Monitoring report form for CDM project activity
(Version 07.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Samsun Landfill Gas to Energy Project, Turkey	
UNFCCC reference number of the project activity	GS935	
Version number of the PDD applicable to this monitoring report	0.4 13/04/2012	
Version number of this monitoring report	0.8	
Completion date of this monitoring report	15/06/2020	
Monitoring period number	Third monitoring period	
Duration of this monitoring period	16/04/2016-08/02/2018 (first and last days included)	
Monitoring report number for this monitoring period	n.a.	
Project participants	Samsun Avdan Enerji Üretim ve Tic. A.Ş.	
Host Party	Turkey	
Applied methodologies and standardized baselines	Waste Handling and Disposal; Energy Industries	
Sectoral scopes	ACM0002 v.12.1, "Consolidated Baseline Methodology for Grid-Connected Electricity Generation From Renewable Sources" ACM0001 v.11, "Consolidated Baseline and Monitoring Methodology for Landfill Gas Project Activities"	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved after 1 January 2013
	-	288,074 tCO_2
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	137,035 tCO2	

SECTION A. Description of project activity

A.1. General description of project activity

The proposed activity involves the collection and utilization of the landfill gas that is generated at the Samsun landfill site, Turkey, to generate electricity with an installed capacity starting with 2.4 MW_e and reaching 4.8 MW_e throughout the initial investment . The capacity increased to 8.4 MWe on dd. 24/03/2016 on the generation licence.[1] In 2017, the province established and operated a landfill site.

The Project aims to generate electricity from landfill gas and feed it to the national electricity grid. The national electricity settlement centre manages supply of power plants such that the power generation of thermal power plant- dominated generation system is reduced at the same amount the Project activity exports power, ensuring that the emissions are decreased in practice. The Project activity effectively collects and destroys methane (a strong greenhouse gas) for power generation or by flaring, further diminishing the greenhouse gas effect caused by the landfill site.

The anaerobic fermentation of the municipal organic waste that is stored at the landfill site results in the formation of methane gas, which is collected by a piping system that is installed by the Project activity. The Project will use the LFG from both the already dumped solid waste and the waste that will be disposed in coming years. Therefore, the piping and capacity expansion work will be carried out in parallel to waste disposal amount during the Project lifetime. The Project mainly consists of a LFG collection system, a flaring unit, electricity generation sets, switchgear station and controlling / measurement equipment. The Project uses internal combustion engines that utilize landfill gas as fuel, destroy the methane content of the gas, thereby generating electricity.

The gas collection and preliminary flaring on site has started on 09/02/2011.

Exact timing and installed power of this expansion work depends on the actual LFG generation on site, the Project design as of commissioning phases;

Phase 1: Capacity 2.4 MWe – 09/03/2012 (1st and 2nd Gas Engines (2 x 1.2 Mwe)
Phase 2: Capacity 3.6 MWe – 27/09/2013 (3th Gas Engine (1.2 Mwe)
Phase 3: Capacity 6.0 MWe – 27/09/2014 (4th and 5th Gas Engines (2x 1.2 Mwe)

Following the installation of the first and second gas engines, official power generation has started on 09/03/2012. The third, fourth and fifth engines have officially started operating respectively at dates: 27/09/2013, 27/09/2014.

[1] License upgrade – 24/03/2016

Total emission reductions achieved in this monitoring period: **288,074** tCO_2[2]

Relevant dates for the project activity: The project activity milestones are:

Date	Action
02/11/2009	Feasibility study is submitted to the project owner.
04/01/2010	First talks with the carbon consultant about carbon finance
01/06/2010	Publication of the tender by Samsun Metropolitan Municipality
18/06/2010	Tender organisation by Samsun Metropolitan Municipality
28/07/2010	Contract signature date with the Municipality
02/08/2010	Carbon development contract signature date
21/08/2010	First equipment order date
13/09/2010	Mobilization on site
24/09/2010	Energy Market Regulatory Authority (EMRA) License application
06/09/2011	First loan agreement - 9207368
18/05/2011	License awarded for 2.4 MWe
09/03/2012	Commissioning of the power plant
06/12/2012	Amendment to the municipality law 6360
04/06/2013	Capacity increase to 3.6 MWe - License upgrade
27/09/2013	Commissioning of the additional capacity (3.6 MWe)
07/05/2014	Capacity increase to 6.0 MWe - License upgrade
27/09/2014*	Commissioning of the additional capacity (6.0 MWe)
2015	Amount of waste deposited increased
24/03/2016	Capacity increase to 8.4 MWe - License upgrade
22/05/2018*	Commissioning of the additional capacity (8.4 MWe)

*On 07/05/2014 and 24/03/2016 the Generation License of the Project was amended and the permitted installed capacity was increased to 6.0 MW and then 8.4 MW. It should be noted that the the additional 2 gas engines have generated electricity from 27/09/2014. But generation of only one gas engine is taken into account until 02/05/2017 and then 6 MW capacity used within the 3rd monitoring period. Because the approved capacity is 4.8 MW for until 03/05/2017 and then 6 MW is used for this 3rd monitoring report. (The project owner has applied to GS for design change and 4W review end date is 02/05/2019) PP produce ERs from design change part maximum two years prior to GS design change 4W end date (I.e. 03/05/2017 - 02/05/2019) On the other hand,CP2 crediting period start date as 09/02/2018, also indicating that PP cannot claim the ERs during delay period, i.e. 9 Feb 2018 – 4 Sep 2019 of CP2 due to delay In submission of the renewal request. So this 3rd monitoring period is only include 16/04/2016-08/02/2018 (first and last days included)

[2] The total emission reduction value has been rounded down for conservativeness. The excel ER file has been provided to the DOE.

A.2. Location of project activity

The Samsun Landfill Gas to Energy Project is located in Blacksea Region, Samsun Province. The nearest residential neighbourhoods is Aşağı Avdan.

The geographic location: 41^0 14′ 45″ N, 36^0 13′ 16″

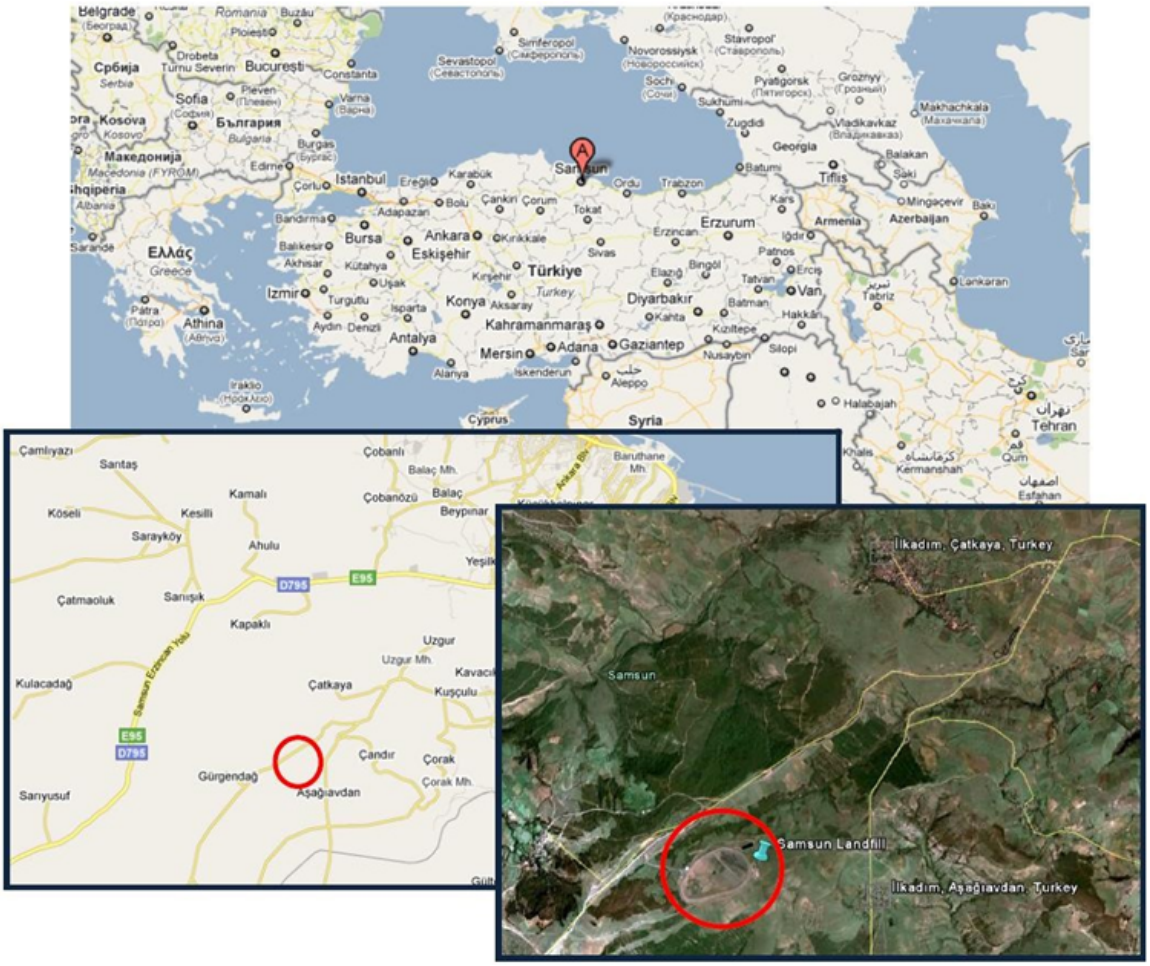


Figure 1: The project location

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey (Host country)	Samsun Avdan Enerji Üretim ve Tic. A.Ş. (private entity)	Yes

Samsun Avdan Enerji Üretim ve Tic. A.Ş. (private entity) is the project owner, shall be defined as the project participant. Contact details are given in Annex 1. Rüzgar Danışmanlık is the carbon consultant for this project.

A.4. References to applied methodologies and standardized baselines

The following tools and methodologies are used for the Project activity:

ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", v.12.1;
ACM0001, "Consolidated baseline and monitoring methodology for landfill gas project activities", v.11;

- "Tool to calculate the emission factor for an electricity system", v.01.1;
- "Tool for the demonstration and assessment of additionality", v.05.2;
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"; v.4;
- Methodological tool "Project emissions from flaring"; v.02.0.0, EB68, Annex 15.
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" v.02.0.0.

The Monitoring Report has been carried out in accordance with the UNFCCC methodologies and tools that have been used in the registered PDD. These tools and methodologies that are used are available at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

A.5. Crediting period type and duration

Type of crediting period: Renewable

Date of the first crediting period: 09/02/2011- 08/02/2018

Date of the second crediting period: 09/02/2018- 08/02/2025

Length: 7 years 0 months, this is planned to be renewed twice.

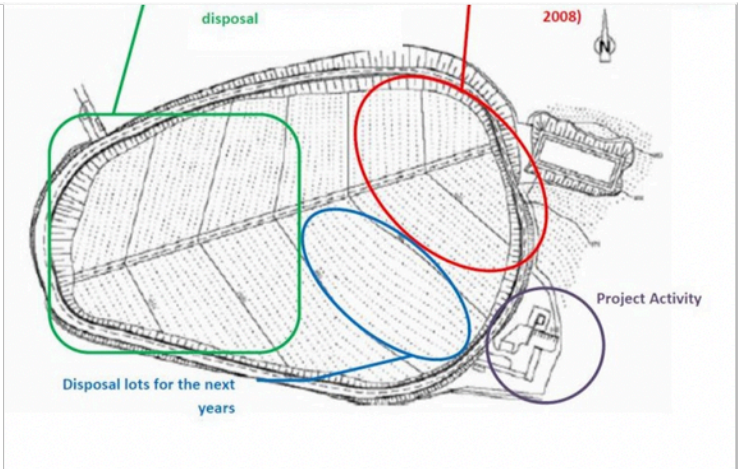
This is first crediting period.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The Project has started reducing emission with flaring of the landfill gas on 09/02/2011. After 2 gas engines are installed, the power generation officially started on 09/03/2012 and then third gas engine officially started on 27/09/2013 with a written approval of relevant authorities (Ministry of Energy and Natural Resources). It should be noted that the the additional 2 gas turbines have generated electricity from 27/09/2014. But generation of only one gas turbine is taken into account until 03/05/2017 and then 6 MW capacity used within the 3rd monitoring period. Because the approved capacity is 4.8 MW for until 03/05/2017 and then 6 MW is used for this 3rd monitoring report. The electricity generated is delivered to the national grid.

When the gas generation is low, the Project activity draws some electricity from the grid, which has to be produced partly by fossil fuel fired power plants. Although power augmentation in such situations may be necessary, these amounts are already accounted for by considering only the net electricity generation of the project. When the yield of gas is insufficient to initiate the generators, or if there is maintenance, or if there is more LFG than the generators can combust, then LFG will be sent to an enclosed auto-ignition flare unit. Once the methane in the LFG is converted to carbon dioxide, its greenhouse effect is effectively reduced.



The LFG collection system consists of newly installed branch pipes, head pipes and extraction wells for the effective collection of the LFG. Following the gas collection, the LFG is pre-treated by first separating the leachate condensate, dewatering, removing solid impurities, drying and pressurization by a blower. Then the pre-treated LFG is fed into the gas engines. The Project does not store LFG.

The main equipment used in the Project is gas engines with the following specifications

Table 2. Technical details of installed methane destruction equipment

	Power Gen-Set	Flare Unit[3]
Manufacturer	MWM (Deutz)	Conveco
Type of Units	1.23 MW_m, 1.2 MW_e	Enclosed type, K-Type thermocouple
Number of units	4 units until 2.05.2017 and then 5 units acceptable for this monitoring period	1

Detector coupled with the electronic module installed in the control panel continuously detect flame presence (by UV sensor). If the detector can't see the flame (and cogeneration engines are in OFF), automatically close the main valve and try to start again the flame with only pilot line. If this operation fail the system automatically shuts down and an alarm appears on the system. The flare state (ON/OFF) is not registered by the system, but the flare state can easily be understood by flare flowrate interpretation.

Overall, the Project is in commercial operation in line with the description in the registered PDD. There are no significant overhaul times, downtimes of equipment, exchange of equipment that could have an impact on the applicability of the UNFCCC tools and methodologies that have been used.

[3] CA.14.13_-_SAMSUN_-_declaration_-_17.08.2013

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

There is no request for deviation applied during this monitoring period.

B.2.2. Corrections

There are no corrections applied during this monitoring period.

B.2.3. Changes to the start date of the crediting period

As stated in the second monitoring report; "The start date of the crediting period has been changed as 9.02.2011 as a permanent deviation."

B.2.4. Inclusion of monitoring plan

Not applicable as, registered PDD includes monitoring plan.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

There is one change realized related with the consultant side. Rüzgar Danışmanlık (Çağla Balcı Eriş) is developed Monitoring report and Calculation of emission reductions.

B.2.6. Changes to project design

In this monitoring period, the following project design changes have been carried out;

In the registered monitoring plan, a flow meter device was supposed to be installed for each gas engine that measures flow rate of the landfill gas. There are 5 flow meter units devices present in this 3rd monitoring period in the project implementation. One of these units (denoted as FM 1, serial number AAL3824F) is installed after the booster (main pipe), another unit measures the LFG that goes into the flare (denoted as FM 2, serial number AAL3829F), and a third unit measures which would measure the LFG that goes to the engines (denoted as FM 3, is not installed at the planned location) and fourth and fifth flow meter measures the LFG that goes to the engines (denoted as FM 4 and FM 5) are not installed The main reason for not installing separate flowmeter units for each gas engine is only commercial.

In addition to landfill gas, biogas is also produced on site and this total gas is collected with the same booster unit. FM1 measures Landfill gas plus Biogas. In order to comply with project boundaries biogas production is measured separately to enable the deduction of the biogas from the total gas. Flow meter unit 3 (serial number AGF1583F) is implemented for this purpose as per Figure 2.

The expected disposed waste amount was 182,500 tonnes, corresponding to an average of 500 t/day.

The capacity increased to 6.0 MWe on dd. 27.09.2014. After the capacity increase amount of the waste is planned to be 228,125 tonnes, corresponding to an average of 625 t/day

Another measurement instrument deviation is the use of a K-type thermocouple in the flare unit, instead of an N-type thermocouple as was suggested in the registered PDD.

Along with the capacity increase and optimization planning the initial P&ID is changed as per below diagrams:

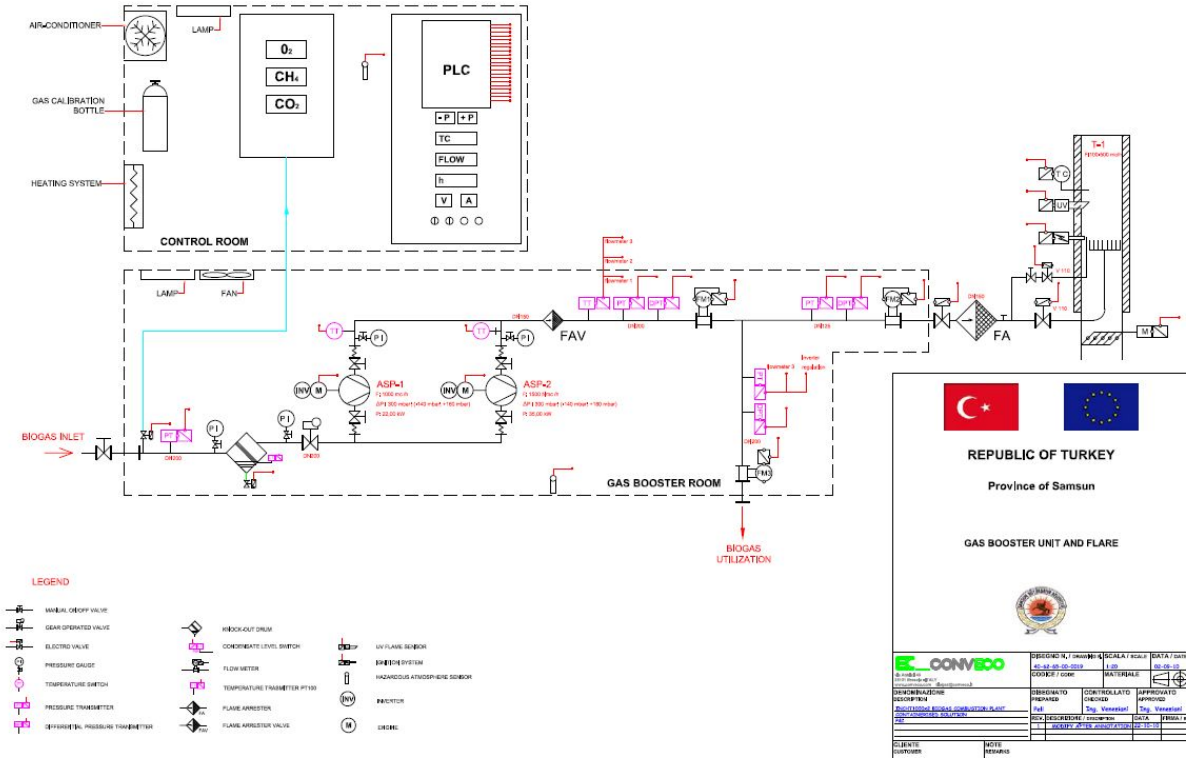


Figure 1. Flow chart of the implemented Project

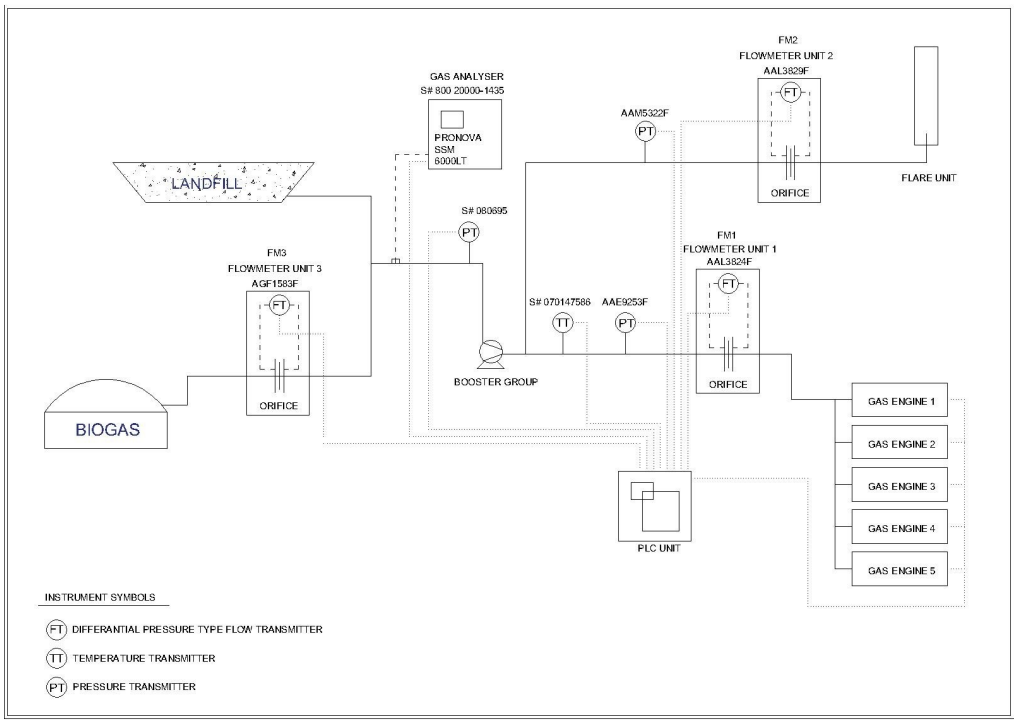


Figure 2 Flow chart of the implemented Project

Another design deviation from the registered PDD is the operating temperature of the flare unit. The installed flare is capable of efficiently flaring landfill gas with an exhaust gas temperature range of 800-1200 °C, instead of 900-1200 °C as stated in the PDD.

The project also has Biogas application but it is not added to project boundary. The main pipe collects the gas produced at the landfill (LFG) and the biogas plant . Biogas plant has its own flowmeter which enables us to monitor and measure the amount of gas produced at the biogas plant. FM3 is also connected to PLC-SCADA system. The electricity energy produced from LFG is calculated based on conservative assumptions and measurements

These deviations do not compromise the applicability of the methodologies and tools that are used for registration. The summary overview of the monitoring system is provided in *Table 2*.

Table 2. Summary of actual monitoring parameters in the implemented Project activity

Parameter	Measured Data	Data Source
$EL_{LFG,y}$	Net amount of electricity supplied to the grid by the Project	Primary and secondary electricity measurement devices (EPIAS)
$PE_{FC,j,y}$	Project emissions from fossil fuel combustion	Calculation
$F_{CH4,RG,m}$	Mass flow of methane in the residual gaseous in the minute *m*	Calculation
$LFG_{flare,y}$	Total amount of landfill gas flared in year y	Flow meter unit # 2
$LFG_{electricity,}$	Amount of landfill gas combusted in generators	Calculation
LFG_{biogas}	Amount of gas produced in biogas plant	Flow meter unit # 3
$LFG_{engine,y}$	Total amount of engine gas collected in year y	Flow meter unit #1
w_{CH4}	Methane fraction in the total gas	Gas analyser #1
$PE_{flare,y}$	Project Emissions from flaring	Calculation
$PE_{biogas,y}$	Project Emissions from biogas	Calculation
h	Operational hours of the power plant	Power generation of engines
AF	Regulatory LFG destruction requirements	Qualitative
$T_{EG,m}$	Temperature in the exhaust gas of the enclosed flare in minute m	Thermocouple

Please refer to *Section D.2* for details of the instruments and QA/QC procedures.

B.2.7. Changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The monitoring plan involves the determination of the baseline emissions occurring within the project boundary during the crediting period. As the project boundary is defined as the national grid of Turkey, the baseline emissions from electricity generation activities in Turkey are calculated and monitored based on national official data.

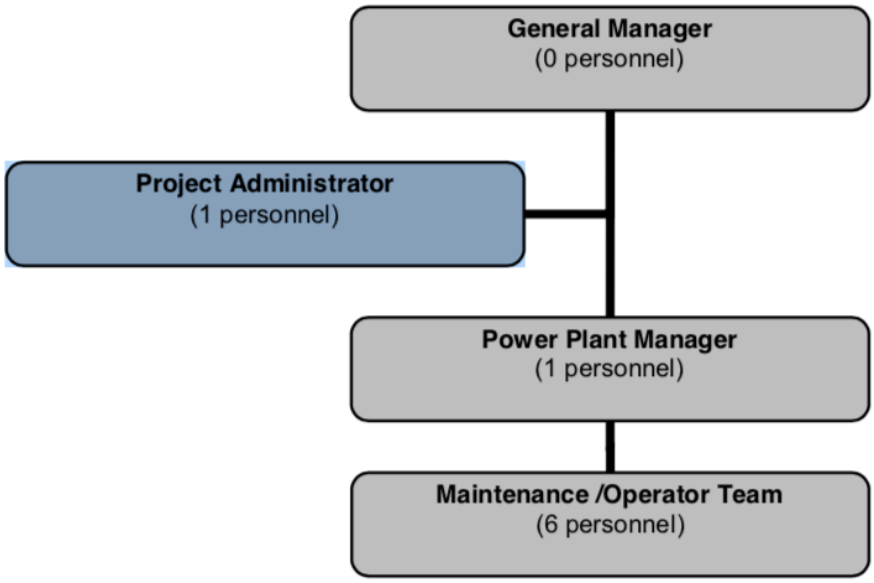
Organizational structure:

The tasks of the General Manager are being carried out by one of the board members. The General Manager is responsible for the information flow and monitoring procedures in the name of the Project owner.

Project Administrator is responsible for information flow, document management and project administration.

Power Plant Manager is responsible for overseeing and managing daily operations and local relationships.

Maintenance / Operator team is responsible for carrying out operational and maintenance tasks



The responsibilities of the General Manager include:

- Ensuring the information flow between the Project owner company and the DOE,
- Managing data collection, record keeping, data handling and processing, filing and reporting,
- Ensuring that project personnel have the necessary skills to carry out these tasks properly,
- Overseeing the proper implementation of the monitoring procedure,
- Emission reduction calculations and the preparation of necessary documents for verification,
- Management of the monitoring and verification procedures,
- Management and organization of trainings and carrying out data handling,

Activities related to invoicing and human resources.

Other Responsibilities:

Çağla Balcı Eriş-Rüzgar Danışmanlık supports the Project owner in the preparation of this monitoring report and its verification.

For maintenance and repairs of the plant, the Project Participant has assigned different 3rd parties as subcontractors (three separate companies are assigned for generator units, for the booster system, and for the electricity and transformer station)

Information flow andProcedures:

i. Electricity Generation Component:

The power generation data are stored by EPIAS, the financial settlement centre of YEDAŞ (the national grid operator). The website of EPIAS (https://www.epias.com.tr/uzlastirma/aylik-uzlastirma-bildirim-sureci/) accessible by the Project owner with their unique user ID and password. Once accessed, the Project owners are able to call electricity generation and consumption reports of their own projects. The same reports are used by the Project owner for invoicing purposes. The electricity generation data are reported on a monthly basis. The procedure involves the following tasks:

Accessing the website of EPIAS (https://www.epias.com.tr/uzlastirma/aylik-uzlastirma-bildirim-sureci/) using the user ID and password assigned to the Project owner,

Obtaining the electricity generation and consumption reports, for each month in the monitoring period,

Storing these monthly reports in electronic format and in printed hardcopies.

ii. Methane Destruction Component:

Gas flow is measured by flow meters, including the flow into the flare, generators and the total flow. These parameters are required to be normalized at 0°C and 1 atm, using actual gas temperature and pressure data to be measured with temperature and pressure transmitters. These in-built transmitters are integrated in each of the flow meters and equipped with a flow computer so that the values sent to the SCADA system are already been normalized (converted to normal cubic meters). Therefore, temperature and pressure data at each flow meter do not need to be separately monitored.

Methane content in the gas is measured by a gas analyser that is connected to the PLC-SCADA system

Measured data has been cross checked to ensure data quality and in case of mismatches necessary procedures has been conservatively taken. Flow rates from different flow meter measurements have

been compared to each other and checked for correctness (e.g. sum of gas fractions, gas flow rate into engines vs. total power generation of engines etc.) to ensure that data is dependable and of high quality.

The monitoring plan mainly involves preparation of a spreadsheet for reporting and verification purposes, supported by evidential documents. All data used for the monitoring plan is archived electronically and backed up regularly. These data have been kept for the full crediting period and a further two years after the end of the crediting period or the last issuance of carbon credits, whichever occurs later.

The monitoring equipment and other equipment of the plant are connected to a Programmable Logic Controller (PLC), which collects all the monitoring data and sends them to the SCADA system so that the operator can read main parameters in real time. The PLC archives reading values in a database which is accessible through the SCADA interface. Monitored data can be read and downloaded with the SCADA system for reporting purposes. Moreover, these electronic records are backed-up in a separate computer.

The main source for landfill gas data is the Project activity's PLC-SCADA system. The system automatically reads measurement devices and records data on hard drives. The PLC system records meter readings at pre-determined intervals, as specified in the CDM monitoring manual. These data will be used to calculate the total emission reductions.

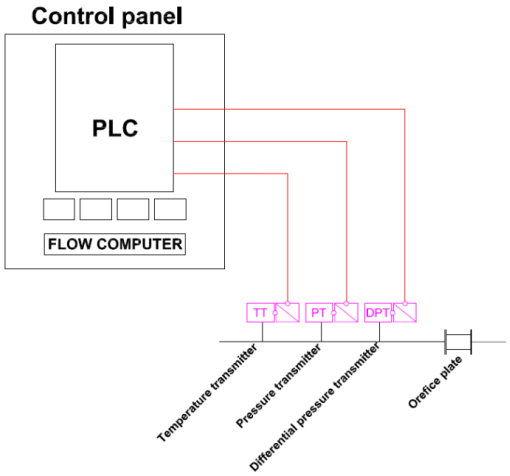
Methane destruction by gas engines: The amount of LFG combusted in the gas engines have been monitored by effectively and conservatively monitoring the methane amount supplied into engine units. The readings will be taken and recorded internally by compatible and proper measurement devices automatically with high data quality. The actual emission reductions from the destruction of methane in the combustion units will be calculated such that the risk of overestimation is minimised, and according to the ACM0001 v.11, "Consolidated baseline and monitoring methodology for landfill gas project activities".

Methane destruction by flare units: An enclosed flare unit is installed that has an inbuilt flame detection unit. The project emissions from flaring and emission reductions from the destruction of LFG have been monitored at this point. The readings have been taken and recorded internally by compatible and proper measurement devices automatically with high data quality. The measured parameters are automatically converted to dry- basis and normal conditions by the PLC system. The instruments monitor parameters continuously. The emissions are calculated using the methodological tool "Project emissions from flaring" (v. 02.0.0), which is the newest version of the tool at the time of the preparation date of this monitoring report.

Every flowmeter unit are composed by:

- Orifice plate - TECNOVA HT (see attached paper named "orifice plate"): that is installad directly on the process;
- Differential pressure transmitter - FUJI: transductor that convert differential pressure in flow rate;

- Temperature transmitter - FUJI: used for flow normalization;
- Pressure transmitter - FUJI: used for flow normalization;
- Flowcomputer and PLC – CONTREC and SIEMENS: used to make calculation for normal and dry-basis flow;



Data recording and aggregation and procedures for extraordinary events

i. Electricity Generation Component:

There are two measurement devices; a primary measurement device and a secondary (i.e. back-up or check-meter) measurement device for quality assurance, to be used if the primary meter fails. Both the primary and back-up measurement devices measure and store the aggregate total electricity import and export for the whole Project in real-time. The PLC system also stores various data electronically.

The invoices are kept by the Project owner as hardcopies. Furthermore, the EPIAS system stores the reports electronically, which is accessible to the Project owner whenever necessary. After the monthly reports are obtained from EPIAS, data are aggregated using a separate spreadsheet. The monthly generation and consumption data are entered to the spreadsheet, which calculates the emission reductions during the monitoring period. This is spreadsheet file is attached in the *ANNEX III – EMISSIONS REDUCTIONS TABLE* of this report.

In case of a fire, earthquake or other similar emergency situation, the electricity data after the settlement with YEDAŞ is valid, i.e. the electricity generation and consumption figures used for invoicing purposes during or after the emergency is used for the calculation of emission reductions.

In case the EPIAS report cannot be reached online, the monthly generation protocols signed by both the Project owner and YEDAŞ is used. These protocols are the source of the EPIAS data and provide the same values, under normal circumstances, in hardcopy format. Although SCADA data are not used for monitoring purposes, they are of high quality and can principally be used for monitoring purposes in case of emergencies conservatively

The meters are as below;

Serial Number	Model-Product	Manufacturer	Accuracy	Date of Initial Calibration
436730	A1500 Alpha	ELSTER (backup)	0.5 S	18.08.2010
65001340	C510.AMT.5851.RS485	MAKEL (main)	0.5 S	07.09.2016
13000893* (changed on 04/10/2017)	AEL.TF11	KÖHLER (main)	0.5 S	04.10.2017

ii. Methane Destruction Component:

Data Storage: The electronic monitoring system periodically archives the readings data. Written documents (e.g. equipment replacement protocols, accident logs, maintenance records, back-ups etc.) have been kept safely.

Data handling: For the PLC system data that are corrupted or missing. Accordingly, for erroneous data the emission reductions are assumed to be simply zero. In case the installed flow meters do not measure flow rates in normalized units (for 0°C and 1 atm) or if the PLC system does not calculate the LFG amount in normalized cubic meters, then this have been done using appropriate formulae, using the temperature and pressure data for the flowing gas.

Flow meter unit details are as below;

Number	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations	Cal. validity
2	%0.1	AAL3829F	Up to 10 years (no periodic calibration requires by manufacturer	24/11/2010	24/11/2020

Number	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations	Cal. validity
1	%0.1	AAL3824F	Up to 10 years (no periodic calibration requires by manufacturer	24/11/2010 10/05/2012	10/05/2022

Number	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations	Cal. validity
3	%0.1	AGF1583F	Up to 10 years (no periodic calibration requires by manufacturer	4/5/2016	4/5/2025

Maintenance and calibration of measurement devices: All measurement devices have been purchased and maintained as specified in the CDM monitoring manual according to manufacturer specifications. All measurement devices that are used in monitoring have been subject to a quality control procedure that includes regular maintenance and calibration in agreement with legal and/or manufacturer requirements. According to the relevant regulation, periodical inspections are required every 10 years. For every calibration, a separate calibration record have been kept that shows the identification number of each measurement device, calibration date, due date for next calibration, calibration service provider etc. Calibration certificates have been kept for every measurement device until two years after the end of the crediting period.

If any equipment has a malfunction or breakdown, corrective actions is carried out in a timely manner to minimize the risk of emissions that are not intended. To ensure data quality, operational staff is trained appropriately so that they can effectively take actions in such cases. The plant operator periodically inspects the plant to check visually if there are any obvious problems. In case of any findings, these are documented.

In case of an organisational change within the Project owner, a qualified person is assigned for carrying out and management of the monitoring and verification procedures. In case of fire, earthquake or another similar emergency situation, the data that are stored by the Project owner as back-up has been used, whereby conservativeness has been maintained with specific procedures. For extraordinary events where such back-up data are not available, the amount of landfill gas consumed will be calculated by using the power generation figures and engines' full load electrical efficiencies, by using conservative values and other assumptions to maintain conservativeness, as necessary.

Regarding the project emissions from flaring, data recording and aggregation and procedures for extraordinary events are the same as described above (i.e. the methane destruction component.

Figure 1:Above P&ID shows the initial planning

Figure 2:: Above P&ID shows the latest

13000893 (changed on 04/10/2017)

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

Data/Parameter	Combined Margin Emission Factor
Unit	tCO2/MWh
Description	The combined margin emission factor is the weighted average of the operating and build margins and describes the emission factor of the baseline scenario.
Source of data	Baseline calculations in the PDD
Value(s) applied	0.559
Choice of data or measurement methods and procedures	Baseline calculations in the PDD
Purpose of data/ parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	The GHG emission reductions of the Project will be calculated by multiplying the ex-ante combined margin emission factor with the net electricity exported.

Data/Parameter	Leakage
Unit	tCO2
Description	Leakage is emissions arising due to activities such as power plant construction, fuel handling and land inundation.
Source of data	The baseline methodology suggests not considering the leakage for this technology.
Value(s) applied	0
Choice of data or measurement methods and procedures	
Purpose of data/ parameter	Calculation of leakage
Additional comments	

Data/Parameter	ρCH4
Unit	t/m3
Description	Density of methane at normal conditions
Source of data	"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"

Value(s) applied	0.0007168
Choice of data or measurement methods and procedures	The methane density under normal conditions (0° C and 1,013 bar) is constant.
Purpose of data/parameter	ER Calculations
Additional comments	N/A

Data/Parameter	GWPCH4
Unit	tCO2eq tCH4
Description	Global Warming Potential of methane valid for the commitment period
Source of data	Methodological tool "Project emissions from flaring" v.02.0.0
Value(s) applied	25
Choice of data or measurement methods and procedures	The default GWP value of 21 is used as suggested by the UNFCCC tool. Since 1.1.2013 the GWP of Methane is considered to be 25 instead of 21. The revised value is confirmed to be correct based on the IPCC 4th Assessment Report: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html).
Purpose of data/parameter	CH4 Emission calculations
Additional comments	N/A

The following information is added to the Monitoring Report as a fixed parameter expost as a result of the use of a newer version of the methodological tool "Project emissions from flaring", v.02.0.0 (EB68, Annex 15). In the next monitoring periods, this information will be taken as ex ante.

Data/Parameter	SPECflare
Unit	Temperature: °C Flow rate: m3/h
Description	Manufacturer's flare specifications for temperature and flow rate
Source of data	Flare manufacturer
Value(s) applied	Flare specifications set by the manufacturer for the correct operation of the flare are the following parameters: a) Minimum and maximum inlet flow rate: 200 - 1000 m3/h b) Minimum and maximum operating temperature: 800 - 1200°C c) Minimum methane content: 25%

Choice of data or measurement methods and procedures	This parameter is only applicable in case of enclosed flares. The maintenance schedule is not required if flare efficiency is fixed (Option A in the methodological tool "Project emissions from flaring", v.02.0.0)
Purpose of data/parameter	Provide flare specifications
Additional comments	These manufacturer requirements are used to determine the flare efficiency at any given time. The flow meter that measures the flow to the flare unit (FM 2) has an accurate measurement range. Only the landfill gas amount that is flared according to manufacturer's specifications and that can effectively be measured by FM 2 will be taken into account.

D.2. Data and parameters monitored

(Copy this table for each data or parameter.)

i. Electricity Generation Component:

Data / Parameter:	$EL_{LFG,y}$ Net amount of electricity supplied to the grid by the project
Unit:	MWh
Description:	Power export and power import by the Project during the monitoring period
Measured/Calculated/Defa	Measured
Source of data:	The EPIAS website (The data imported from this website are read from the primary measurement device (or the back-up device in case the primary device is inaccurate, malfunctioning etc.)
Value(s) of monitored parameter:	Net electricity generation of the Project activity is as the following: Sum 2016 (16.04.2016-31.12.2016): 19,169,270 kWh Sum 2017 (01.01.2017-31.12.2017): 40,182,176 kWh Sum 2018 (01.01.2018-08.02.2018): 5,817,322 kWh

Monitoring Equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)

The measurement devices have the following specifications:

Table 3. Specifications of measurement devices used

Serial Number	Model-Product	Manufacturer	Accuracy	Date of Initial Calibration
436730	A1500 Alpha	ELSTER (backup)	0.5 S	18.08.2010
65001340	C510.AMT.5851.RS485	MAKEL (main)	0.5 S	07.09.2016
13000893* (changed on 04/10/2017)	AEL.TF11	KÖHLER (main)	0.5 S	04.10.2017

*This meter is replaced. Please see Table 4 for details:

Calibration frequency: According to the Article 9 of the relevant regulation periodical inspections of "gauges for electric, water, coal gas, natural gas and, current and voltage measuring transformers will be made once in 10 years". This is in line with the monitoring plan and national requirements. YEDAŞ will decide when to carry out the next calibration. The Project owner has no control over or access to the measurement devices and is not entitled to perform any type of maintenance or calibration.

Date of last calibration: The measurement devices have not been calibrated again since their first installation.

Responsible personnel: YEDAŞ is responsible for monitoring and ensuring that the measurement devices satisfy the requirements. YEDAŞ is also responsible for the calibration of the measurement devices. In case of any detected problem (e.g. failure of one of the measurement devices, inconsistency between the readings of the primary and the back-up meter etc.), the plant manager in the name of the Project owner is responsible for coordinating the necessary maintenance and calibration procedure with YEDAŞ.

Validity: The technical specifications and the calibration procedure are in agreement with the national regulations and the monitoring plan.

There is not any extraordinary event which could be critical in assessing the accuracy of this monitoring parameter.

The list of the incidents occurred during the monitoring period which might have an impact on the measurement devices is given below;

Table 4. Extraordinary Events (during monitoring period

Potential Risks of Inaccuracy	Occurence	Information
Calibration of the measurement devices (carried out by YEDAŞ)	None	This is in line with the monitoring plan
Malfunction, replacement, resetting, repair service or any other relavant activity regarding the measurement devices	Köhler 13000893 is replaced by the grid operator with Makel 65001340 (04/10/2017)	The replaced device is calibrated and sealed
Accident (fire, technical equipment failure, theft of equipment etc.) which could compromise the accuracy	None	This is in line with the monitoring plan

As seen from the Table 4, there is not any extraordinary event which could be critical in assessing the accuracy of this monitoring parameter.

Measuring / Reading/ Recording frequency:	The primary and back-up measurement devices measure, read and record various data such as electricity generated and consumed, in real-time. The measurements and recordings are made continuously. The readings are performed in monthly intervals. There is no sampling involved.

Calculation method (if applicable):	The EPIAS (YEDAŞ) Market Balancing Center website is accessed and the monthly reports are recorded, using the Project Owner's own user ID and password. These reports do not show the net electricity generation, but Power Export and Power Import data. Therefore, their difference is calculated to obtain the net electricity generation of the Project. These data in the EPIAS interface are copied and pasted to a prepared spreadsheet, which will perform the calculations. For each month, the Power Export and the Power Import values are extracted from the EPIASmonthly reports. The Power Export is denoted as "Iletim Sistemine Veris Miktari" (ISVM) and the Power Import is denoted as "Uzlasmaya Esas Cekis Miktari" (UECM) in the monthly report in Turkish language. Net Electricity Generated = Power Export – Power Import This difference (which is equal to monthly net electricity generation) is added to each other for each month of the monitoring period to find the total net electricity generation of the Project. The monitoring spreadsheet, together with the scans of the EPIAS reports, is submitted to the DOE. The calculation and formulae are clearly visible in the spreadsheet.
QA/QC procedures:	There are two measurement devices continuously measuring and recording electricity generation and consumption of the Project activity. The primary measurement device is used for invoicing, and the secondary measurement device is used for quality control and back-up purposes. Both measurement devices comply with industry standards, UNFCCC and national requirements. This ensures the quality and continuity of monitored data. YEDAŞ reads monthly recorded values that were measured until 24:00 of the last day of the preceding month. Based on this reading, the invoices are prepared by the Project owner. The monthly measurement device readings are transferred and stored in the web server of EPIAS (the financial settlement agency of YEDAŞ). Since 01.02.2012, the reading of the measurement devices are remotely made by YEDAŞ, with the system called OSOS (Automatic Meter Reading System) via GPRS technology. This is done through an external modem which has no impact on the quality and quantity of data reading. With the introduction of OSOS system, YEDAŞ personnel do not go to project site to perform the reading of the measurement devices
Purpose of Data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment	N/A

ii. Methane Destruction Component:

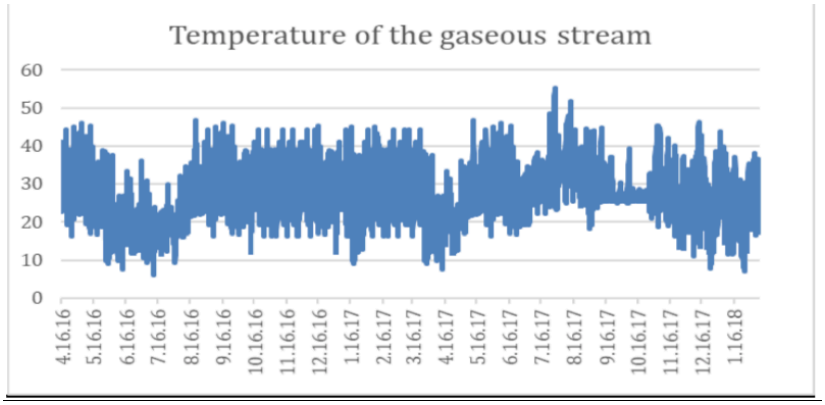
Data / Parameter:	$PE_{FC,j,y}$
Unit:	$tCO2_e$
Description:	Project emissions from fossil fuel combustion in process *j* during the year *y*
Measured /Calculated /Default:	Calculated
Source of data:	Fuel invoices
Value(s) of monitored parameter:	N/A
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Project emissions involve direct emissions (such as fossil fuel consumption of construction equipment, co-firing for power generation or vehicles for on-going operations and maintenance) by the Project activity.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable)	If the amount is not negligible, then the following methods will be used: AMS I.F, Table 1.F.1; and/or, "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
QA/QC procedures:	The consumption of fossil fuel will be monitored based on the fuel invoices and is therefore of high quality.
Purpose of data:	
Additional comment:	In case of blackouts, the diesel generator owned by the Municipality at the landfill site provides power to the landfill and also to the offices of the Project for daily use purposes. This parameter does not include project emissions from flaring.

Data / Parameter:	$F_{CH4,RG,m}$
Unit:	kg
Description:	Mass flow of methane in the residual gas in the minute *m*
Measured /Calculated /Default:	Calculated
Source of data:	This parameter is added after the Project registration as a deviation from the monitoring plan, as the tool requires that the methane amount is monitored as mass (kg), instead of volume (m3). For conversion, volumetric flow rate data is collected from the flow meter Nr.2 (FM 1).
Value(s) of monitored parameter:	Total methane mass flow in the residual gas over the crediting period is 10,344 ton of CH_4.

<table>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>Table 5: Equipment Specifications
<table>
<tr><th>Type</th><th>Accuracy</th><th>Serial No:</th><th>Cal. Frequency</th><th>Dates of relevant calibrations</th><th>Cal. validity</th></tr>
<tr><td>Technova HT</td><td>%0.1</td><td>AAL3824F</td><td>Up to 10 years (no periodic calibration requires by manufacturer</td><td>24/11/2010
10/05/2012</td><td>10/05/2022</td></tr>
</table>
Measurement range: 0-600 Nm^3/h
Flowmeter consistency is checked on 11.04.2013 to confirm that no calibration is necessary.</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Measured continuously in real-time and recorded every 10 minutes.
Data recording system is changed on 10.09.2013 so that the interval is increased to every 30 minutes.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>The flow rate of the residual landfill gas is automatically converted to dry basis and normal conditions by the PLC system without any intervention by the Project owner. This parameter is calculated by multiplying LFGflare, density of methane and wCH4 (percentage of methane measured by the gas analyzer).

This is in compliance with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, v.02.0.0, EB61, Annex 11.</td></tr>
<tr><td>QA/QC procedures:</td><td>A separate flow meter is installed for the flare unit. Data is measured continuously with a flow meter by the Project owner. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. This will ensure that the accuracy of the measurement instrument is maintained. The measurement frequency is equal to or more than one sampling each hour.</td></tr>
<tr><td>Purpose of data:</td><td>This parameter will be used to check with the $SPEC_{flare}$ parameter.
This parameter will be used to calculate $PE_{flare,y}$.</td></tr>
<tr><td>Additional comment:</td><td>Na.</td></tr>
</table>

Data / Parameter:	Tt
Unit:	K
Description:	Temperature of the gaseous stream
Measured /Calculated/Default:	Measured
Source of data:	Measurement device

Values of monitored parameter	Fluctuating between 25-38 °C (16.04.2016 – 08.02.2018) The average is 25,05 °C 
Monitoring equipment (type, accuracy class serial number, calibration frequency, date of last calibration, validity)	Table 6: Equipment Specifications <table><tr><th>Type</th><th>Accuracy</th><th>Serial No:</th><th>Cal. Frequency</th><th>Dates of relevant calibrations</th><th>Cal. validity</th></tr><tr><td>Gentek Temperature gauge LUTRON</td><td></td><td>12-1900</td><td>No periodic calibration required by manufacturer</td><td>30/06/2014</td><td>NA</td></tr></table>
Measuring/Reading/ Recording frequency:	Manual reading and recording continously.
Calculation method (if applicable):	
QA/QC procedures:	The data is manually read and recorded. The temperature measurement device is calibrated, indicating a small error margin and small fluctuations.
Purpose of data:	$F_{CH4,RG,m}$, mass flow of methane in the residual gas in the minute m, is calculated based on the dry basis assumption, which requires the temperature of the landfill gas to be below 60 °C. This data is used to verify that this requirement is fulfilled. It should also be noted that the landfill gas is dehumidified before the booster intake.
Additional comment:	N.A.

Data / Parameter:	$LFG_{engine,y}$
Unit:	Nm^3
Description:	Total amount of landfill gas (under normal conditions of 0° and 1 Atm) combusted in the generator unit in year y
Measured/Calculated /Default:	Measured

<table>
<tr><td>Source of data:</td><td>Flow meter Nr.1 (FM 1)</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>26,096,423 m^3</td></tr>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>Table 7: Equipment Specifications
<table>
<tr><th>Type</th><th>Accuracy</th><th>Serial No:</th><th>Cal. Frequency</th><th>Dates of relevant calibrations</th><th>Cal. validity</th></tr>
<tr><td>Technova HT</td><td>%0.1</td><td>AAL3824F</td><td>Up to 10 years (no periodic calibration requires by manufacturer</td><td>24/11/2010
10/05/2012</td><td>10/05/2022</td></tr>
</table>
Measurement Range: 0-2200 Nm3/h.

Flowmeter consistency is checked on 11.04.2013 to confirm that no calibration is necessary.</td></tr>
<tr><td>Measuring / Reading/ Recording frequency</td><td>Measured continuously in real-time and recorded every 10 minutes.

Data recording system is changed in 2013 so that the interval is increased to every 30 minutes.</td></tr>
<tr><td>Recording frequency:</td><td></td></tr>
<tr><td>Calculation method (if applicable)</td><td>N/A</td></tr>
<tr><td>QA/QC procedures:</td><td>Data is measured continuously with a flow meter by the Project owner. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. This will ensure that the accuracy of the measurement instrument is maintained. The measurement frequency is equal to or more than one sampling each hour.

One flow meter is installed for all of the gen-sets.</td></tr>
<tr><td>Purpose of data:</td><td></td></tr>
<tr><td>Additional comment:</td><td>The flow meter that measures the flow to the gas engine units (FM 1) has an accurate measurement range. Only the landfill gas amount that is used for power generation and that can effectively be measured by FM 1 will be taken into account.</td></tr>
</table>

Data / Parameter:	$LFG_{flare,y}$
Unit:	Nm^3
Description:	Total amount of gas (under normal conditions of 0° and 1 Atm) flared in year y
Measured /Calculate /Default:	Measured
Source of data:	Flow meter Nr.2 (FM 2)

Value(s) Of monitored parameter:	38,398.97 m3
Monitoring equipment (type, accuracy class, Serial number, calibration frequency, date of last calibration, validity)	Please see details of the parameter $F_{CH4,RG,m}$.
Measuring/ Reading/ Recording frequency:	Measured continuously in real-time and recorded every 10 minutes Data recording system is changed in 2013 so that the interval is increased to every 30 minutes
Calculation method (if applicable):	N/A
QA/QC procedures:	Please see details of the parameter $F_{CH4,RG,m}$.
Purpose of data:	This indicator has been included in the monitoring plan of the registered PDD. As the "Project emissions from flaring", v.02.0.0 (EB68, Annex 15) does *not* include this parameter, it is only used for double checking purposes by comparing it with $LFG_{electricity,y}$ and $LFG_{engine,y}$.
Additional comment:	n.a

Data / Parameter:	LFGbiogas,y
Unit:	Nm3
Description:	Total amount of gas (under normal pressure and temperature) captured in year y
Measured /Calculated / Default:	Measured
Source of data:	Flow meter Nr.3 (FM 3)
Value(s) of monitored parameter:	330,568 m3
Monitoring equipment	Table 8: Equipment Specifications

Type	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations	Cal. validity
Technova HT	%0.1	AGF1583F	Up to 10 years (no periodic calibration require by manufacrurer	4/5/2016	4/5/2025

Measurement Range: 0-2200 Nm3/h

Measuring/Reading/ Recording frequency:	Measured continuously in real-time and recorded every 10 minutes. Data recording system is changed in 2013 so that the interval is increased to every 30 minutes.

Calculation method (if applicable):	N/A
QA/QC procedures:	Data is measured continuously with a flow meter by the Project owner. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. This will ensure that the accuracy of the measurement instrument is maintained. The measurement frequency is equal to or more than one sampling each hour.
Purpose of data:	This parameter is used for measure m3 of biogas
Additional comment:	N/A

Data / Parameter	wCH4
Unit:	%
Description:	Methane fraction in the landfill gas
Measured /Calculated /Default:	Measured
Source of data:	Gas analyzer (at the main booster pipe)
Value(s) of monitored parameter:	55,11% (Average) 2016: 54,50% 2017: 55,40% 2018: 56,49%
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Table 9: Equipment Specifications

Type	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations
Provonova SSM 6000LT	%0.2	8002000-0-1435	Annually (manufacturer specification)	11/04/2013 10/09/2013

Measuring/ Reading/ Recording frequency:	Measured continuously in real-time
Calculation method (if applicable):	N/A
QA/QC procedures:	Methane content is measured directly and continuously with a gas analyser. The gas analyser has been maintained and calibrated regularly according to the manufacturer's requirements in order to ensure that required level of accuracy is maintained. The gas analyser is subject to a regular maintenance and testing regime to ensure accuracy, therefore the analyser will be calibrated according to the manufacturer's recommendations. The measurement interval is equal to or more than one sampling each hour.

Purpose of data:	The percentage of methane in the landfill gas is used to calculate the amount of methane destroyed in the gas engine and flare units. It is also used to check whether it satisfies the minimum methane content threshold for the flare unit to ensure the gas is flared efficiently.
Additional comment:	

Data / Parameter	$PE_{flare,y}$
Unit:	tCO_2-eq
Description:	Project emissions from flaring of the residual gas in year *y*
Measured /Calculated /Default:	Calculated
Source of data:	N/A
Value(s) of monitored parameter:	383,12 tCO_2-eq
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	$PE = \sum_{m=1}^{\text{mon. period}} F * (1-\eta) * GWP * 10^{-3}$ flare,y $F_{CH4,RG,m}$ and $\eta_{flare,m}$ parameters are read continuously but recorded at regular intervals. Therefore, the formula above has been applied to 10- minutes and 30-minutes data, instead of 1-minute data. GWP_{CH4} is a fixed ex ante parameter.
QA/QC procedures:	Calculations are carried out with a spreadsheet to minimize the risk errors
Purpose of data:	
Additional comment:	

Data / Parameter	Operation of the power plant
Unit:	h
Description:	Operational hours of the power plant
Measured /Calculated /Default:	Measured
Source of data:	Power generation of engines
Value(s) of monitored parameter:	66,144 hours

<table>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>
Table 10: Equipment Specifications
<table>
<tr><th>Type</th><th>Accuracy</th><th>Serial No:</th><th>Cal. Frequency</th><th>Dates of relevant calibrations</th><th>Cal. validity</th></tr>
<tr><td>Genset Control EASYGEN 3200-5</td><td>N/A</td><td>17856564</td><td>N/A</td><td>02/12/2011</td><td>N/A</td></tr>
<tr><td>Genset Control EASYGEN 3200-5</td><td>N/A</td><td>17609634</td><td>N/A</td><td>11/07/2011</td><td>N/A</td></tr>
<tr><td>Genset Control EASYGEN 3200-5</td><td>N/A</td><td>18336534</td><td>N/A</td><td>27/09/2013</td><td>N/A</td></tr>
<tr><td>Genset Control EASYGEN 3200-5</td><td>N/A</td><td>19872432</td><td>N/A</td><td>27/09/2014</td><td>N/A</td></tr>
<tr><td>Genset Control EASYGEN 3200-5</td><td>N/A</td><td>19641470</td><td>N/A</td><td>27/09/2014</td><td>N/A</td></tr>
</table>
–
Operation hours of the Engines (hours)
<table>
<tr><td></td><td>G1</td><td>G2</td><td>G3</td><td>G4</td><td>G5</td></tr>
<tr><td>16.4.2016</td><td>28,441</td><td>29,166</td><td>20,219</td><td>11,228</td><td>11,506</td></tr>
<tr><td>8.2.2018</td><td>40,709</td><td>41,022</td><td>33,160</td><td>26,109</td><td>25,704</td></tr>
<tr><td>Operation Hour</td><td>12,268</td><td>11,856</td><td>12,941</td><td>14,881</td><td>14,198</td></tr>
</table>
</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Measured continuously in real-time and recorded every 10 minutes.
Data recording system is changed in 2013 so that the interval is increased to every 30 minutes.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>The Project is considered to be operating when the total power generation of the engines is higher than 0 kW.</td></tr>
<tr><td>QA/QC procedures:</td><td>The PLC provides data on engines' supplied amount of power (kW). Operational hours are calculated based on engine operation (i.e. at least of one of the engines generates power</td></tr>
<tr><td>Purpose of data:</td><td></td></tr>
<tr><td>Additional comment:</td><td></td></tr>
</table>

Data / Parameter	AF
Unit:	%
Description:	Regulatory requirements relating landfill gas projects
Measured /Calculated /Default:	Default

Source of data:	National laws and regulations
Value(s) of monitored parameter:	0
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a
Measuring/ Reading/ Recording frequency:	n.a
Calculation method (if applicable):	n.a
QA/QC procedures:	There has not been any legal development concerning Article 27 of the "Control of Solid Waste Regulation" in the host country for obligatory landfill gas destruction.
Purpose of data:	n.a.
Additional comment:	n.a.

Data / Parameter	$T_{EG,m}$
Unit:	°C
Description:	Temperature in the exhaust gas of the enclosed flare in minute *m*
Measured /Calculated /Default:	Measured
Source of data:	Thermocouple
Value(s) of monitored parameter:	The average exhaust gas temperature during the monitoring period is 500°C for the data that are used for calculations of emission reduction from flaring. Exhaust gas temperatures below and above the flare efficiency range are discarded from calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Table 11: Equipment Specifications

Type	Accuracy	Serial No:	Cal. Frequency	Dates of relevant calibrations	Cal. validity
K-Type Thermocouple Isocontrolli	N/A	N/A	Annual replacement	February 2012	N/A

Measuring/ Reading/ Recording frequency:	Measured continuously in real-time and recorded every 10 minutes. Data recording system is changed in 2013 so that the interval is increased to every 30 minutes.
Calculation method (if applicable):	n.a

QA/QC procedures:	If more than tne temperature port is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer's specifications for temperature. Temperature measurement equipment should be replaced or calibrated in accordance with their maintenance scheduled. Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. These events should be noted in the site records along with any corrective action that was implemented to correct the issue
Purpose of data:	This parameter will be used to check with the $SPEC_{flare}$ parameter.
Additional comment:	n.a

Data / Parameter	$\eta_{flare,m}$
Unit:	%
Description:	Flare efficiency in minute m
Measured /Calculated /Default:	Default. Option A in the methodological tool "Project emissions from flaring", v.02.0.0 is selected, as the flare is of encolosed type.
Source of data:	$T_{EG,m}$, $F_{CH4,RG,m}$, and $SPEC_{flare}$
Value(s) of monitored parameter:	The flare efficiency for the minute m ($\eta_{flare,m}$) is 90% when the following conditions are met to demonstrate that the flare is operating: The temperature of the flare ($T_{EG.m}$), minimum methane content 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 Otherwise $\eta_{flare,m}$ is 0%.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a
Measuring/ Reading/ Recording frequency:	Measured continuously in real-time and recorded every 10 minutes. Data recording system is changed in 2013 so that the interval is increased to every 30 minutes.
Calculation method (if applicable):	A calculation spreadsheet is used to check the requirements defined above, which minimizes the risk of manual errors.
QA/QC procedures:	n.a
Purpose of data:	n.a
Additional comment:	n.a

Data / Parameter	$Flame_m$
Unit:	n.a
Description:	Flame detection of flare in the minute m
Measured /Calculated /Default:	Measured.
Source of data:	Flame detector unit
Value(s) of monitored parameter:	Time series
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Table 12: Equipment Specifications Type: Optical flame detector; Accuracy: N/A; Serial No: N/A; Cal. Frequency: N/A; Dates of relevant calibrations: N/A; Cal. validity: N/A
Measuring/ Reading/ Recording frequency:	Measured continuously
Calculation method (if applicable):	n.a
QA/QC procedures:	The flare unit installed for the project activity includes the flame detector as an integral safety component. This detector coupled with the electronic module installed in the control panel continuously detect flame presence by UV sensor. If the detector cannot see the flame (and cogeneration engine are in OFF), the main valve automatically closes, and a flame is tried to be created with only pilot line. If this operation fails, the system automatically shuts down and an alarm appears on the system. Therefore, the data availability also implies flame detection.
Purpose of data:	This parameter is added to comply with the methodological tool "Project emissions from flaring", v.02.0.0 and there is no direct use for these data in calculations.
Additional comment:	n.a

Data / Parameter	CF_{EM}
Unit:	n.a
Description:	Correction factor for error margin (resulting from the deviation of $LFG_{flare,y}$ monitoring frequency) used for conservatively adjusting emission reduction claimed from flared methane.
Measured /Calculated /Default:	Calculated.
Source of data:	Flow meter Nr.2 (FM 2)

Value(s) of monitored parameter:	The error margin is calculated to be 0.86% [11] .However, for conservativeness, it is has been rounded up to 1%. Therefore, the emission reductions calculated from flared methane have been decreased by 1% as an adjustment measure to account for uncertainty risk.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please see details of the parameter $F_{CH4,RG,m}$.
Measuring/ Reading/ Recording frequency:	According to the methodological tool "Project emissions from flaring", v.02.0.0, the monitoring frequency of the LFGflare,y is required to be every 1 minute. However, the Project has been registered in agreement with the "Tool to determine project emissions from flaring gases containing methane" v.01, which the Project has complied with a LFGflare,y monitoring frequency of 30 minutes (10 minutes at the beginning of the monitoring period). As a deviation (please see Section B.2.3), this monitoring report is using "Project emissions from flaring", v.02.0.0. Because of the difference between monitoring frequencies, a correction factor, CF_{EM}, has been introduced by the Project Participant to account for the use of measurement interval of 30 (and 10) minutes, instead of 1 minute interval
Calculation method (if applicable):	Statistically, a higher frequency of monitored data provides more accurate results. Therefore, the 1-minute frequency requirement is more accurate than the 10 and 30 minutes monitoring frequency. The difference between the two monitoring scenarios has been compared with each other with statistical methods. Accordingly, measuring the $LFG_{flare,y}$ every 10 and 30 minutes (total data points 34,700) instead of 1 minute (total data points 653,760) results in a maximum error margin of 0.86% with 99.9% confidence.
QA/QC procedures:	The calculation methodology of the error margin assumes a confidence level of 99.9%, which is statistically quite high and in agreement with the CDM requirements. Therefore, to account for this error margin, the emission reductions resulting from $LFG_{flare,y}$ should be adjusted by deducting 0.86% of $MD_{flare,y}$. However, to be on the safe side and to prevent any over-calculation, the Project Participant has rounded up this correction factor to 1%, which has been used in the formula 7.
Purpose of data:	This parameter has been used for the calculation of $MD_{flare,y}$.
Additional comment:	n.a

D.3. Implementation of sampling plan

No sampling is done. All data are measured continuously but recorded at intervals due to memory limits of the system. Considering the overall length of the monitoring period, rate or recording sufficiently provides adequate accuracy

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

i. Electricity Generation Component:

The Project mainly involves electricity capacity addition, which reduces CO_2 through the substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. According to the baseline methodology, the emission reduction ER_y by the project activity during a given year y is found as;

SECTION A.

$$ERy = BEy – PEy - LEy \quad (1)$$

Where:

ERy = Emission reductions in year y ((t CO_2/yr)
BEy = Baseline emissions in year y ((t CO_2/yr)
PEy = Project emissions in year y ((t CO_2/yr)
LEy= Leakage in year y ((t CO_2/yr)

The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

$$BE_y = (EG_y – EG_{baseline}) * EF_{grid,CM,y} \quad (2)$$

$EF_{grid,CM,y}$ = Combined margin CO_2emission factor for grid connected power generation in year *y* calculated using the latest version of the T"ool to calculate the emission factor for an electricity system" (t CO_2/MWh)= 0.559 t CO_2/MWh

Baseline emissions are calculated using formula (2);

BE_y = 65,168,768 kWh * 0.559 tCO_2/MWh* %98.88* = **36,017 tCO_2**

*** The ratio of Landfill Flow**

ii. Methane Destruction Component:

$$BE_y = (MD_{project,y} - MD_{BL,y}) * GWP_{CH4} \quad (3)$$

The regulatory methane destruction is calculated as

$$MD_{BL,y} = MD_{project,y} * AF \quad (4)$$

As the Project does *not* involve thermal power generation or gas-supply to any pipeline, according to ACM0001 the methane destruction by the Project is calculated as;

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (5)$$

Methane destroyed by the gen-sets is found as;

$$MDelectricity,y = (LFGlandfill,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4) \quad (6)$$

$$LFGelectricity,y = LFGengine,y + LFGflared,y-LFGbiogas,y \quad (7)$$

Methane destroyed by flaring is found as;

$$MD_{flared,y} = CF_{EM} * (LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4}) \quad (8)$$

E.2. Calculation of project emissions or actual net removals

Data used for calculations and further details are available in the PDD. Definitions can be found in *Table 15*. The screenshot of the electronic spreadsheet presenting monthly calculations can be found in *ANNEX III – EMISSIONS REDUCTIONS TABLE* of this report.

Baseline Emission in between 16/04/2016 and 31/12/2016:

BE 2016= 19,169.27 [MWh] * 0.559 [t CO_2/MWh]* %98.50*= 10,555 t CO_2

Baseline Emission in between 01/01/2017 and 31/12/2017:

BE 2017= 40,182.76 [MWh] * 0.559[t CO_2/MWh]* %98.96*= 22,227 t CO_2

Baseline Emission in between 01/01/2018 and 08/02/2018:

BE 2018= 5,817.32 [MWh] * 0.559 [t CO_2/MWh]* %99.51*= 3,235t CO_2

**The ratio of Landfill Flow

The baseline emissions for the project activity according to the PDD are included in the following table:

Table 13: Baseline emissions

Month	(A)Electricity supplied to the grid [MWh]	(B)Electricity consumption from the grid [MWh]	C)=(A)-(B) Net electricity supplied to the grid [MWh]	Baseline emissions (equation) [t CO2]
16.04.2016-31.04.2016	1,140.10	0.06	1,140.03	627.73
May 16	2,310.60	0.13	2,310.47	1,272.21
June 16	2,231.01	0.08	2.230,93	1,228.41
July 2016	2,302.80	0.04	2,302.77	1,267.97
August 2016	2,356.39	-	2,356.39	1,297.49
September 2016	2,241.38	0.03	2,241.36	1,234.16
October 2016	2,206.14	0.09	2,206.04	1,214.71
November 2016	2,167.75	0.05	2,167.70	1,193.60
December 2016	2,213.79	0.20	2,213.59	1,218.87
January 2017	2,228.51	0.18	2,228.33	1,232.66
February 2017	1,908.65	0.27	1,908.38	1,055.67
March 2017	2,120.54	0.20	2,120.34	1,172.92
April 2017	2,294.25	0.22	2,294.03	1,269.00
May 17	3,400.89	0.09	3,400.80	1,881.23
June 2017	3,293.80	0.08	3,293.72	1,822.00
July 2017	3,771.20	0.18	3,771.02	2,086.03
August 2017	4,059.23	0.14	4,059.09	2,245.38
September 2017	3,914.49	0.15	3,914.34	2,165.31
October 2017	4,236.84	0.04	4,236.80	2,343.69
November 2017	4,383.14	0.13	4,383.01	2,424.57

December 2017	4,572.41	0.10	4,572.31	2,529.28
January 2018	4,701.60	0.13	4,701.47	2,615.16
01.02.2018-08.02.2018	1,115.89	0.04	1,115.852	620.69

Sum 2016 (16.04.2016-31.12.2016)	19,169.94	0.67	19,169.27	10,555.00
Sum 2017 (01.01.2017-31.12.2017)	40,183.49	1.78	40,182.176	22,227.00
Sum 2018 (01.01.2018-08.02.2018)	5,817.49	0.16	5,817.322	3,235.00

Sum 3rd Monitoring Period (16/04/2016 – 08/02/2018)	65,171	2.62	65,168	36,017

ii. Methane Destruction Component:

The baseline emissions prior to the Project implementation consist of the methane emitted to the atmosphere from the landfill and the grid emissions due to electricity generation.

$$BE_y = (MD_{project,y} - MD_{BL,y}) * GWP_{CH4} \quad (3)$$

The regulatory methane destruction is calculated as

$$MD_{BL,y} = MD_{project,y} * AF \quad (4)$$

As the Project does *not* involve thermal power generation or gas-supply to any pipeline, according to ACM0001 the methane destruction by the Project is calculated as;

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (5)$$

Methane destroyed by the gen-sets is found as;

$$MDelectricity,y = (LFGengine,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4) \quad (6)$$

$$LFGelectricity,y = LFGengine,y + LFGflared,y - LFGbiogas,y \quad (7)$$

Methane destroyed by flaring is found as;

$$MD_{flared,y} = CF_{EM} * (LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4}) \quad (8)$$

where CFEM is the correction factor for error margin included by the Project Participant to account for the use of measurement interval of 10 or 30 minutes instead of 1 minute interval suggested in the methodological tool "Project emissions from flaring", v.02.0.0. Please refer to the monitoring parameter CF_{EM} in Section D.2 for details.

The project emissions due to flaring will be calculated by using the methodological tool "Project emissions from flaring", v.02.0.0 (EB68, Annex 15)

$$PE_{flare,y} = \sum_{m=1}^{\text{mon. Period}} F_{CH4,RG,m}*(1-\eta_{flare,m})*GWP_{CH4}*10^{-3} \quad (9)$$

Total flaring is 38,398 m3 during monitoring period.

$F_{CH4,RG,m} = LFG_{flare} * w_{CH4} * \rho_{CH4}$

$PE_{flare,2016}$= 0 tCO_2e

$PE_{flare,2017}$= 284 tCO_2e

$PE_{flare,2018}$= 98 tCO_2e

$PE_{flare,y}$= 383.12 tCO_2e.

where $F_{CH4,RG,m}$ is calculated by using the Option A in the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" v.02.0.0. Option A is selected due to volumetric and dry basis flow of gaseous stream and dry basis in the analysis of volumetric fraction. The relevant formula is:

$$F_{CH4,RG,m} = LFG_{flare} * w_{CH4} * \rho_{CH4} \quad (10)$$

$MD_{project,y}$ is calculated from formula (5) by adding up $MD_{flared,y}$ and $MD_{electricity,y}$ respectively;

Flare temperature has not been monitored and as previously indicated that the flare efficiency is being taken as zero therefore there cannot be any methane destruction by flaring, rather these should appear as project emissions.

= 0 tCH_4 + 10,097.7 tCH_4 = 10,097.7 tCH_4

Baseline emissions from methane destruction are calculated using formula (3) using two GWP values; BE_y = 252,441 tCO_2

$PE_{flare,y}$= 383.12 tCO_2e

For verification purposes, the LFG consumption in the flare and gen-sets ($F_{CH4,RG,m}$ and $LFG_{electricity,y}$) throughout the monitoring period is obtained from measurement devices.

E.3. Calculation of leakage emissions

i. Electricity Generation Component: As described in section D.1, leakage is considered as ex-ante and to be zero.

ii. Methane Destruction Component: According to the methodology ACM0001, leakage does not need to be accounted

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	288,458	384			288,074	288,074

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
288,074	203,720

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

The PDD estimation has been prepared through 3.6 MW capacity. The estimation has been revised through actual capacities during the monitoring period. Estimation revision based on 4.8 MW capacity until 2 May 2017. After 2 May 2017 estimation determined through 6 MW capacity.

YEAR	PDD ER Estimation (Section B.6.4)	Through 3th Crediting Period
16.04.2016-31.12.2016	**48,681**	64,909
2017	**75,801**	117,889
01.01.2018-08.02.2018	**12,553**	20,922
TOTAL	**137,035**	**203,720**

Until 2 May 2017 (Days) *122*
After 2 May 2017 (Days) *243*
*****Until 2 May 4,8 Mwe After 2 May 6,0 MWe*

E.6. Remarks on increase in achieved emission reductions

The actual emission reductions achieved during the monitoring period exceed the estimated values. It is believed that this over-production is due to the following possible reasons;

- The actual landfill gas amount is higher than the calculated values: This is the result of high quality and efficient piping system laid in the waste, professional engineering design and operation, careful waste terracing and low percentage of repairs. Another reason can be the UNFCCC methodologies and formulae, which lead to different results than PP's own calculations. The PP believes that the gas is being collected very efficiently, with minimal escape to the atmosphere.

- Installation of the third, fourth and fifth engine: These 3 engines are installed and started operating, increasing power generation and methane destruction. Therefore, flaring (which leads to a lower emission reduction, compared to power generation) was not needed extensively (in contrast to the previous monitoring period)

E.7. Remarks on scale of small-scale project activity

N/A

ANNEX I - GOLD STANDARD INFORMATION

According to the PDD, two types of parameters are monitored for this Gold Standard project;

i. GHG Emission Reductions: GHG Emission reductions are monitored in accordance with the UNFCCC requirements and the additional conservative approach of the Gold Standard.

ii. Sustainable Development Screen: As required by the rules of the Gold Standard, the choice of indicators is based on the issues that have been highlighted to be important during the sustainable development assessment. These indicators are monitored to ensure the sustainable development contribution of the Project. During the sustainable development assessment, no issues have been highlighted as having a negative impact on sustainable development. The project provides power from a renewable resource and thereby contributes to local economy in various ways. It also creates positive environmental and social impacts, compared to the baseline of energy generation from fossil fuel resources.

Table 12. Summary of monitored parameters

ID number	Data variable	Source of data	Data unit	Way of obtaining data
01	Air quality: SO_2 and NO_x emissions reduced	YEDAŞ, Turkstat	metric tons	Calculation
02	Water quality and quantity: cooling water	YEDAŞ, Turkstat	metric tons	Calculation
	Water quality and quantity: leachate management	Municipality	N/A	Estimation
03	Soil condition: waste terraces	Municipality	N/A	Estimation
	Soil condition: hazardous waste	Municipality	N/A	Estimation
04	Other pollutants: VOC	Flow meters	metric tons	Calculation
05	Quality of employment	Project Owner	N/A	Estimation
06	Access to affordable and clean energy services: avoided fossil fuels	YEDAŞ	metric tons	Calculation
07	Employment (numbers)	Project Owner	N/A	Measurement
08	Balance of payments: reduction of natural gas import	YEDAŞ	metric tons	Calculation
09	Technology transfer	Project Owner	N/A	Estimation

1. Sustainable Development Indicator: 01

No		01
Indicator		Air Quality
Mitigation measure		Reduction of baseline SO_2 and NO_x emissions: The Project, by replacing electricity from fossil fuel combustion and the related fuel consumption, reduces the baseline SO_2 and NO_x emissions from electricity generation. The reductions of SO_2 and NO_x emissions will be calculated by multiplying net electricity generation of the Project activity with the SO_2 and NO_x intensities referred above.
Chosen parameter		a) SO_2 reductions b) NO_x reductions
Current situation of parameter		a) **SO_2 emissions:** The Project's net electricity generation is 65,168,768 kWh, therefore the Project has resulted in a SO_2 reduction of: 65,168,768 kWh * 5.31 kg/MWh *%98.72= 344.34 tons SO_2 b) **NO_x emissions:** The Project's net electricity generation is 65,168,768 kWh, therefore the Project has resulted in an NO_x reduction of: 65,168,768 kWh * 1.65 kg/MWh* %98.72 = 107 tons NO_x Information about the calculation of emission intensities for SO_2 and NO_x are provided below. **Conclusion:** The Project contributes positively to air quality.
Future target for parameter		The Project is expected to reduce the following emission amounts annually: SO_2: 5.31 kg/MWh * 7,920 MWh = 42 t SO_2 NO_x: 1.65 kg/MWh * 7,920 MWh = 13 t NO_x
Way of monitoring	How	Calculation. By multiplying the net electricity generation of the Project with the NO_x and SO_2 emission intensities calculated above.
	When	Every monitoring periods.
	By who	Project owner

2. Sustainable Development Indicator: 02

No	02
Indicator	Water quality and quantity
Mitigation measure	Reduction of discharged cooling water in the baseline and Leachate quality: The Project, by replacing electricity from fossil fuel combustion and the related fuel consumption, reduces the baseline cooling water emissions generated by thermal power plants. The reductions of cooling water emissions will be calculated by multiplying net electricity generation of the Project activity with the ex-ante calculated cooling water intensities. ———
Chosen parameter	Reduction of discharged cooling water

Current situation of parameter		The Project's net electricity generation is 65,168,768 kWh, therefore the Project has resulted in a cooling water reduction of: 23.5 m3/MWh * 65,168,768 kWh*%98.72 = 1,523,913.19 m3 Information about the calculation of cooling water emission intensities: In 2008, 4.45 billion m3 cooling water was discharged by thermal power plants in Turkey. Net electricity generation in 2008 was 189,762 MWh, corresponding to 23.5 m3/MWh discharged cooling water intensity.
Future target for parameter		Estimated discharged cooling water reduction of in the second operational year is: 23.5 m^3/MWh * 7,920 MWh = 186,120 m^3 This amount is expected to increase in forthcoming years.
Way of monitoring	How	Calculation. By multiplying the net electricity generation of the Project with the ex-ante cooling water emission intensities.
	When	Every monitoring period.
	By who	Project owner
Chosen parameter		Leachate management
Current Situation of parameter		Leachate is successfully collected and treated. The Municipality has assigned a third party on site, who is responsible of treating leachate properly. The Municipality has provided a letter confirming that the leachate quality has improved after the Project start.
Future target for parameter		Leachate is successfully collected and treated.
Way of monitoring	How	By collecting information from the Municipality.
	When	Every monitoring period.
	By who	Project owner

3. Sustainable Development Indicator: 03

No		03
Indicator		Soil Condition
Mitigation measure		Waste terracing and prevention of hazardous waste dumping on site
Chosen parameter		Waste terracing: Setting up capping layers in terraces
Current situatior of parameter		Waste terracing is properly done with capping layers.
Future target for parameter		Waste terracing will be properly done with capping layers.
Way of monitoring	How	Visual inspection
	When	Every monitoring period.
	By who	Project owner
Repeat for each parameter		
Chosen parameter		Hazardous waste processing
Current situatior of parameter		No hazardous waste is accepted or processed at the landfill site.
Future target for parameter		The Project will *not* function as a hazardous waste disposal or processing facility (i.e. as a hazardous waste gasification or incineration facility).
Way of monitoring	How	Visual inspection and interviews with stakeholders
	When	Every monitoring period
	By who	Project owner

4. Sustainable Development Indicator: 04

No		04
Indicator		Other Pollutants
Mitigation measure		LFG collection and destruction.
Chosen parameter		Reduction of Volatile Organic Compounds
Current situatior of parameter		The non-methane VOCs are typically roughly 2% of methane emissions. The VOC destruction by combustion or flaring can be expected to be greater than 98%. This leads to the following reductions of VOCs: VOCs Reduced = 25,804,253 m^3 * 2% * 98% = 516,085 m^3
Future target for parameter		Estimated amount of VOC reduction in the second operational year is: 2,490,958 m^3 * 2% * 98% = 48,823 m^3 The amount of methane destroyed is expected to rise in forthcoming years, increasing also the amount of VOCs reduced.
Way of monitoring	How	Calculation. By multiplying the total methane amount that is destroyed with the ex-ante constants for VOC fraction (2%) and combustion VOC destruction percentage (98%).
	When	Every monitoring period.
	By who	Project owner

5. Sustainable Development Indicator: 05

No		05
Indicator		Quality of employment
Mitigation measure		Safe and healthy working conditions
Chosen parameter		a) Relevant health and safety precautions taken, b) Compliance of tasks of the personnel with regulations, and, c) Social security provided to the personnel
Current situation of parameter		All safety equipment is available and used by personnel. No work accident has happened during the monitoring period. Necessary trainings are given to the personnel regarding safety and emergency procedures. The working environment of the personnel on the site do not present health risks or hazardous tasks. The tasks carried out by personnel are in compliance with legal employment and EHS requirements. All of the personnel have social security and they are paid in a timely manner. This Project contributes positively.
Future target for parameter		a) All necessary health and safety precautions will be taken, b) Tasks carried out by the personnel will comply with regulations, and, c) All employees will have social security and will be paid timely.
Way of monitoring	How	Estimated. Qualitative Assessment: By checking training certificates, attendance records and social security records.
	When	Continuously. Details are summarized in *Table 16* and *Table 17*.
	By who	Project owner

6. Sustainable Development Indicator: 06

<table>
<tr><td colspan="2">No</td><td>06</td></tr>
<tr><td colspan="2">Indicator</td><td>Access to affordable and clean energy services</td></tr>
<tr><td colspan="2">Mitigation measure</td><td>N/A</td></tr>
<tr><td colspan="2">Chosen parameter</td><td>Avoided fossil fuel consumption: The Project will generate and supply clean energy to the national grid, improving the carbon intensity of the</td></tr>
<tr><td colspan="2">Current situation of parameter</td><td>Using ex-ante (2008) fuel intensity figures in the host country, the parameter following amounts of fuel consumption are avoided:

Amounts of fuels saved by the Project

<table>
<tr><th>Fuel Type</th><th>Fuel Consumption Intensity (t/GWh, 1000 m³/GWh)</th><th>Avoided Amount (t,1000 m³)</th></tr>
<tr><td>Coal</td><td>395</td><td>2,606</td></tr>
<tr><td>Lignite</td><td>1,586</td><td>27,592</td></tr>
<tr><td>Fuel Oil</td><td>301</td><td>903</td></tr>
<tr><td>Diesel Oil</td><td>493</td><td>55</td></tr>
<tr><td>LPG</td><td>0</td><td>0</td></tr>
<tr><td>Naphta</td><td>243</td><td>4</td></tr>
<tr><td>Natural Gas</td><td>219</td><td>8,982</td></tr>
</table>
The Project contributes positively.</td></tr>
<tr><td colspan="2">Future Target for Parameter</td><td>This parameter corresponds to the following expected fuel avoidance

Expected fuel avoidance due to the Project

<table>
<tr><th>Fuel Type</th><th>Avoided Amount (t,1000 m³)</th></tr>
<tr><td>Coal</td><td>534</td></tr>
<tr><td>Lignite</td><td>5,656</td></tr>
<tr><td>Fuel Oil</td><td>185</td></tr>
<tr><td>Diesel Oil</td><td>11</td></tr>
<tr><td>LPG</td><td>0</td></tr>
<tr><td>Naphta</td><td>1</td></tr>
<tr><td>Natural Gas</td><td>1,841</td></tr>
</table></td></tr>
<tr><td rowspan="3">Way of monitoring</td><td>How</td><td>It is assumed that the net electricity generation during the monitoring period will be distributed among fossil fuels with the same weight as the fossil fuels. These values will be multiplied with the ex-ante fuel consumption intensities given above to find the respective reduction of fossil fuel consumption.</td></tr>
<tr><td>When</td><td>Monthly, by recording EPIAS</td></tr>
<tr><td>By who</td><td>Project owner.</td></tr>
</table>

7. Sustainable Development Indicator: 07

No		07
Indicator		Quantitative employment and income generation
Mitigation measure		New job creation
Chosen parameter		Number of local employees of the Project (last date 08.02.2018)
Current situation of parameter		12
Future target for parameter		Between 20 and 25
Way of monitoring	How	By checking the social security and residence records of the personnel.
	When	Continuously.
	By who	Project owner.

8. Sustainable Development Indicator: 08

No		08
Indicator		Balance of payments and investment
Mitigation measure		Reduction in fossil fuel imports
Repeat for each parameter		
Chosen parameter		Value of the imported natural gas avoided
Current situation of parameter		Using the ex-ante natural gas price of 2.64 USD/MMBtu and the actual electricity generation of 65,168,768 kWh(311,523 MMbtu) , the Project has indirectly caused a natural gas import savings of 1,171,866 USD.
Future target for parameter		Using the ex-ante natural gas price of 3.7 USD/MMBtu and the project is expected to indirectly cause a natural gas import savings of 236,371 USD.
Way of monitoring	How	The avoided natural gas amount will be taken from the indicator "Access to affordable and clean energy services". The energy content of this amount will then be multiplied by the ex-ante natural gas price.
	When	Monthly, by recording EPIAS.
	By who	Project owner.

9. Sustainable Development Indicator: 09

No		09
Indicator		Technology transfer and technological self-reliance
Mitigation measure		Continuous know how sharing with the local team
Chosen parameter		
Current situation of parameter		Local and international experts have provided technical trainings.
Future target for parameter		Local stakeholders and the Municipality will gain information and best practice applications through site visits, training sessions and/or know how contributions made by international experts.
Way of monitoring	How	Interviews with stakeholders.
	When	Continuously.
	By who	Project owner.

ANNEX II – INFORMATION ABOUT MONITORING PARAMETER

Table 15. Definitions of the parameters

Parameter	Definition
$EM_{grid,y}$	Emissions resulting from electricity generation in year y
EG_y	Net electricity delivered to the grid in year y, excluding low cost-must run generation units
ER_y	Emission reductions in year y (tCO2e/yr)
PE_y	Project emissions in year y (tCO2/yr)
BE_y	Baseline emissions in year y (tCO_{2e})
$MD_{project,y}$	The amount of methane that would have been destroyed/combusted during the year, in tonnes of methane (tCH_4) in project scenario
$MD_{BL,y}$	The amount of methane that would have been destroyed/combusted during the year in the absence of the project due to regulatory and/or contractual requirement, in tonnes of methane (tCH_4)
$MD_{flared,y}$	Quantity of methane destroyed by flaring (tCH_4)
$MD_{electricity,y}$	Quantity of methane destroyed by generation of electricity (tCH_4)
$F_{CH4,RG,m}$	Mass flow of methane in the residual gas on a dry basis at reference conditions in the minute *m* (kg)
$w_{CH4,y}$	Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m^3 CH_4/ m^3 LFG)
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream y
$SPEC_{flare}$	Manufacturer's flare specifications for temperature and flow rate
$T_{EG,m}$	Temperature in the exhaust gas of the enclosed flare in minute *m*
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated
$LFG_{flare,y}$	Total amount of gas (under normal conditions of 0° and 1 Atm) flared in year y
$LFG_{biogas,y}$	Total amount of biogas (under normal conditions of 0° and 1 Atm)
$LFG_{electricity,y}$	Total amount of landfill gas (under normal conditions of 0° and 1 Atm) combusted in the generator unit in year y
$LFG_{engine,y}$	Total amount of engine gas (under normal pressure and temperature) captured in year y
CF_{EM}	Correction factor for error margin

Table 16. Health and safety precautions

Checklist	Assessment
Safety equipment is available and sufficient.	Positive. The available safety equipment include safety rope, rescue rope, working clothes, safety shoes, helmets, safety gloves, protective glasses, ear plugs, dust and gas masks, medicine box and fire extinguishers.
Personel use safety equipment continuously and correctly.	Positive. The personnel on site effectively use the required equipment such as the working clothes, safety shoes and helmets, depending on their roles and responsibilities.
The project does not involve hazardous work	Positive. The Project does not involve any activity that is hazardous

No accident has happened during monitoring period.	Positive. There has not been any work accident (i.e. personal injury, first aid etc.) on site during the monitoring period.
Compliance with national health and safety regulations.	Positive. There has not been any incompliance with relevant regulations in the host country.

Table 17. Trainings

Description	Managed / Given By	Participants	Year	Certificate
Occupational Health and Safety Training	ATAC	8 staff 9 staff 11 staff 12 staff	2015* 2016 2017 2018**	Yes

*,** These are not under this monitoring period but all the certificates have been provided to the DOE.

Table 18. Employment Information

Position	Task	Number ofStaff	Employer	How many of them are local people?
Power Plant Manager	Responsible from operational and maintenance activities and management of the plant on site	1	Project Owner	0
Project Administrator	Information flow, document management and project administration	1	Project Owner	0
Maintenance Operator	Routine controls, intervention in case of breakdowns, daily operations.	10	Project Owner	10
Total	12 full-time			11

ANNEX III – EMISSIONS REDUCTIONS TABLE

2016	MDflared,y	CFEM * (LFGflare,y * wCH4,y * DCH4) – (PEflare,y / GWPCH4)	0	tCH4
	*PEflare,y	Σ FCH4,RG,m*(1-ηflare,m)*GWPCH4*10-3	0.0	tCO2e
		FCH4,RG,m = LFGflare * wCH4 * ρCH4	0.00	tCH4
	MDelectricity,y	MDelectricity,y = (LFGlandfill,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4)	2,818.19	tCH4
			70,454.00	**tCO2e**
2017	MDflared,y	CFEM * (LFGflare,y * wCH4,y * DCH4) – (PEflare,y / GWPCH4)	0.00	tCH4
	*PEflare,y	Σ FCH4,RG,m*(1-ηflare,m)*GWPCH4*10-3	284.371	tCO2e
		FCH4,RG,m = LFGflare * wCH4 * ρCH4	11.37	tCH4
	MDelectricity,y	MDelectricity,y = (LFGlandfill,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4)	6,292.24	tCH4
			157,306.00	**tCO2e**
2018	MDflared,y	CFEM * (LFGflare,y * wCH4,y * DCH4) – (PEflare,y / GWPCH4)	0.00	tCH4
	*PEflare,y	Σ FCH4,RG,m*(1-ηflare,m)*GWPCH4*10-3	98.75	tCO2e
		FCH4,RG,m = LFGflare * wCH4 * ρCH4	3.950	tCH4
	MDelectricity,y	MDelectricity,y = (LFGlandfill,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4)	987.27	tCH4
			24,681.00	**tCO2e**
Total	MDflared,y	CFEM * (LFGflare,y * wCH4,y * DCH4) – (PEflare,y / GWPCH4)	-	tCH4
	*PEflare,y	Σ FCH4,RG,m*(1-ηflare,m)*GWPCH4*10-3	383.12	tCO2e
		FCH4,RG,m = LFGflare * wCH4 * ρCH4	15.32	tCH4
	MDelectricity,y	MDelectricity,y = (LFGlandfill,y * wCH4,y * DCH4) - (LFGbiogas,y * wCH4,y * DCH4)	10,097.70	tCH4
			252,441.00	**tCO2e**

*flare temperature has not been monitored and as previously indicated that the flare efficiency is being taken as zero therefore there cannot be any methane destruction b

MDflared,y	-	tCH4
MDelectricity,y	252,441.00	tCH4
Project Emission	383.12	tCH4
BE,y	**252,057.88**	**tCO2e**

Crediting Period		**16/04/2016-08/02/2018**	
	Emission Reduction from Methane Destruction (tCO2e)	**Emission Reduction from Electricity Generation (tCO2e)**	**Overall Emission Reduction (tCO2e)**
16.04.2016 - 31.12.2016	70,454	10,555	81,009
01.01.2017 - 31.12.2017	157,306	22,227	179,533
01.01.2018 - 08.02.2018	24,681	3,235	27,916
TOTAL	**252,441**	**36,017**	**288,458**

	Baseline emissions or baseline net GHG removals by sinks (t CO2e)	**Project emissions or actual net GHG removals by sinks (t CO2e)**	**Leakage (t CO2e)**	**Emission reductions or net anthropogenic GHG removals by sinks (t CO2e)**
16.04.2016 - 31.12.2016	81,009	0	0	81,009
01.01.2017 - 31.12.2017	179,533	284	0	179,248
01.01.2018 - 08.02.2018	27,916	99	0	27,817
TOTAL	**288,458**	**383**	-	**288,074**

Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.