treatment Plant complied with the data collection, testing and analysis, and data management obligations of this MP. The operator integrated the following data collection requirements into the company's data basis and information collection policies.

The diagram below shows the main measuring points related to the project:

Fig.6: Measuring points



1. Data on CHP plant and boilers performance:
 - Total electricity generation (MWh/yr)
 - Total net heat production (MWh/yr)

The data has been collected and processed on yearly basis

- Quantity and quality of biogas generated (m³/year)

- Quantity of CH₄ flared (kg/year)
- Quantity of sludge entering digesters (m³/y)
- Quantity of dry substance in the sludge entering digesters (t/y)

The data was collected continuously and recorded and processed monthly and yearly. The operator has the responsibility to input the required data feeds on a monthly and annual basis as required in the monitoring methodology and input data templates in the electronic workbook. The workbook was saved after each update. Back-up copies of the workbook were saved and stored on a secure system on a monthly basis to avoid loss of information.

The following measuring equipment was used for monitoring of the project activity:

TEMPLATE

Table 2: List of measuring equipment

No	Measuring equipment	Measured parameter, variable	Equipment producer and type	Serial number	Installation date	Date of latest calibration	Periodicity of calibration	Measurement error data	Comments
1	Automatic gas analyser, flow-meter system	Methane concentration in the biogas $w_{CH_4,y}$ Methane – 0-100 Vol% Oxygen – 0-25 Vol% Carbon dioxide – 0-100 Vol% H ₂ S – 0-500 ppm Absolute pressure 0-1600 mbar	Draeger, Awite AwiFlex	564_09	01 July 2009	27.11.2020 10.06.2021 19.11.2021 20.05.2022 08.11.2022	6 months	+/-1 % for Methane and Carbon Dioxide +/- 0.015 % for temperature	Analysis the content of the biogas (normalised)
2	Automatic gas analyser, flow-meter system	Biogas flow $B_{G_{burnt},y}$	FCI International LLC ST51 MASS FLOW METER	MODEL 022218-0620J1 S/N 642404	January 2018	27.11.2020 10.06.2021 19.11.2021 20.05.2022 08.11.2022	6 months	+/-2%	The flow-meter is integral part of the AWITE automatic gas analyzer, flow-meter system.
3	Digital electric meter	Electricity generated by the CHP EGgrid,y	Schneider Electric	Ser. No 600 008 706 annunciator module LSB6RGB	January 2016	New	N/A	+/- 0.5%	The electric meter is used only for internal control of the electric energy generated by the SCADA system and is not for commercial

TEMPLATE- Monitoring Report

			PM 5560						use or monitoring for the needs of this project.
4	Digital electric meter	Electricity exported to the grid EG_{grid,y}	ZMQ 202C.8; L+G	Ser. No 95591181	23/10/2020	23/10/2020	4 years according to the regulation	+/- 0.5%	The commercial electric meter is property of the electric distribution company (NEC)
5	Digital electric meter	Electricity exported to the grid EG_{grid,y}	ZMQ 202C.8; L+G	Ser. No 95591212	27/10/2020	27/10/2020	4 years according to the regulation	+/- 0.5%	The commercial electric meter is property of the electric distribution company (NEC)
6	Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X001	2006	N/A	Not required if there are no range changes	Standard Calibration +/- 0.5% of rate	Sludge flow meter for Digester 1
7	Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X003	2006	N/A	Not required if there are no range changes	Standard Calibration +/- 0.5% of rate	Sludge flow meter for Digester 2
8	Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X004	2006	N/A	Not required if there are no range changes	Standard Calibration +/- 0.5% of rate	Sludge flow meter for Digester 3
9	Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X002	2006	N/A	Not required if there are no range changes	Standart Calibration +/- 0.5% of rate	Sludge flow meter for Digester 4

TEMPLATE- Monitoring Report

10	Automatic gas analyser, flow-meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder , Combimass eco basic switch bio EEx de Messystems	S.No.C080 650	01 July 2009	N/A	Not required if there are no range changes	+/-1%	Biogas flowmeter for Digester 1 (normalised). Used for reference and control/crosschecking.
11	Automatic gas analyser, flow-meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder , Combimass eco basic switch bio EEx de Messystems	S.No.C080 647	01 July 2009	N/A	Not required if there are no range changes	+/-1%	Biogas flowmeter for Digester 2 (normalised). Used for reference and control/crosschecking.
12	Automatic gas analyser, flow-meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder , Combimass eco basic switch bio EEx de Messystems	S.No.C080 649	01 July 2009	N/A	Not required if there are no range changes	+/-1%	Biogas flowmeter for Digester 3 (normalised). Used for reference and control/crosschecking.
13	Automatic gas analyser, flow-meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder , Combimass eco basic switch bio EEx de Messystems	S.No.C080 648	01 July 2009	N/A	Not required if there are no range changes	+/-1%	Biogas flowmeter for Digester 4 (normalised). Used for reference and control/crosschecking.
14	Automatic gas analyser, flow-meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 oC BG_{burnt,y}	AWITE AwiFLEX Cool+	S.No 2764	2019	N/A	Not required if there are no range changes	+/-1%	Biogas flowmeter for Digester 5 (normalised). Used for reference and control/crosschecking
15	Automatic gas analyser, flow-meter system	Biogas flow to CHPs, Nm3/h	Binder , Combimass eco ver.2014-02	S.No.C120 564	July 2014	N/A	Not required if there are no range changes	+/- 0.25%+0.025% of max calibrated value(4245,24Nm3/h)	The flowmeter is measuring the gas used in the CHPs (normalised) For crosschecking purposes

TEMPLATE- Monitoring Report

16	Turbine gas meter	Biogas flow to boilers 50-1000m ³ /h	Common Turbine gas meter	450345/2011	09.2014	N/A	Not required if there are no range changes	0.2Q _{max} -Q _{max} <+/-1% Q _{min} -0.2Q _{max} <+/-2%	The flowmeter is measuring the gas used in the boiler. For crosschecking purposes.
17	Digital thermal energy meter	Thermal energy generated by the CHP units. EG _{thermal,y}	Kamstrup, Type 602C00070D1233	Ser.No: 69303430/2013	30.12.2013 (with factory calibration)	20.10.2020	5 years	EC± (0.5 + ΔΘ _{min} /ΔΘ) %	The heatmeter is installed at the delivery side of the CHP unit to measure the generated useful heat.
18	Digital thermal energy meter	Thermal energy generated by the CHP units. EG _{thermal,y}	Kamstrup, Type 602C00070D1233	Ser.No: 69303431/2013	30.12.2013 (with factory calibration)	21.10.2020	5 years	EC± (0.5 + ΔΘ _{min} /ΔΘ) %	The heatmeter is installed at the delivery side of the CHP unit to measure the generated useful heat.
19	Digital thermal energy meter	Thermal energy generated by the CHP units. EG _{thermal,y}	Kamstrup, Type 602C00070D1233	Ser.No: 69303432/2013	30.12.2013 (with factory calibration)	21.10.2020	5 years	EC± (0.5 + ΔΘ _{min} /ΔΘ) %	The heatmeter is installed at the delivery side of the CHP unit to measure the generated useful heat.
20	Digital thermal energy meter	Thermal energy generated by the CHPs exhaust gasses	Kamstrup 602C00070D1233	S.No 78347526	2017	10.2020	5 years	EC± (0.5 + ΔΘ _{min} /ΔΘ) %	The heatmeter is installed at the delivery side of the utiliser to measure the generated useful heat.
21	Digital thermal energy meter	Thermal energy generated by the boiler. EG _{thermal,y}	Kamstrup, Type 602C00020C1233	Ser.No: 69303436/2013	30.12.2013 (with factory calibration)	23.10.2020	5 years	EC± (0.5 + ΔΘ _{min} /ΔΘ) %	The heatmeter is installed at the delivery side of the boiler units to measure the generated useful heat.

TEMPLATE

The management and operation of the project is a responsibility of Sofiyska voda AD (the project operator). Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation, for the purpose of achieving trustworthy VERs is the key responsibility of the operator.

The project operator had the responsibility to procure and install all the necessary equipment and data acquisition systems to enable the collection and of the stipulated data at the required frequency, and to manage and present this data in the electronic workbook as part of a wider data management system that would be sufficient to meet the needs of the monitoring and the independent verifier.

The establishment of transparent, auditable systems for the collection and storage of data, including adequate record keeping and data monitoring systems was also a responsibility of the operator. The operator developed and implemented a protocol that provided for these critical functions and processes, fit for independent auditing.

For electronic and paper based data entry and record keeping system, there was clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made, so that compliance with requirements could be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, were outlined to provide for the possibility of electronic system failures and used in the event of such failure. The record keeping system provided for a paper trail that could be audited.

The operator appointed a competent manager who has been in charge of and accountable for the generation of VERs including monitoring, record keeping, computation of VERs, audits and verification. The operator officially signed off on all official paper versions of GHG emission worksheets.

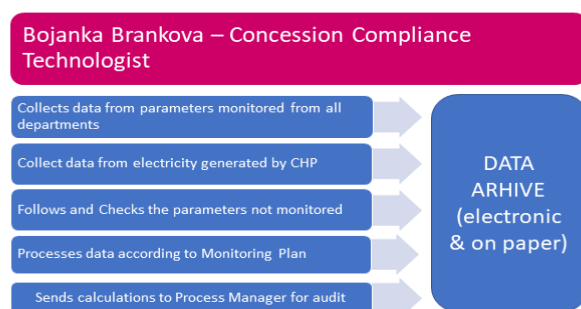
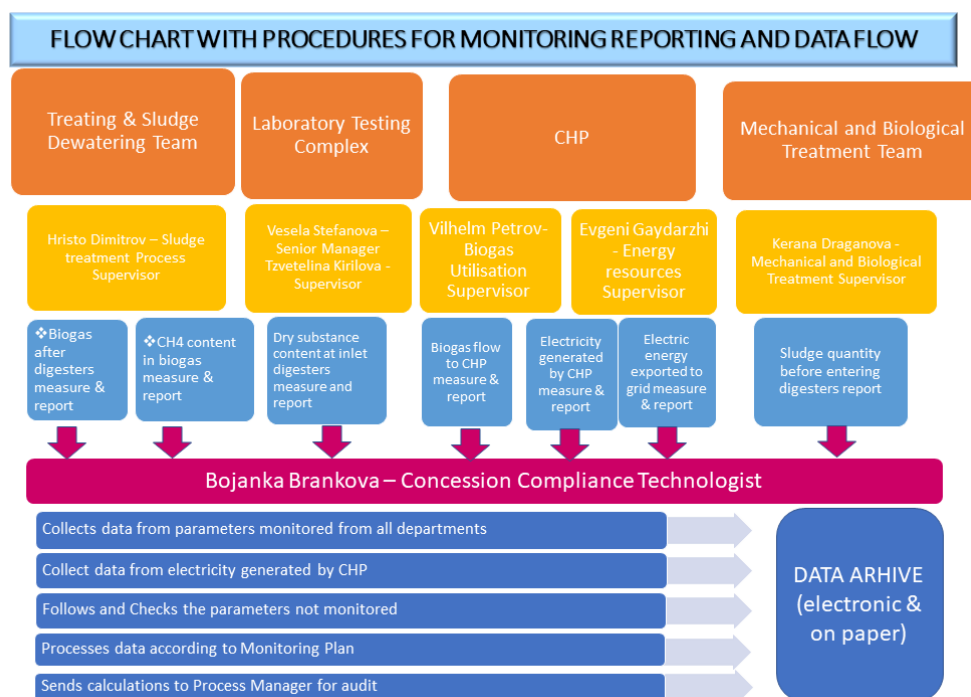
The general project management was implemented by Mr. Jelyaz Rangelov – Manager of Kubratovo WwTP through supervising and coordinating activities of his subordinates, such as head of laboratory, head of Process Management dept., head of accounting department, head of planning unit. During the daytime a group of mechanics who were responsible for maintenance of all technological and measuring equipment as well as automation tools were present on-site.

On-line information was transmitted to the Concession compliance technologist Mrs. Bojanka Brankova who calculated finally emission reductions based on that data and archived all information.

The personnel of Treating and Dewatering of the sludge process, listing 32 people and headed by the Process manager Mr. Hristo Dimitrov were authorized to take all measurements related to the generation of biogas.

The plant laboratory managed by Mrs. Vesela Stefanova and Mrs. Tzvetelina Kirilova measured the dry substance content in the sludge at inlet of anaerobic digesters. The data were transferred to the Process Management dept. for further processing.

Fig.7: Procedures and reporting responsibilities



SECTION D. DATA AND PARAMETERS

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

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 3

Data/parameter	EF _{EL,y}
----------------	--------------------

Unit	tCO _{2e} /MWh
Description	Emission factor of the national power grid of Bulgaria
Source of data	Default value
Value(s) applied	0.400
Choice of data or Measurement methods and procedures	According to "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" This project falls under the requirements of (a) Scenario A because before implementation of the project electric energy was purchased from the grid only. For the purpose of this project the emission factor of the electricity grid is defined according para.20, Option A2 (b): A value of 0.4 t CO_{2e}/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years.
Purpose of data	Calculation of baseline emissions
Additional comment	This parameter has been fixed ex-ante for the whole crediting period.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 4

Data/parameter	MCF _{s,BL,treatment}
Unit	-
Description	Methane correction factor of the disposal site that receives the treated sludge in the baseline situation,
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.4
Choice of data or Measurement methods and procedures	CDM Tool "Emissions from solid waste disposal sites", Version 08
Purpose of data	Calculation of baseline emissions

Additional comment

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 5

Data/parameter	DOC _s
Unit	
Description	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 6

Data/parameter	DOC _F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions

Additional comment

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 7

Data/parameter	F
Unit	-
Description	Fraction of CH ₄ in biogas
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 8

Data/parameter	UFB _L
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 9

Data/parameter	GWP_{CH_4}
Unit	-
Description	Global Warming Potential for methane
Source of data	IPCC
Value(s) applied	28
Choice of data or Measurement methods and procedures	Default value from 5th IPCC Assessment Report is used as per the recommendations of GS1
Purpose of data	Baseline/project emissions calculation
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 10

Data/parameter	η_{flare}
Unit	%
Description	Flare efficiency
Source of data	"Project emissions from flaring" , Version 03.0.0
Value(s) applied	0%
Choice of data or Measurement methods and procedures	Default value from "Project emissions from flaring" , Version 03.0.0. The flare efficiency for the minute m ($\eta_{flare,m}$) is 90% when the following two conditions are met to demonstrate that

¹ <https://globalgoals.goldstandard.org/applicability-of-global-warming-potential-for-gold-standard-for-the-global-goals-projects/>

	the flare is operating: (1) The temperature of the flare ($T_{EG,m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute m; and (2) The flame is detected in minute m ($F_{lame,m}$). Otherwise $\eta_{flare,m}$ is 0%.
Purpose of data	Project emissions calculation
Additional comment	The value is set as 0% for conservativeness.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 11

Data/parameter	$\eta_{BL,thermal}$
Unit	%
Description	Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 39 or 40
Source of data	AMS-I.C, version 21 – default value
Value(s) applied	100%
Choice of data or Measurement methods and procedures	Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 42 (c) of of AMS-I.C, version 21 – 100% default value
Purpose of data	Baseline emissions calculation
Additional comment	The baseline fuel is changed from light oil to natural gas.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 12

Data/parameter	EF_{FF,CO_2}
Unit	tCO_{2e}/TJ

Description	CO ₂ emission factor of the fossil fuel (Natural gas) that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used
Source of data	2006 IPCC Guidelines for national Greenhouse Gas Inventories, Volume 2.2 Stationary Combustion, Table 2.2
Value(s) applied	54.30
Choice of data or Measurement methods and procedures	Lower value at 95% confidence interval for natural gas
Purpose of data	Baseline emissions calculation
Additional comment	The old boilers used light oil (naphta) as fuel but Natural gas is considered as baseline fuel for conservativeness in the Second crediting period. Still, naphta is used as an emergency fuel due to the fact that the project site has no natural gas supply option.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 13

Data/parameter	$NCV_{i,y}$
Unit	GJ/t
Description	Net calorific value of the light oil used for emergency cases in year y
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	46.50
Choice of data or Measurement methods and procedures	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of data	Project emissions calculation
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 14

Data/parameter	$EF_{CO_2,i,y}$
Unit	tCO _{2e} /GJ
Description	CO ₂ emission factor of the light oil (naphta) used for emergency cases in year y
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	76.30
Choice of data or Measurement methods and procedures	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of data	Project emissions calculation
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 15

Data/parameter	$PE_{fugitive,s,y}$
Unit	Nm ³ leaked/Nm ³ produced
Description	Portion of methane leaked from the system
Source of data	AMS-III.H, paragraph 40(b)
Value(s) applied	0.05
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Project emissions calculation
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 16

Data/parameter	D_{CH_4}
Unit	t/m ³
Description	Density of methane
Source of data	CDM ACM 0010 (v8.0), p.30
Value(s) applied	0.000670
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Project emissions calculation including emissions from incomplete flaring.
Additional comment	

D.2 Data and parameters monitored

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 17

Data / Parameter	$S_{final,PJ,y}$
Unit	t
Description	Amount of dry matter in the sludge in the year y
Source of data	Plant records. See Attachment 1, column 7.
Value(s) applied	2021 – 28,339.50 2022 - 33,855.52 2023 – 10,334.63
Measurement methods and procedures	Calculated. Sample taken by laboratory every hour.
Monitoring frequency	Measured hourly. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and

	operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Calculation of baseline emissions
Additional comment	The quantity of sludge delivered to the digesters is equal to the quantity of sludge delivered for dewatering in the baseline. The Procedure for determining the content and amount of dry matter ($S_{final,PJ,y}$), on entry Methane tanks is the following: The dry matter at the Methane tanks inlet is determined by using the volumes of the sludge entering for anaerobic stabilization in m^3, and respectively in tons, measured by flow meters, as well as the dry matter in %, determined analytically in the Laboratory test complex, according to the following formula: Dry matter (t) = Q sludge (m^3) x Dry matter (%)(100-Moisture)(%). The analytical content and amount of Dry matter in % is determined according to the BDS EN 12880 standard as moisture content and dry matter.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 18

Data / Parameter	$EG_{thermal,y}$
Unit	TJ
Description	The net quantity of heat supplied by the project activity in the year y
Source of data	Plant records. See Attachment 1, column 2.
Value(s) applied	2021 – 72.95 2022 - 91.79 2023 – 28.84
Measurement methods and procedures	Measured by digital thermal energy meters

Monitoring frequency	Measured continuously. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Calculation of baseline emissions
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 19

Data / Parameter	$EG_{grid,y}$
Unit	MWh
Description	Electricity generated by the CHP in the year y
Source of data	Plant records. See Attachment 1, column 3.
Value(s) applied	2021 – 17,801.21 2022 – 22,506.46 2023 – 6,542.33
Measurement methods and procedures	Measured by digital electric energy meters
Monitoring frequency	Measured continuously. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are

	included.
Purpose of data	Calculation of baseline emissions
Additional comment	In case records are missing due to meters failure or replacement the electricity consumption for that period and that part of the installation will be estimated by multiplying the installed capacity of the electric motors and devices involved times the working hours of the installation as per plant's records.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 20

Data / Parameter	BG _{burnt,y}
Unit	Nm ³
Description	Quantity of biogas generated by the anaerobic digesters in the year y
Source of data	Plant records. See Attachment 1, column 4.
Value(s) applied	2021 - 8,180,966.42 2022 - 10,355,824.00 2023 - 3,059,666.00
Measurement methods and procedures	Measured by digital combined flowmeters
Monitoring frequency	Measured continuously. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation including emissions from incomplete flaring

Additional comment	The analyser takes into consideration the pressure and temperature of the biogas. The final result is normalized.
--------------------	---

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 21

Data / Parameter	CH ₄ ,burnt,y
Unit	m ³
Description	Quantity of methane generated by the anaerobic digesters in the year y
Source of data	Plant records. See Attachment 1, column 9.
Value(s) applied	2021 - 5,392,745.48 2022 - 6,420,610.88 2023 - 1,906,904.54
Measurement methods and procedures	Calculated based on the quantity of bio-gas generated and specific content of methane in the bio-gas WCH ₄
Monitoring frequency	Measured continuously. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation including emissions from incomplete flaring
Additional comment	The analyser takes into consideration the pressure and temperature of the biogas. The final result is normalized.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 22

Data / Parameter	CH _{4,burnt,y}
Unit	t
Description	Quantity of methane generated by the anaerobic digesters in the year y
Source of data	Plant records. See Attachment 1, column 10.
Value(s) applied	2021 - 3,613.14 2022 - 4,301.81 2023 - 1,277.63
Measurement methods and procedures	Calculated based on the quantity of bio-gas generated, specific content of methane in the bio-gas WCH ₄ and density of methane.
Monitoring frequency	Measured continuously. Recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation including emissions from incomplete flaring
Additional comment	The analyser takes into consideration the pressure and temperature of the biogas. The final result is normalized.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 23

Data / Parameter	Q_DG _{s_inlet,y}
Unit	m ³
Description	Quantity of sludge entering the anaerobic digesters in the year y

Source of data	Plant records. See Attachment 1, column 5.
Value(s) applied	2021 - 567,800.00 2022 - 744,630.00 2023 - 177,900.00
Measurement methods and procedures	Measured by digital flowmeters
Monitoring frequency	Measured continuously. Results are integrated hourly, recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Baseline emissions calculation.
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 24

Data / Parameter	ρ_{sludge}
Unit	t/m ³
Description	Dry substance content in the sludge
Source of data	Plant records. See Attachment 1, column 6.
Value(s) applied	2021 - 0.04991 2022 - 0.04547 2023 - 0.05809
Measurement methods and procedures	The tests are made by an accredited laboratory on-site the plant.

Monitoring frequency	Samples taken by laboratory
QA/QC procedures	Laboratory samples taken every hour. Results are recorded hourly, monthly and yearly
Purpose of data	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Additional comment	Baselines emissions calculation.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 25

Data / Parameter	$W_{CH_4,y}$
Unit	%
Description	Methane content in biogas in the year y
Source of data	Plant records. See Attachment 1, column 8.
Value(s) applied	2021 – 65.92 2022 - 62.00 2023 – 62.32
Measurement methods and procedures	Measured by digital combined gas-meters AWITE
Monitoring frequency	Measured continuously. Aggregated hourly and recorded monthly and yearly.
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical

	description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation including emissions from incomplete flaring
Additional comment	The analyser takes into consideration the pressure and temperature of the biogas. The final result is normalized.

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 26

Data / Parameter	FC _y
Unit	t
Description	Quantity of fossil fuel (naphta) used for emergency needs in the year y.
Source of data	Plant records. See Attachment 1, column 11.
Value(s) applied	2021 - 0 2022 - 0 2023 - 0
Measurement methods and procedures	The yearly quantity is calculated using accounting documents for the purchased quantity of fuel during the reported period the initial and the residual content of the reservoirs.
Monitoring frequency	yearly
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation

Additional comment

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 27

Data / Parameter	$V_{t,db}$
Unit	m^3CH_4
Description	Volumetric flow of the gaseous stream
Source of data	Plant records. See Attachment 1, column 13.
Value(s) applied	2021 - 75,095.96 2022 - 136,741.00 2023 - 21,977.50
Measurement methods and procedures	Calculated based on the measured content of methane in the biogas $wCH_{4,y}$, the time flares have been in operation and the maximal capacity of the flares.
Monitoring frequency	Measured every minute, Integrated hourly, recorded hourly and monthly
QA/QC procedures	The activities outlined here are undertaken under the ISO 45001:2018 and the internal quality procedures implemented. This will ensure that all management and operational systems will meet the requirements of external auditors. QA/QC internal procedures are implemented in the plant and all measurement processes, as device technical description and documentation, position, calibration, training, temporally replacing procedures etc. are included.
Purpose of data	Project emissions calculation.
Additional comment	

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 28

Data / Parameter	$F_{CH_4,y}$
------------------	--------------

Unit	KgCH ₄
Description	Mass flow of methane in the residual biogas flared in the year y
Source of data	Plant's records. See Attachment 1, column 15.
Value(s) applied	2021 - 50,314.29 2022 - 91,616.47 2023 - 14,724.93
Measurement methods and procedures	The quantity and quality of biogas is measured continuously and normalized. The mass flow is calculated based on above measurements.
Monitoring frequency	Continuously, calculated for every minute interval
QA/QC procedures	The procedure is integrated in the ISO 9001:2015 system implemented by the plant. The meters are checked and calibrated every year.
Purpose of data	Ex-post project emissions calculation.
Additional comment	

SDG 13: Climate action

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Table 29

Data / Parameter	ER
Unit	tCO _{2e}
Description	GHG emission reductions
Source of data	Monitoring report No 1., 2 nd CP
Value(s) applied	2021 – 51,694(01.04.2021 to 31.12.2021) 2022 – 61,642 (01.01.2022 to 31.12.2022) 2023 – 19,149 (01.01.2023 to 31.03.2023)
Measurement methods and	Calculated as per equation (14)

procedures	
Monitoring frequency	Yearly
QA/QC procedures	The procedure is integrated in the ISO 9001:2015 system implemented by the plant. The meters are checked and calibrated every year.
Purpose of data	Estimation of the GHG emission reductions from the project
Additional comment	

SDG 11 Sustainable cities and communities

11.6: Release of pollutants

Table 30

Data / Parameter	<i>Emissions of NOx in the stack flue gas.</i>
Unit	mg/Nm ³ ;
Description	Emissions in the air by the project activities.
Source of data	Plant records, 3 rd party protocols
Value(s) applied	2022 NOx gasses Unit 1 -306+/-23 mg/Nm ³ Unit 2 -375+/-28 mg/Nm ³ Unit 3 -326+/-24 mg/Nm ³
Measurement methods and procedures	Measured according to plant internal procedures by an independent 3rd party laboratory
Monitoring frequency	Every 2 years for exhaust gases as by local law
QA/QC procedures	As per internal procedures, ISO 14001: 2015 and ISO 45001:2018.
Purpose of data	Ex-post monitoring of dangerous emissions and pollutants

Additional comment	The project combusts biogas containing CH ₄ and no measurement of its content as well as dust content in the flue gas is required.
--------------------	---

SDG 6 Clean water and sanitation

6.3.1 Impact on natural water patterns and flow

Table 31

Data / Parameter	1.COD (Chemical Oxygen Demand) of the inlet wastewater; 1a.BOD ₅ (Biochemical Oxygen Demand for 5 days) of the inlet wastewater; 2.COD (Chemical Oxygen Demand) of the effluent water; 2a.BOD ₅ (Biochemical Oxygen Demand for 5 days) of the effluent water;
Unit	1. mgO ₂ /l 1a. mgO ₂ /l 2. mgO ₂ /l 2a. mgO ₂ /l
Description	Water quality
Source of data	Plant records.
Value(s) applied	See Table 32 below.
Measurement methods and procedures	As per VLM NoWW-17/27.05.2008 and BDS EN 1899-1:2004. Samples taken and analysed by accredited laboratory
Monitoring frequency	As per approved internal procedures – 2-3 times every month
QA/QC procedures	As per ISO 9001:2015
Purpose of data	Ex-post monitoring of the water quality
Additional comment	

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

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

Quantity of biogas burnt (BG _{burnt,y})	2021 – 8,180,966.42 m ³ (01.04.2021 – 31.12.2021) 2022 – 10,355,824.00 m ³ (01.01.2022 – 31.12.2022) 2023 – 3,059,666.00 m ³ (01.01.2023 – 31.03.2023) Annual average: 10,798,228.00 m³	Data from 4th Monitoring Report 2020-2021 (1st CP) 2020 – 3,476,600.00 m ³ (01.09.2020 – 31.12.2020) 2021 – 2,725,073.00 m ³ (01.01.2021 – 31.03.2021) Annual average: 10,631,439.43 m³
NOx gasses emitted	2022 Unit 1 -306+/-23 mg/Nm ³ Unit 2 -375+/-28 mg/Nm ³ Unit 3 -326+/-24 mg/Nm ³	Data from 4th Monitoring Report 2020-2021 (1st CP) 2020 Unit 1 -198 +/-16 mg/Nm ³ Unit 2 -221+/-18 mg/Nm ³ Unit 3 -209+/-17 mg/Nm ³
Waste water (sludge) treated-COD & BOD ₅ values at inlet/outlet of plant	See Table 32 below and file: Sofiyska_voda_VER_Calculation_2021-2023_combined.xlsx, sheet SDG6&SDG11_data Average 2021(01.04.2021 – 31.12.2021): COD inlet – 366.78 mgO ₂ /l BOD inlet – 172.08 mgO ₂ /l COD outlet – 22.11 mgO ₂ /l BOD outlet – 10.17 mgO ₂ /l Average 2022(01.01.2022 – 31.12.2022): COD inlet – 333.91 mgO ₂ /l BOD inlet – 149.33 mgO ₂ /l COD outlet – 27.26 mgO ₂ /l BOD outlet – 10.49 mgO ₂ /l Average 2023(01.01.2023 – 31.03.2023): COD inlet – 329.67 mgO ₂ /l BOD inlet – 143.33 mgO ₂ /l COD outlet – 19.25 mgO ₂ /l BOD outlet – 9.83 mgO ₂ /l	Data from 4th Monitoring Report 2020-2021 (1st CP) Average 2020(01.09.2020 – 31.12.2020): COD inlet – 386.0 mgO ₂ /l BOD inlet – 164.58 mgO ₂ /l COD outlet – 20.75 mgO ₂ /l BOD outlet – 7.10 mgO ₂ /l Average 2021(01.01.2021 – 31.03.2021): COD inlet – 183.3 mgO ₂ /l BOD inlet – 71.6 mgO ₂ /l COD outlet – 22.7 mgO ₂ /l BOD outlet – 9.4 mgO ₂ /l

As demonstrated in the table above the quantities of biogas generated during the present and the last monitoring periods are of the same range.

The air and wastewater quality parameters registered during the present and the last monitoring periods are compatible and well below the maximal values permitted by the law (see Section E.2 of the present Monitoring Report).

D.4. Implementation of sampling plan

N/A, Left blank intentionally

SECTION E. CALCULATION OF SDG IMPACTS

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

SDG 13

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

$$BE_{final,s,y} = \sum_j S_{j,BL,y} \times MCF_{s,final,BL,j} \times DOC_s \times UF_{BL} \times DOC_F \times F \times 16/12 \times GWP_{CH_4} \quad (3)$$

Where:

$S_{j,BL,y}$	Amount of dry matter in the treated sludge. The baseline wastewater treating system is not different from the project system so no correction of the monitored amount of dry matter in the treated sludge generated is required. In this case $j=final$ and $S_{final,BL,y} = S_{final, PJ,y}$
$MCF_{s,final,BL,j}$	0.4-Methane correction factor of the disposal site that receives the sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site, ver.08.0", para.6.4. This is necessary because in the baseline the sludge generated is separated, dewatered and deposited in sludge pits for long period of time (~18 months) before transported to waste desposal site.
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis). Default values of 0.5 for domestic sludge shall be used. (AMS-III.H,ver.19.0, para.30)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5); (AMS-III.H,ver.19.0, para.30)
F	Fraction of CH_4 in biogas (IPCC default of 0.5);(AMS-III.H,ver.19.0, para.30)
UF_{BL}	Model correction factor to account for model uncertainties (0.89); (AMS-III.H,ver.19.0, para.30)
GWP_{CH_4}	Global Warming Potential for methane (value of 28)
j	Index for baseline sludge treatment system. In this case $j=1$ because the treating system is only one.

The ex-post calculation of the baseline emissions from CH_4 avoidance is as follows:

$BE_{s,final,2021}$: **47,081** tCO_{2e} (for the period 01/04/2021 – 31/12/2021)

$BE_{s,final,2022}$: **56,245** tCO_{2e} (for the period 01/01/2022 – 31/12/2022)

$BE_{s,final,2023}$: **17,169** tCO_{2e} (for the period 01/01/2023 – 31/03/2023)

The baseline emissions from thermal and electricity displacement are calculated as follows:

$$BE_{grid,y} = EG_{grid,y} \times EF_{grid,y}$$

Where:

$BE_{grid,y}$ = Baseline emissions for the grid electricity displaced by the project in year y (t CO_{2e})

$EG_{grid,y}$ = Amount of grid electricity displaced by project in year y (MWh)

$EF_{grid,y}$ = Emission factor of the grid (t CO_{2e}/MWh)

And

$$BE_{thermal,CO2,y} = \left(\frac{EG_{thermal,y}}{\eta_{BL,thermal}} \right) \times EF_{FF,CO2}$$

Where:

$BE_{thermal,CO2,y}$ = Baseline emissions from thermal energy displaced by the project activity during the year y (t CO_{2e})

$EG_{thermal,y}$ = Net quantity of thermal energy supplied by the project activity during the year y (TJ)

$EF_{FF,CO2}$ = CO_{2e} emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (t CO_{2e}/TJ)

$\eta_{BL,thermal}$ = Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 39 or 40

The ex-post calculation of the baseline emissions from thermal and electricity displacement is as follows:

$BE_{grid,2021}$: **7,120** tCO_{2e} (for the period 01/04/2021 – 31/12/2021)

$BE_{grid,2022}$: **9,002** tCO_{2e} (for the period 01/01/2022 – 31/12/2022)

$BE_{grid,2023}$: **2,616** tCO_{2e} (for the period 01/01/2023 – 31/03/2023)

$BE_{thermal, CO2,2021}$: **3,961** tCO_{2e} (for the period 01/04/2019 – 31/12/2021)

$BE_{thermal, CO2,2022}$: **4,984** tCO_{2e} (for the period 01/01/2022 – 31/12/2022)

$BE_{thermal, CO2,2023}$: **1,566** tCO_{2e} (for the period 01/01/2023 – 31/03/2023)

The total baseline emissions estimated for the project are:

BE_{2021} : **58,162** tCO_{2e} (for the period 01/04/2021 – 31/12/2021)

BE₂₀₂₂: **70,231** tCO_{2e} (for the period 01/01/2022 – 31/12/2022)

BE₂₀₂₃: **21,351** tCO_{2e} (for the period 01/01/2023 – 31/03/2023)

BE₂₀₂₁₋₂₃: **149,744** tCO_{2e} (for the period 01/04/2021 – 31/03/2023)

The calculation of the baseline emissions is presented in details in the excel file named "Sofiyska_voda_VER_Calculation_2021-2023_ver.04.xlsm" which is attached to this Monitoring report.

SDG 6

Quality of waste water.

1. COD (Chemical Oxygen Demand) of the inlet wastewater;
- 1a.BOD₅ (Biochemical Oxygen Demand for 5 days) of the inlet wastewater;
2. COD (Chemical Oxygen Demand) of the effluent water;
- 2a.BOD₅ (Biochemical Oxygen Demand for 5 days) of the effluent water;

The parameter did not exist prior the project implementation.

SDG 11

Emissions of NO_x gasses in the stack flue gas.

The parameter did not exist prior the project implementation.

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

SDG 13

The project emissions are determined as per the formula:

$$PE_y = PE_{power,y} + PE_{fugitive,y} + PE_{flare}$$

Where

PE_{power,y} = Project emissions from combustion of fossil fuel (naphtha) in case of emergency;

PE_{fugitive,y} = Project emissions from leaking methane from capturing system;

PE_{flare} = Project emissions from incomplete flaring.

And

$$PE_{power,y} = PE_{FC,y} = F_{C,i,y} \times COEF_{i,y}$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where

PE_{FC,i,y} Are the CO₂ emissions from emergency fossil fuel (naphtha) combustion (tCO₂/yr);

FC	Is the quantity of naphtha combusted (mass or volume unit/yr);
COEF	Is the CO ₂ emission coefficient of naphtha (tCO ₂ /mass or volume unit)
NCV	Is the net calorific value of the emergency fuel, (GJ/mass or volume unit)
EF _{CO2}	Is the CO ₂ emission factor of emergency fuel (naphtha), (tCO ₂ /GJ)

For the monitored period there was no use of emergency fuel, hence

$$PE_{\text{power}} = 0$$

PE_{fugitive} are calculated as follows:

The fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y will be determined as per paragraph 42 (b) of AMS-III.H: a default value of 0.05 m³ biogas leaked/m³ biogas produced will be used as an alternative.

$$PE_{\text{fugitive},2021} : \mathbf{5,059} \text{ tCO}_{2e} \text{ (for the period 01/01/2021 – 31/03/2021)}$$

$$PE_{\text{fugitive},2022} : \mathbf{6,023} \text{ tCO}_{2e} \text{ (for the period 01/01/2022 – 31/12/2022)}$$

$$PE_{\text{fugitive},2023} : \mathbf{1,789} \text{ tCO}_{2e} \text{ (for the period 01/01/2023 – 31/03/2023)}$$

PE_{flare} are determined as follows:

$$F_{\text{CH}_4,t} = V_{t,\text{db}} * V_{\text{CH}_4,t,\text{db}} * \rho_{\text{CH}_4,t}$$

which is equivalent to

$$F_{\text{CH}_4,t} = V_{t,\text{db}} * w_{\text{CH}_4,y} * D_{\text{CH}_4}$$

Where:

$F_{\text{CH}_4,t}$ Mass flow of the methane in the gaseous stream in time interval t (kg CH₄/h)

$V_{t,\text{db}}$ Volumetric flow of the gaseous stream in time interval t on a dry basis (m³ CH₄/h)

$V_{\text{CH}_4,t,\text{db}} = W_{\text{CH}_4}$ Volumetric fraction of methane in the gaseous stream in a time interval t on a dry basis (m³ CH₄/m³ dry gas)

$\rho_{\text{CH}_4,t} = D_{\text{CH}_4} = 0.670$ Density of CH₄ in the gaseous stream in time interval t (kg CH₄/m³ CH₄)

$$\eta_{\text{flare}} = 0.0\%$$

and

$$PE_{\text{flare}} = F_{\text{CH}_4,t} * GWP_{\text{CH}_4} * ((100 - \eta_{\text{flare}})/100)$$

$$PE_{\text{flare},2021} : \mathbf{1,409} \text{ tCO}_{2e} \text{ (for the period 01/04/2021 – 31/12/2021)}$$

$$PE_{\text{flare},2022} : \mathbf{2,566} \text{ tCO}_{2e} \text{ (for the period 01/01/2022 – 31/12/2022)}$$

$$PE_{\text{flare},2023} : \mathbf{413} \text{ tCO}_{2e} \text{ (for the period 01/01/2023 – 31/03/2023)}$$

The project emissions during the monitored period are as follows:

PE₂₀₂₁: **6,468** tCO_{2e} (for the period 01/04/2021 – 31/12/2021)
PE₂₀₂₂: **8,589** tCO_{2e} (for the period 01/01/2022 – 31/12/2022)
PE₂₀₂₃: **2,202** tCO_{2e} (for the period 01/01/2023 – 31/03/2023)

PE₂₀₂₁₋₂₃: **17,259** tCO_{2e} (for the period 01/04/2021 – 31/03/2023)

The calculation of the project emissions is presented in the excel file named "Sofiyska_voda_VER_Calculation_2021-2023_ver.04.xlsm" which is attached to this Monitoring report.

Calculation of leakage:

No leakage emissions are generated by the project.

SDG 11

Air pollutants:

Last available data from measurements are documented in Protocols NoNo 102,103 & 104 dated 17/11/2022 0 issued by Ecological test laboratory "LABLAND" at "LABEXPERT" Ltd., and are as follows:

2022

1. Engine 1; No 59115371
NO_x – 306 +/-23 mg/Nm³
2. Engine 2; No 59115391
NO_x – 375 +/-28 mg/Nm³
3. Engine 3; No 59115381
NO_x – 326 +/-24 mg/Nm³

Acceptable values by the law:

NO_x - 500 mg/Nm³

As demonstrated by the protocols the content of NO_x gases in the stack flue gas of the co-generator units is in the permitted range according to the relevant Regulation No1 of 27.06.2005 for gaseous fuels.

In order to keep values inside permitted limits the operating personnel is paying higher attention to the operating regime of the gas engines in order to provide optimal conditions for the combustion of the biogas. In order to reduce emissions the operating team cleans at a regular base the oxidizing catalyst and adjusts the combusting process to reach optimal performance of the process.

The project combusts biogas containing CH₄ and no measurement of its content as well as dust content in the flue gas is required.

The data is measured on 2 years as by local law and per internal procedures, ISO 14001: 2015 and ISO 45001:2018.

SDG 6

The values recorded monthly for 2021-2023 (01/04/2021 – 31/03/2023) are given in the table below:

Table 32: Waste water quality

Date	Waste water inlet				Waste water outlet			
	COD	Deviation	BOD ₅	Deviation	COD	Deviation	BOD ₅	Deviation
	mgO ₂ /l	+/-	mgO ₂ /l	+/-	mgO ₂ /l	+/-	mgO ₂ /l	+/-
22/04/2021	256.00	26.00	133.70	26.60	19.00	3.30	11.80	2.40
05/05/2021	333.00	34.00	158.90	32.10	21.00	3.50	10.10	2.00
16/06/2021	233.00	24.00	139.80	27.20	19.00	3.20	8.40	1.70
08/07/2021	368.00	35.00	143.60	28.50	22.00	2.00	9.40	1.90
05/08/2021	368.00	35.00	173.00	34.90	18.00	2.00	6.50	1.30
28/09/2021	752.00	71.00	385.90	95.20	26.00	5.00	13.90	3.40
21/10/2021	366.00	41.00	173.40	42.80	24.00	3.30	8.80	2.20
18/11/2021	240.00	27.00	107.60	13.70	25.00	3.50	12.20	1.60
30/12/2021	385.00	43.00	132.80	21.00	25.00	3.50	10.40	1.40
Average	366.78	37.33	172.08	35.78	22.11	3.26	10.17	1.99

Date	Waste water inlet				Waste water outlet			
	COD [mgO ₂ /l]	Deviation +/-	BOD ₅ [mgO ₂ /l]	Deviation +/-	COD [mgO ₂ /l]	Deviation +/-	BOD ₅ [mgO ₂ /l]	Deviation +/-
28/01/2022	260.00	24.70	124.90	15.90				
24/02/2022	378.00	42.00	218.50	28.20	30.00	2.90	10.30	1.30
11/02/2022	314.00	35.00	92.60	11.80	27.00	2.60	22.90	2.90
24/03/2022	432.00	48.00	183.60	23.70	79.00	15.00	21.20	2.70
10/03/2022	294.00	33.00	145.70	18.60				
19/03/2022					29.00	2.80	9.90	1.30
27/04/2022	462.00	56.00	174.70	22.50				
24/05/2022	408.00	46.00	210.10	46.20				
23/05/2022					27.00	2.60	8.30	1.80
05/05/2022	323.00	36.00	120.80	15.40	29.00	2.80	9.00	1.20
08/06/2022	285.00	35.00	123.10	27.00	22.00	3.00	6.80	1.50
25/06/2022	235.00	25.00	130.70	28.70	27.00	2.60	13.00	2.90
08/07/2022					25.30	2.70	9.00	2.00
07/07/2022	459.00	56.00	220.00	48.00				
26/07/2022	352.00	42.00	170.00	37.00	23.40	2.60	7.00	2.00
17/08/2022	362.00	44.00	180.00	40.00	32.30	7.10	8.80	1.70
09/08/2022	285.00	34.00	120.00	26.00	21.80	2.40	11.00	3.00
29/09/2022	140.00	15.00	60.00	16.00	19.70	2.60	6.00	1.00
06/09/2022					18.70	2.50	10.00	2.00
07/09/2022	282.00	33.00	140.00	31.00				

24/10/2022	352.00	42.00	170.00	37.00	27.70	3.10	7.00	2.00
25/10/2022	368.00	44.00	180.00	40.00	24.50	2.90	19.00	5.00
17/11/2022	360.00	43.00	210.00	46.00	20.20	2.60	7.00	2.00
01/11/2022	372.00	44.00			23.00	2.80	14.00	3.00
03/11/2022	314.00	37.00	170.00	37.00	22.90	2.80	7.00	2.00
20/12/2022	426.00	51.00	150.00	33.00	24.80	2.90	8.00	2.00
02/12/2022	217.00	25.00	140.00	31.00	18.20	2.50	5.00	1.00
Average	333.91	38.73	149.33	28.70	27.26	3.51	10.49	2.11

Date	Waste water inlet				Waste water outlet			
	COD	Deviation	BOD ₅	Deviation	COD	Deviation	BOD ₅	Deviation
	mgO ₂ /l	+/-	mgO ₂ /l	+/-	mgO ₂ /l	+/-	mgO ₂ /l	+/-
14/01/2023	326.00	38.00	130.00	29.00	18.10	2.50	13.00	3.00
23/01/2023	287.00	33.00	130.00	29.00	15.80	2.30	4.00	0.90
03/02/2023	341.00	40.00	160.00	35.00	18.60	2.50	11.00	3.00
17/02/2023	369.00	44.00	160.00	35.00	20.40	2.60	10.00	2.00
09/03/2023	328.00	39.00	130.00	29.00	21.50	2.70	10.00	2.00
24/03/2023	327.00	39.00	150.00	33.00	21.10	2.70	11.00	3.00
Average	326.00	38.00	130.00	29.00	18.10	2.50	13.00	3.00

The data is presented in file: Sofiyska_voda_VER_Calculation_2022.xlsx, sheet SDG6&SDG11_data, attached to this document.

Acceptable values by the standard (effluent water):

1. COD – not specified
- 1a. BOD₅ – not specified
2. COD – 125.00 mgO₂/l
- 2a. BOD₅ – 25.00 mgO₂/l

As demonstrated by the table all measured values of effluent water are lower than the values permitted by the standard.

Data is collected following plant internal procedures and as per VLM NoWW-17/27.05.2008 and BDS EN 1899-1:2004, B.4.2.

E.3. Calculation of leakage

No leakage emissions are generated by the project.

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

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
13 Climate Action	13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	149,744 tCO _{2e}	17,259 tCO _{2e}	132,485 tCO _{2e}

6 Clean water and sanitation	6.3.1 Impact on natural water patterns and flow	Water quality Effluent water COD- ≤ 125 mgO ₂ /l BOD ₅ - ≤ 25.0 mgO ₂ /l	N/A	Water quality Effluent water COD:19.25 mgO ₂ /l BOD ₅ :9.83 mgO ₂ /l
11 Sustainable cities and communities	11.6: Release of pollutants	Air quality- NOx gasses ≤ 500 mg/Nm ³	N/A	NOx Unit 1:306 mg/Nm ³ Unit 2:375 mg/Nm ³ Unit 3:326 mg/Nm ³

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

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values ² achieved during this monitoring period
13 Climate Action	VER 132,848	VER 132,485
6 Clean water and sanitation	Effluent water quality COD: ≤ 125 mgO ₂ /l BOD ₅ : ≤ 25 mgO ₂ /l	Effluent water quality COD:19.25 mgO ₂ /l BOD ₅ : 9.83 mgO ₂ /l
11 Sustainable cities and communities	NOx ≤ 500 mg/Nm ³	NOx Unit 1:306 mg/Nm ³ Unit 2:375 mg/Nm ³ Unit 3:326 mg/Nm ³

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

There is almost no difference in the way and methodology the ex-ante and the ex-post values monitored, estimated and calculated.

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

SDG 13: The quantity of VERs generated in this monitoring period is actually the same as estimated in the PDD.

SDG 6: The value of COD and BOD₅ of the effluent water is well below the limits allowed by the law (COD: ≤ 125 mgO₂/l; BOD₅: ≤ 25 mgO₂/l).

² Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

SDG 11: The values of NO_x gasses during the monitoring period are lower than maximal values allowed by the environmental law (<500 mg/Nm³).

TEMPLATE

SECTION F. SAFEGUARDS REPORTING

Table 4: Safeguarding principles

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 regards to participation and inclusion	NO	1. The Project is not in conflict with the general economic life in Bulgaria or of the local community. The Project does not cause any human rights abuse. Moreover, by providing of wastewater treatment to the capital of Bulgaria the project guarantees the right to high standard living conditions to more than 1,5 million citizens of Sofia. Bulgaria has ratified the Universal Declaration of Human Rights. Bulgaria has also ratified all	Not required

		relevant conventions on human rights, including, without limitation: - The European Convention of Human Rights, and Protocols 1 (protection of property), 4 7 and 13 - International Covenant on Civil and Political Rights; - International Covenant on Economic, Social and Cultural Rights; - Convention on the Elimination of all forms of Racial Discrimination; 2. Project activities are not expected to cause any human rights abuse. Bulgaria is a member of the European Union and of the United Nations and part of UN Agreement on Human Rights. As part of the EU Bulgaria is obliged to strictly follow all European standards regarding preservation of human rights. No action against human rights is tolerated what-so-ever.	
Principle 2. Gender Equality			
1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender	NO	1. The project respects Women's rights, including dignity, cultural property and uniqueness of indigenous people. Participation	Not required The project involves women on responsible positions. The project

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 and recommendations of an Expert Stakeholder(s)		is completely voluntary and the project respects personal freedom and liberty. The project respects internationally proclaimed human rights. Bulgaria has ratified the Convention on the Elimination of all forms of Discrimination Against Women; 2. The personnel of 32 engaged in the running of the project includes 9 women that occupy positions requiring high level of education and abilities. 3. The project takes into account the roles of women and men and their possibilities to work for the project following the requirements of the Ministry of Labour and Social Care; 4. The project has a potential to contribute to the increase of women's workload, having in mind that working for the project is a full-time job which can influence the possibility to take care for children and family. In this respect the government and local authorities are taking all possible measures to provide care for children in kindergardens and schools. 5. The project involves operation of mechanical, electrical and biological equipment which potentially can expose women	has provided 32 working positions of which 9 are occupied by women. There was a potential possibility that the project increased the load on women involved but as a member of the European Union Bulgaria has ratified all conventions on labour conditions and European laws concerning safe and suitable working conditions. Safety ragulations are strictly followed and regarded during operation of the project.
---	--	--	---

		workers to some risks and hazards in case of accidents or not following safety rules. However the company policy in that respect is very strict and involves regular trainings in safety measures and safety knowledge improvement.	
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	NO	The Project avoids community exposure to increased health risks and does not adversely affect the health of the workers and the community. The Project developer Sofiyska voda AD is certified by ISO 45001:2018 – Health and safety management ³ (reg.# 44 126 087290)	Not required
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	The Project area does not include any historical or other sites of interest. It is situated in the field outside nearby communities.	Not required
>>			

³ https://www.sofiyskavoda.bg/about/safety_and_health.aspx

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 Project is situated in the field outside nearby communities and did not require any physical or economic relocation of people.	Not required
>>			
>>			
Principle 4.3 Land Tenure and Other Rights			
Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership?	NO	The land on which the Project is situated is property of Sofia Municipality and the whole equipment based on it is issued for operation to Sofiyska Voda AD (the Project owner – part of Veolia group) under a General concession contract ⁴ amended in lastly 2018. The company is part of the French Veolia group and strictly follows European standards against corruption.	Not required
>>			
Principle 5. Corruption			
1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	NO	The Project is owned by a private entity and is certified by ISO 37001:2016 – Anti-bribery Management System with Certificate No 066 20 0002, valid	Not required

⁴ <https://www.sofiyskavoda.bg/docs.aspx?docs=7>

		until 05/07/2023.	
Principle 6.1 Labour Rights			
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 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	NO	1. Sofiyska voda, as Project Developer, has ensured 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. The company is certified by ISO 45001:2018 – Health and safety management (reg.# 44 126 087290) 2. All workers are able to establish and join labour organisations as per the Labour Code of Bulgaria. 3. Working agreements with all individual workers are documented and implemented and include: a) Working hours (do not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (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	Not required

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 appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures		f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave. All personal labour contracts follow the requirements of the Bulgarian Labour Code. 4. Children labour is not allowed in Bulgaria as per the Labour Code. Bulgaria has also ratified Convention on the Rights of the Child. 5. The Project Developer ensured the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures	
Principle 6.2 Negative Economic Consequences			

1. Does the project cause negative economic consequences during and after project implementation?	NO	No negative economic consequences during and after implementation of the project were registered. On the contrary, the project strengthened the economic status of the company and near-by communities by providing 32 additional working positions, some of them for local citizens.	Not required
Principle 7.1 Emissions			
Will the Project increase greenhouse gas emissions over the Baseline Scenario?	NO	The methane produced by the WWTP is captured in methane tanks and utilised as a fuel for energy production. This leads to the reduction of high amounts of CH ₄ (powerful greenhouse gas). In addition the production of electricity and heat from biogas replaces the use of fossil fuels thus reducing greenhouse gases such as CO ₂ .	Not required
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	The project is self-sufficient in energy terms. It produces electricity, which in the absence of the project would have been supplied from the local grid. The fuel resource (methane) could not be used by local users in the absence of the project.	Not required
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	The project does not affect the natural water pattern and flow. No depletion or contamination of local reservoirs/ aquifers occurs. Water consumed in the whole range of the project is to prepare a solution of a flocculent for compression and dewatering of the treated sludge, as well as for washing the machines and to supplement the heating system if necessary. Part of the water used is technical water. The wastewater formed in the process is returned to the entrance of the plant for processing. The plant possesses Permission for deposition of the effluent outlet water into the Iskar river No 1295/14.04.2014, issued by the Ministry of Environment and Water. The Permission defines the quantity of inlet and outlet water and the quality of the effluent water. The quality of the effluent water and heavy metals content is monitored and measured according to the plan and frequency part of the Permission. The quality of the water is monitored by the accredited laboratory part of Kubratovo Wastewater Treatment Plant.	Not required
--	-----------	---	---------------------

Principle 8.2 Erosion and/or Water Body Instability			
Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	NO	The project does not result in soil erosion, and does not contribute to soil contamination by pollutants. The deactivated sludge coming out of the digesters is dewatered, dried and used as fertilizer.	Not required
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 project does not involve the use of any land and soil for production of crops or other production. The equipment needed for the project is situated on the land of the WWTP.	Not required
Principle 9.2 Vulnerability to Natural Disaster			

Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	Potentially	The project is a municipal wastewater treatment and has no any direct relation to vulnerability to natural disaster. However in case of very heavy and long lasting rains in the area there is a potential threat of flooding the premises. That threat exists for the whole area around the capital of Sofia and is taken into account by the Municipality authorities.	Not required The potential hazard of natural disaster is regarded in general and is not specifically connected to the project and its operation.
Principle 9.3 Genetic Resources			

TEMPLATE- Monitoring Report

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)?	N/A	N/A	N/A
Principle 9.4 Release of pollutants			

Could the Project potentially result in the release of pollutants to the environment?	Potentially	The project has major positive effect on the air quality through dramatically reducing the existing methane gas emissions at the plant while also reducing the volume of sludge (to as much as 50%) that needs to be transported, hence reducing GHG emissions from transportation as well.	Not required The monitoring of potential pollutants is connected with the parameter included in the PDD and the approved Annex 1 and are connected to the regarded SDG 6 and SDG 11. All data from the monitoring are reported and stated in Section D.2 above.
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?	NO	One of the products as a result of the project is the deactivated sludge coming out of the digesters. It is dewatered, dried and used as fertilizer. The quality of the deactivated sludge is monitored and checked regularly by an accredited third party and the results are issued in a special Protocol for testing. The tests guarantee that the deactivated sludge corresponds to all requirements for use as a fertilizer and does not contaminate the soil whatsoever. The Protocols are available for inspection at the plant. The quantity of deactivated sludge shipped for use as fertilizer on the field is monitored by recording the trucks shipped and the tonnage of sludge shipped. Another waste product from the project is the waste oil used in the equipment. The collection of the waste oil is done by an authorized company certified for collection and treatment of waste oil. The waste oil is disposed according to the requirements of the Decision for Waste Treatment No 12-ДО-1204-00 dated 20.02.2013, issued by the Regional Inspection for Environment.	Not required
---	-----------	---	---------------------

Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers?	N/A	N/A	N/A
Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests?	N/A	N/A	N/A
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?	N/A	N/A	N/A
Principle 9.9 Animal husbandry			

TEMPLATE- Monitoring Report

Will the Project involve animal husbandry?	N/A	N/A	N/A
Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	NO	The project area is not physically related to any intact or High Conservation Value ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified.	Not required
Principle 9.11 Endangered Species			

TEMPLATE- Monitoring Report

Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)? AND/OR Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	NO	There are no endangered species identified in the Project area. The Wastewater treatment plant is situated on plain low category wasteland outside living areas. The effluent water is with very high quality and is safely deposited into the near-by Iskar river following all requirements of the Ministry of Environment and Water.	Not required
--	-----------	--	---------------------

TEMPLATE

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

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

No inputs/grievances have been registered during the current monitoring period

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

No inputs/grievances have been registered from the previous monitoring period that require any follow up action.

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

N/A

TEMPLATE

Attachment 1
Monitoring data

<i>Month/Year</i>	Net thermal energy by cogenerators & boilers $EG_{thermal,y}$	El. Energy produced by cogenerators $EG_{grid,y}$	Biogas generated $BG_{burnt,y}$	Quantity of sludge at inlet digesters Q_{DGs_inlet}	Specific content of dry matter in the sludge p_{sludge}	Quantity of dry matter in the sludge at inlet digesters $S_{final,PJ,y}$	CH ₄ content in the biogas $W_{CH_4,y}$	Quantity of CH ₄ in the biogas BG_{CH_4burnt}	Quantity of CH ₄ in the biogas BG_{CH_4burnt}	Quantity of emergency fuel used FC_y	Flare debit	Quantity of CH ₄ to flare $V_{t,db}$	Flare working hours	Quantity of CH ₄ in the biogas to flare F_{CH_4}
	[TJ]	[MWh]	[Nm ³]	[m ³]	[t/m ³]	[t]	[%]	[m ³]	[t]	[t]	[m ³ /h]	[m ³]	[h]	[kg]
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Apr 2021	8.62	1 961.03	886 023.00	64 100.00	0.05075	3 252.80	65.24	578 082.82	387.32	0.00	500.00	8 166.46	25.03	5 471.53
May 2021	9.19	2 174.13	930 950.00	65 400.00	0.05291	3 460.59	66.00	614 427.00	411.67	0.00	500.00	16 808.00	50.93	11 261.36
Jun 2021	8.34	1 963.26	887 566.88	62 700.00	0.04652	2 917.01	66.00	585 794.14	392.48	0.00	500.00	15 917.00	48.23	10 664.39
Jul 2021	7.29	1 911.67	886 310.65	61 600.00	0.04647	2 862.30	66.00	584 965.03	391.93	0.00	500.00	2 123.00	6.43	1 422.41
Aug 2021	6.76	1 834.00	847 616.97	63 500.00	0.04650	2 952.71	66.00	559 427.20	374.82	0.00	500.00	7 056.50	21.38	4 727.86
Sep 2021	6.78	1 838.80	851 169.92	58 900.00	0.04729	2 785.13	66.00	561 772.15	376.39	0.00	500.00	6 006.00	18.20	4 024.02
Oct 2021	8.31	1 971.86	895 300.00	62 400.00	0.04821	3 008.36	66.00	590 898.00	395.90	0.00	500.00	2 711.50	8.22	1 816.71
Nov 2021	9.25	2 178.27	1 060 946.00	63 300.00	0.04821	3 051.62	66.00	700 224.36	469.15	0.00	500.00	10 626.00	32.20	7 119.42
Dec 2021	8.41	1 968.19	935 083.00	65 900.00	0.06144	4 049.01	66.00	617 154.78	413.49	0.00	500.00	5 681.50	17.22	3 806.61

TEMPLATE- Monitoring Report

TOTAL	72.96	15 833.01	8 180 966.41	567 800.00	0.04991	28 339.50	65.92	5 392 745.47	3 613.14	0.00		75 095.96		50 314.29
--------------	--------------	------------------	---------------------	-------------------	----------------	------------------	--------------	---------------------	-----------------	-------------	--	------------------	--	------------------

Month/Year	Net thermal energy by cogenerators & boilers EGthermal,y	El. Energy produced by cogenerators EGgrid,y	Biogas generated BGburnt,y	Quantity of sludge at inlet digesters Q_DGs_inlet	Specific content of dry matter in the sludge p_{sludge}	Quantity of dry matter in the sludge at inlet digesters S_{final}, PJ,y	CH4 content in the biogas W_{CH4,y}	Quantity of CH4 in the biogas BGCH4burnt	Quantity of CH4 in the biogas BGCH4burnt	Quantity of emergency fuel used FCy	Flare debit	Quantity of CH4 to flare Vt,db	Flare working hours	Quantity of CH4 in the biogas to flare FCH4
	[TJ]	[MWh]	[Nm3]	[m3]	[t/m3]	[t]	[%]	[m3]	[t]	[t]	[m3/h]	[m3]	[h]	[kg]
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Jan 2022	8.94	2 121.75	1 007 270.00	70 900.00	0.05	3 676.58	62.00	624 507.40	418.42	0.00	1 000.00	7 822.33	12.62	5 240.96
Feb 2022	9.57	1 856.53	949 230.00	63 330.00	0.05	3 075.71	62.00	588 522.60	394.31	0.00	1 000.00	23 312.00	37.60	15 619.04
Mar 2022	8.64	2 035.45	931 040.00	67 800.00	0.04	2 900.31	62.00	577 244.80	386.75	0.00	1 000.00	4 236.67	6.83	2 838.57
Apr 2022	7.08	1 879.43	818 168.00	66 000.00	0.03990	2 633.40	62.00	507 264.16	339.87	0.00	1 000.00	6 417.00	10.35	4 299.39
May 2022	9.13	2 166.36	995 910.00	66 900.00	0.04981	3 332.49	62.00	617 464.20	413.70	0.00	1 000.00	39 091.00	63.05	26 190.97
Jun 2022	6.99	1 881.17	855 800.00	62 700.00	0.05261	3 298.89	62.00	530 596.00	355.50	0.00	1 000.00	14 311.67	23.08	9 588.82
Jul 2022	6.66	1 807.81	817 415.00	62 400.00	0.04106	2 562.42	62.00	506 797.30	339.55	0.00	1 000.00	2 015.00	3.25	1 350.05
Aug 2022	6.08	1 649.28	731 090.00	59 000.00	0.03772	2 225.69	62.00	453 275.80	303.69	0.00	1 000.00	1 033.33	1.67	692.33
Sep 2022	6.07	1 629.00	718 030.00	55 900.00	0.03551	1 985.24	62.00	445 178.60	298.27	0.00	1 000.00	12 069.33	19.47	8 086.45
Oct 2022	6.87	1 811.42	803 081.00	56 700.00	0.04119	2 335.31	62.00	497 910.22	333.60	0.00	1 000.00	165.33	0.27	110.77
Nov 2022	7.72	1 753.79	853 060.00	54 600.00	0.05028	2 745.02	62.00	528 897.20	354.36	0.00	1 000.00	21 080.00	34.00	14 123.60
Dec 2022	8.05	1 914.49	875 730.00	58 400.00	0.05282	3 084.48	62.00	542 952.60	363.78	0.00	1 000.00	5 187.33	8.37	3 475.51
TOTAL	91.79	22 506.46	10 355 824.00	744 630.00	0.04547	33 855.52	62.00	6 420 610.88	4 301.81	0.00		136 741.00		91 616.47

TEMPLATE- Monitoring Report

Month/Year	Net thermal energy by cogenerators & boilers $EG_{thermal,y}$	El. Energy produced by cogenerators $EG_{grid,y}$	Biogas generated $BG_{burnt,y}$	Quantity of sludge at inlet digesters Q_{DGs_inlet}	Specific content of dry matter in the sludge p_{sludge}	Quantity of dry matter in the sludge at inlet digesters $S_{final,PJ,y}$	CH4 content in the biogas $w_{CH4,y}$	Quantity of CH_4 in the biogas $BG_{CH4burnt}$	Quantity of CH_4 in the biogas $BG_{CH4burnt}$	Quantity of emergency fuel used FC_y	Flare debit	Quantity of CH_4 to flare $V_{t,db}$	Flare working hours	Quantity of CH_4 in the biogas to flare F_{CH4}
	[TJ]	[MWh]	[Nm3]	[m3]	[t/m3]	[t]	[%]	[m3]	[t]	[t]	[m3/h]	[m3]	[h]	[kg]
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Jan 2023	8.21	2 227.31	991 162.00	58 900.00	0.06	3 461.33	63.00	624 432.06	418.37	0.00	1 000.00	1 858.50	2.95	1 245.20
Feb 2023	9.96	2 038.33	993 630.00	56 900.00	0.05	3 107.79	62.00	616 050.60	412.75	0.00	1 000.00	12 172.67	19.63	8 155.69
Mar 2023	10.66	2 276.69	1 074 874.00	62 100.00	0.06	3 765.51	62.00	666 421.88	446.50	0.00	1 000.00	7 946.33	12.82	5 324.04
TOTAL	28.84	6 542.33	3 059 666.00	177 900.00	0.05809	10 334.63	62.32	1 906 904.54	1 277.63	0.00		21 977.50	35.40	14 724.93



Gold Standard[®]
for the Global Goals

TEMPLATE