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	Wonju Landfill Gas Recovery Project for Electricity Generation	
UNFCCC reference number of the project activity	10379	
Version number of the PDD applicable to this monitoring report	Version 3.1	
Version number of this monitoring report	Version 1.0	
Completion date of this monitoring report	03/09/2020	
Monitoring period number	3rd monitoring period	
Duration of this monitoring period	01/07/2019~30/06/2020 (366days)	
Monitoring report number for this monitoring period	N/A	
Project participants	NEWGEN ELECTRICS Co., Ltd. ROEN consulting Co., Ltd.	
Host Party	Republic of Korea	
Applied methodologies and standardized baselines	Applied methodologies: - AMS I. D: Grid connected renewable electricity generation_V18.0 - AMS Ⅲ. G: Landfill methane recovery_V09.0 No standardized baseline applicable.	
Sectoral scopes	- Scope 1. Energy industry - Scope 13. Waste handling and disposal	
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 from 1 January 2013
	-	15,727 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	Total amount of estimated in PDD for this monitoring period: 15,774 tCO_2e (Amount estimated in PDD for 2019: 7,621 tCO_2e Amount estimated in PDD for 2020: 8,153 tCO_2e) * 2019:184 days, 2020: 182 days, Total: 366 days	

SECTION A. Description of project activity

A.1. General description of project activity

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Wonju Landfill Gas Recovery Project for Electricity Generation (hereafter referred to as the "Project") developed by NEWGEN ELECTRICS Co., Ltd. (hereafter referred to as "NEWGEN") is a landfill gas (LFG) recovery for power generation project at Wonju City Waste Comprehensive Treatment Complex (hereafter referred to as "Wonju landfill") in Wonju City, Gangwon Province, Republic of Korea.

Wonju landfill has been landfilled since 1995 and is scheduled to be landfilled by 2031. The objective of this project is to capture LFG and generate electricity. The project is aimed at reducing atmospheric emissions of methane, a greenhouse gas (GHG) which contributes to global warming and climate change.

The purpose of the project and the measures taken to reduce greenhouse gas emission

The objective of this project is to capture LFG and generate electricity. The project is aimed at reducing atmospheric emissions of methane, a greenhouse gas (GHG) which contributes to global warming and climate change.

Prior to this proposed project, significant amount of LFG generated at the Wonju landfill was released to atmosphere even though the LFG is captured partially and combusted by the simple incineration facility. The project captures the LFG that would have been released to the atmosphere without the project activity and generates electricity with the LFG. The generated electricity was transmitted to the grid of Korea Electric Power Corporation (hereinafter referred to as the KEPCO grid) which is a company in charge of exclusively managing the grid of Republic of Korea.

Description of the installed technology and equipment

The main process of the project is a landfill gas collecting system, a landfill gas pre-treatment system and an electricity generation system. The project involves the installation of a highly efficient collecting, transmitting and pre-treatment system and four electricity generators. The four generators installed with total capacity of 0.98MW (0.170MWx3set, 0.470MWx1set).

2 or 3 of the four generators are operated depending on the amount of the gas, the CH_4 concentration, the condition of the generator, and the seasonal conditions. In addition, all generators are always maintained at regularly and operated alternately according to the maintenance status.

The project activity is significantly contributing to a reduction in GHG emissions while at the same time improving local air quality and mitigating some of the existing environmental impacts affecting people working and/or living in the vicinity of the landfill sites.

Total emission reduction achieved in this monitoring period

Total GHG emission reductions in this monitoring period (01/07/2019-30/06/2020) are 15,727 tCO_2e.

The relevant dates for the project activity

<Table A-1> Operation activity

Date	Project Schedule
07/06/2016	Permission from generation business
17/10/2016	Began commercial operation
03/11/2016	Completed pre-operational inspection (commercial operation and selling electricity) check of generation equipment)
16/12/2016	Reported of opening a business
01/06/2017	Registered as a CDM project

A.2. Location of project activity

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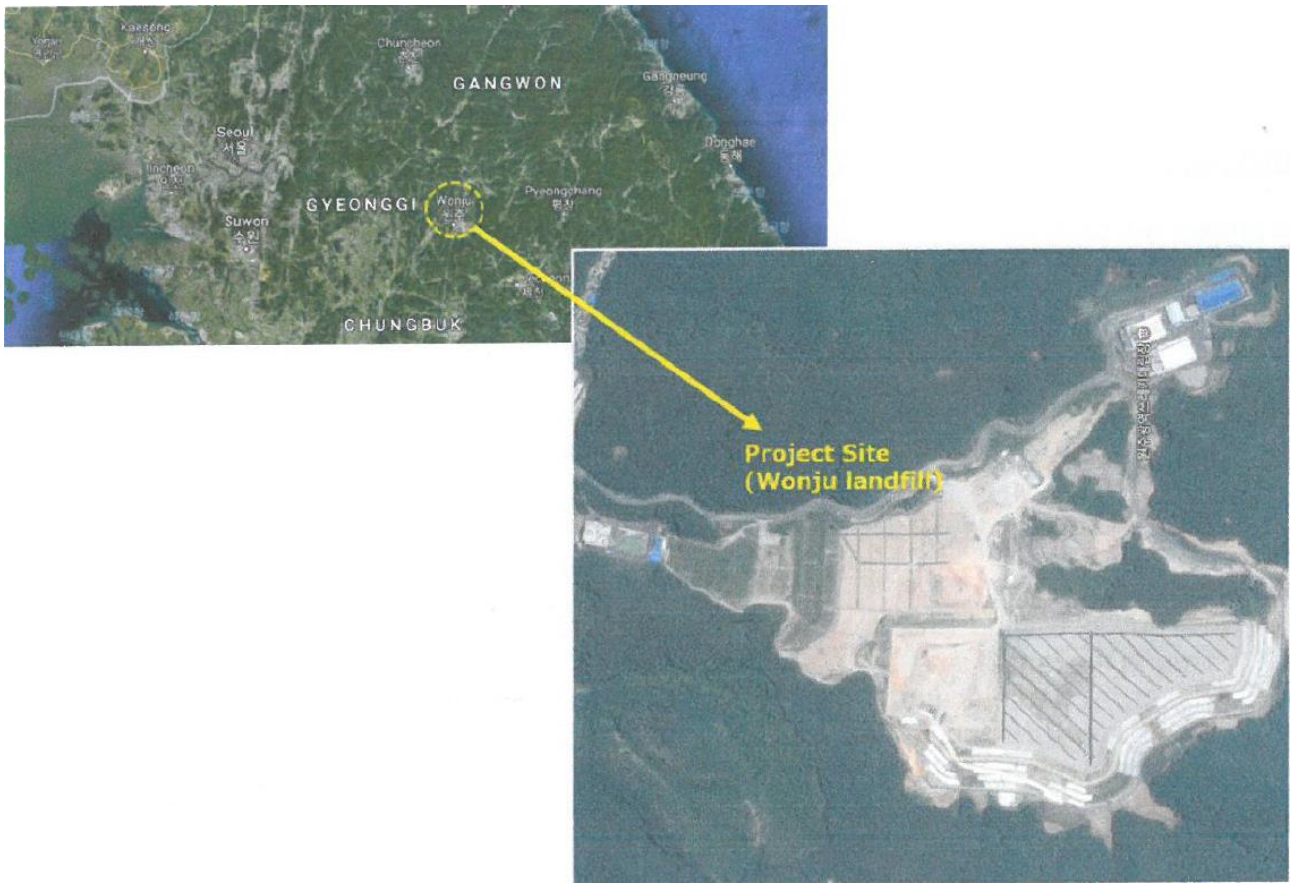
Host Party(ies)	Republic of Korea
Region/State/Province, etc.	Gangwon-do
City/Town/Community, etc.	Wonju city

The site of the "Wonju Landfill Gas Recovery Project for Electricity Generation" is located in San 185, Saje-ri, Heungeop-myeon, Wonju-city, Gangwon-do, Republic of Korea. The facilities and equipment were installed inside the Wonju landfill. The coordinates are latitude of North 37.327570˚ and longitude of East 127.869777˚.



<Figure A-1> Location of project site

A.3. Parties and project participants

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Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea(host)	NEWGEN ELECTRICS Co., Ltd. ROEN consulting Co., Ltd.	No

A.4. Reference to applied methodologies and standardized baselines

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This project is a small-scale project activity and conforms to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.
According to Annex A of the Kyoto Protocol, this project fits in sectoral categories:
1. Energy Industry, and;
13. Waste Handling and Disposal

Type

- I – Renewable energy projects and category
- III – Other project activities and category

Methodology

The approved small-scale CDM baseline methodologies;
- AMS- I.D “Grid connected renewable electricity generation” (Version 18)
- AMS-III.G “Landfill methane recovery” (Version 09.0)

Reference

- ACM0001 “Flaring or use landfill gas” (Version 17.0)

Tools Used

- “Emissions from solid waste disposal sites” (Version 08.0)
- “Tool to calculate the emission factor for an electricity system” (Version 05.0)
- “Project emissions from flaring” (Version 03.0)

A.5. Crediting period type and duration

>>

Start date: 01/06/2017
Length of crediting period: 7 years (Renewable)
Crediting period: 01/06/2017-31/05/2024

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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Installation of 0.98MW generator was completed and started commercial operation in 17/10/2016. The CDM project monitoring activity has been started since 01/06/2017. It is registered date for CDM project.

The LFG collecting equipment installed on site is described in the revised PDD. The main component is the gas collecting system.

<Figure B-1> The gas analyzer

<Figure B-2> The gas flow meter

<Figure B-3>
The watt-hour meter (exported)

<Figure B-4>
The watt-hour meter (imported)

Due to the error of equipment, there were several generator shutdowns but there was no significant event affecting the amount of reduction during the monitoring period. In addition, any regulation or policy has not changed that could affect the normal operation of the project or the applicability of the methodology.

There were several monitoring equipment maintenances but no significant malfunction was carried out in accordance with the revised PDD. In addition, the monitoring is compliant with the monitoring plan as described in “Operating Manual-Wonju LFG Power Plant related CDM project”.

Based on “Operating Manual-Wonju LFG Power Plant related CDM project”, if monitoring system error occurs, the flow rate and CH_4 concentration were recorded by hourly work log. In addition, if the result of the zero-span test of gas analyzer is larger than the maximum permissible error (Rel. 5%), the measured CH_4 concentration during the monitoring period should be applied the conservative value. In this monitoring period, there is no adjusted value about the zero-span test.

The details of operation events during this monitoring period are as follows;

<Table B-1> Operation events history

Date	duration		Operation events	Note
24/07/2019	09:00-12:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
21/08/2019	11:00-12:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
27/08/2019	15:00-16:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
03/09/2019	09:00-23:59	15hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
04/09/2019	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
05/09/2019	00:00-14:00	14hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
07/09/2019	21:00-23:59	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
08/09/2019	00:00-06:00	6hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/09/2019	09:00-10:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
26/09/2019	16:00-17:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
27/09/2019	11:00-19:00	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
30/09/2019	11:00-19:00	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
01/10/2019	10:00-19:00	9hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
04/10/2019	09:00-18:00	9hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
03/11/2019	00:00-01:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/11/2019	05:00-08:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
11/11/2019	00:00-06:00	6hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work

				log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
25/11/2019	10:00-21:00	11hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
26/11/2019	09:00-19:00	10hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
27/11/2019	14:00-15:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
28/11/2019	12:00-17:00	5hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
04/12/2016	11:00-20:00	9hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
06/12/2019	15:00-17:00	2hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
09/12/2019	16:00-18:00	2hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/12/2019	13:00-22:00	9hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
12/12/2019	14:00-15:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
16/12/2019	15:00-20:00	5hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
17/12/2019	12:00-20:00	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
18/12/2019	08:00-14:00	6hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
22/12/2019	10:00-23:59	14hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
23/12/2019	01:00-18:00	17hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
26/12/2019	14:00-17:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
29/12/2019	11:00-12:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
07/01/2020	12:00-23:59	12hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for

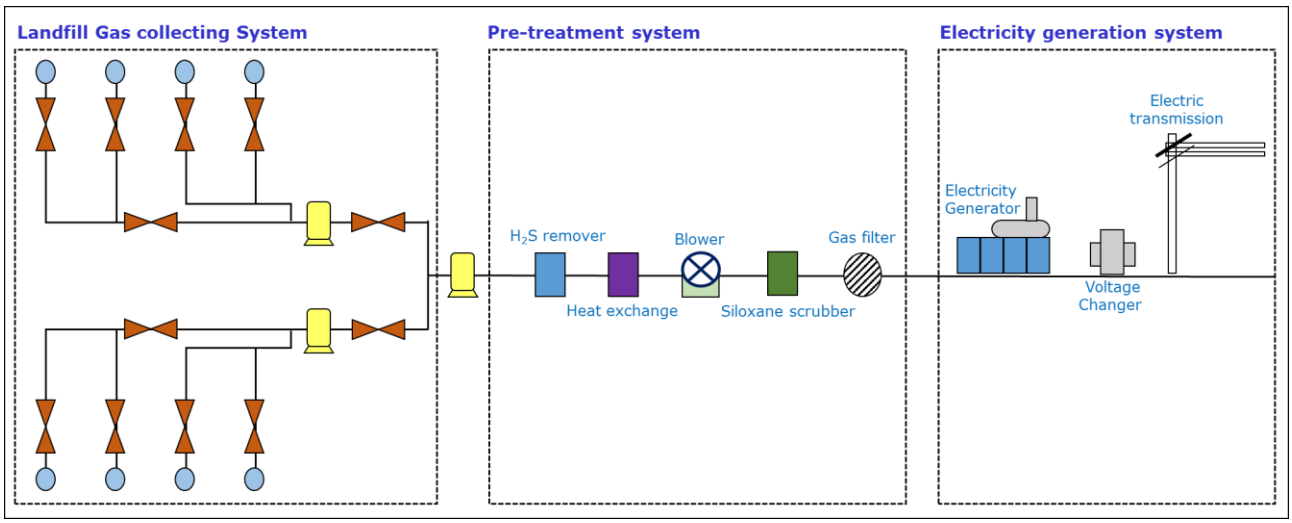
				estimation of emission reduction
08/01/2020	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
09/01/2020	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/01/2020	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
11/01/2020	00:00-15:00	15hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
13/01/2020	15:00-19:00	4hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
14/01/2020	10:00-15:00	4hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
15/01/2020	16:00-23:59	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
16/01/2020	00:00-15:00	15hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
17/01/2020	12:00-14:00	2hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
21/01/2020	11:00-16:00	5hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
29/01/2020	10:00-15:00	4hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
03/02/2020	17:00-19:00	2hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
17/02/2020	10:00-13:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
18/02/2020	16:00-23:59	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
19/02/2020	00:00-15:00	15hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
20/02/2020	10:00-18:00	8hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
21/02/2020	00:00-11:00	11hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction

03/03/2020	11:00-20:00	9hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
04/03/2020	07:00-10:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
08/03/2020	03:00-04:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/03/2020	20:00-23:59	4hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
11/03/2020	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
12/03/2020	00:00-23:59	24hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
13/03/2020	00:00-13:00	13hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
17/03/2020	12:00-13:00	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
	18:00-19:00	1hr		
25/03/2020	11:00-17:00	6hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
09/04/2020	23:00-23:59	1hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
10/04/2020	00:00-11:00	11hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
12/04/2020	08:00-23:59	16hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
17/04/2020	11:00-13:00	2hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction
	18:00-20:00	2hr		
28/04/2020	16:00-19:00	3hr	Monitoring system error	The flow rate and CH_4 concentration are not available due to monitoring system error → Keep an hourly work log on the flow rate and CH_4 concentration. Included for estimation of emission reduction

The description of the technology

The main process of the project is a landfill gas collecting system, a landfill gas pre-treatment system and an electricity generation system. The best available technology for each process of collecting and recycling LFG effectively is adopted into this project.

The main features of the LFG facilities are presented below.



<Figure B-6> The main process of the this project

Landfill Gas Collecting System

The landfill gas collection system consists of the following elements

- Vertical gas wells that extract the landfill gas from the landfill;
- Gas pipes that collect and transport the extracted gas to the power plant;
- Blowers which draw the gas from the wells through the collecting system;
- Siloxane scrubber to remove siloxane in gas and then the gas deliver it to gas fuelled power generation.

The type of LFG collecting system is expected to enhance maintenance and LFG collecting efficiency because vertical collecting system has higher collecting efficiency and is easier to maintain and repair system compared to the horizontal collecting system.

Landfill Gas Pre-treatment System

Prior to combustion in the power generation units, the LFG was treated in a pre-treatment unit: to remove condensed water by using the Condensation Separate Vessel (CSV) tank, removing sulfur through the desulfurization and also removing the moisture of the gas through a heat exchanger. And then after removing dust and siloxane in gas filter put it into the generator.

Condensation Separate Vessel (CSV)	Condensed water removal
▼	
H_2S remover	Desulfurization
▼	
Exchange and Chiller	Gas temperature control/water removal
▼	
Blower	Gas Inhalation into the generator
▼	
Siloxane scrubber	Siloxane removal
▼	
Gas Filter	Dust removal

<Figure B-7> The process of pre-treatment system

Generation System

This project is originally designed to install the four generators with total capacity of 0.98MW (0.245MWx4set) inside the Wonju landfill. But among them 1st, 2nd, 4th generators capacity were downgraded in 0.17MW, 3rd generator was changed to the new one with the capacity of 0.47MW. But, the total capacity of the generators remains unchanged. The collected LFG is sent to the generator and the electricity generated is exported to the grid-connected system of the Korea Electric Power Corporation (KEPCO) supply system.

<Table B-2> The technical data of power generator based on full load

1st 2nd 4th	Engine	Engine manufacture	Doosan Infracore Co., Ltd.
		Model	GV180TI
		Engine Type	V-type 4 cycle, water cooled Turbo charged & intercooled (water to air)
	Generator	Generation set manufacture	HANATECH
		Model	BDS-170
		Type	Container Type Landfill Gas
		Maximum Electrical Power Output (kW)	170
		Voltage (V)	380
		Frequency (Hz)	60
		Speed (rpm)	1,800
3rd	Engine	Engine manufacture	Baudouin
		Model	12M26D660E301NG
		Engine Type	Turbocharged & Air-to-Air Aftercooled
	Generator	Generation set manufacture	HANATECH
		Model	BBS-470
		Type	Container Type Landfill Gas
		Maximum Electrical Power Output (kW)	470
		Voltage (V)	380
		Frequency (Hz)	60
		Speed (rpm)	1,800

B.2. Post-registration changes

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

>>
N/A

B.2.2. Corrections

>>
N/A

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

>>
N/A

B.2.4. Inclusion of monitoring plan

>>
N/A

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

>>
N/A

B.2.6. Changes to project design

>>

No change have applied to this monitoring.

Changes to project design of registered project activity has applied 2nd monitoring period.
Approval date and ref. No.: 09 Jul. 2020 (Effective approval date: 09 Jul. 2020)
(ref. No. PRC-10379-002)
After the registration of the project, there were few changes in this monitoring period. The changes were carried out in the revised PDD version 3.1, and the main changes to the registered project were as follows;

1) Changes of project design.
The construction for extension of the pipeline was conducted in order to capture methane from the Wonju landfill which including whole amount of waste. The above changes mentioned are available in the revised PDD version 3.1 at section appendix 7, A.1 and B.6.3.

2) The changes of plant generator
The revised PDD version 3.1 includes the change of the information regarding power-plant generator in section A.3 as below;

The four generators installed with a total capacity of 0.98MW (0.245MWx4set). 2 or 3 of the four generators are operated alternately depending on the amount of the gas, the CH_4 concentration, the condition of the generator, and the seasonal conditions. Among them 1st, 2nd, 4th generators capacity were downgraded in 0.17MW, 3rd generator was changed to the new one with the capacity of 0.47MW. But, the total capacity of the generators remains unchanged.

In order to maintain a total capacity in the PDD, the capacity of the three generators was down-graded under the manufacturer even though the capacity of the 3rd generator has been changed with higher capacity (0.245MW→0.47MW). For this reason, the name-tag of existing generators and now generators have been changed, in accordance with “CLEAN AIR CONSERVATION ACT”, project participant got the “Permission to install air discharge facility (notification)” from the government.

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

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N/A

SECTION C. Description of monitoring system

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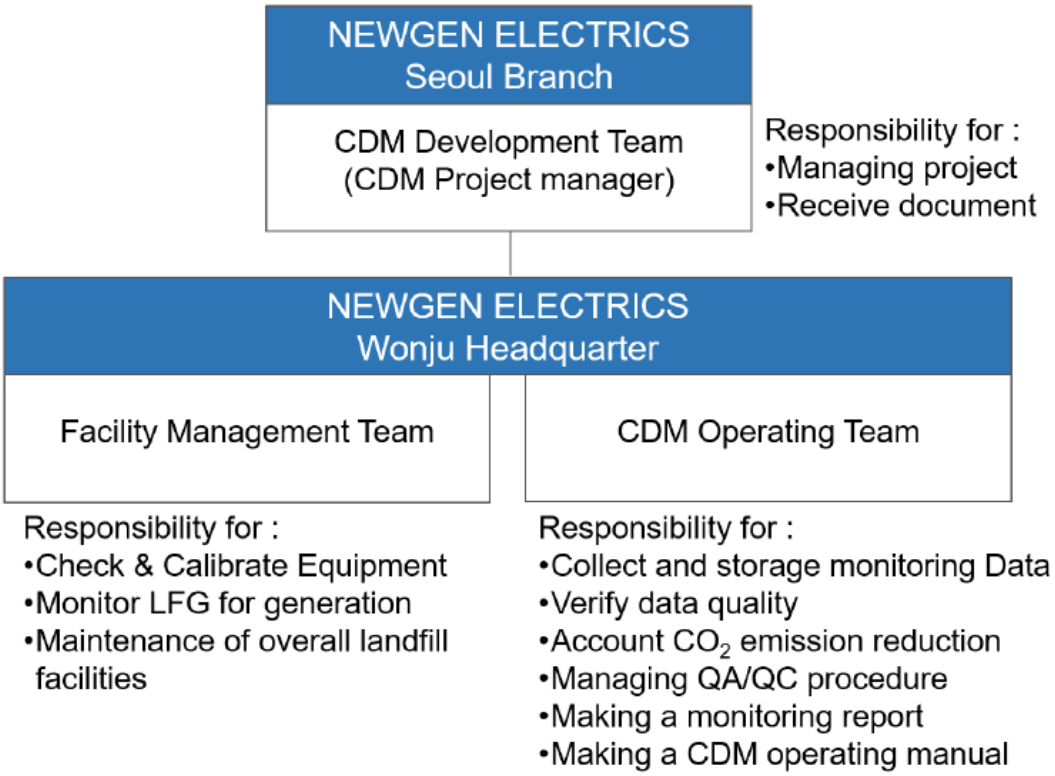
Monitoring data and parameters are monitored and their measurement method is referred to "Operating Manual-Wonju LFG Power Plant related CDM project". The relevant document has been submitted to the DOE. Data and parameters are provided in Section D.

Monitoring organization and the role of each party

The following figure describes the operation and management structure for monitoring of the project activity. The following table shows the responsible party for each task of monitoring.



<Figure C-1> The structure of monitoring system

<Table C-1> The responsible party for each task of monitoring

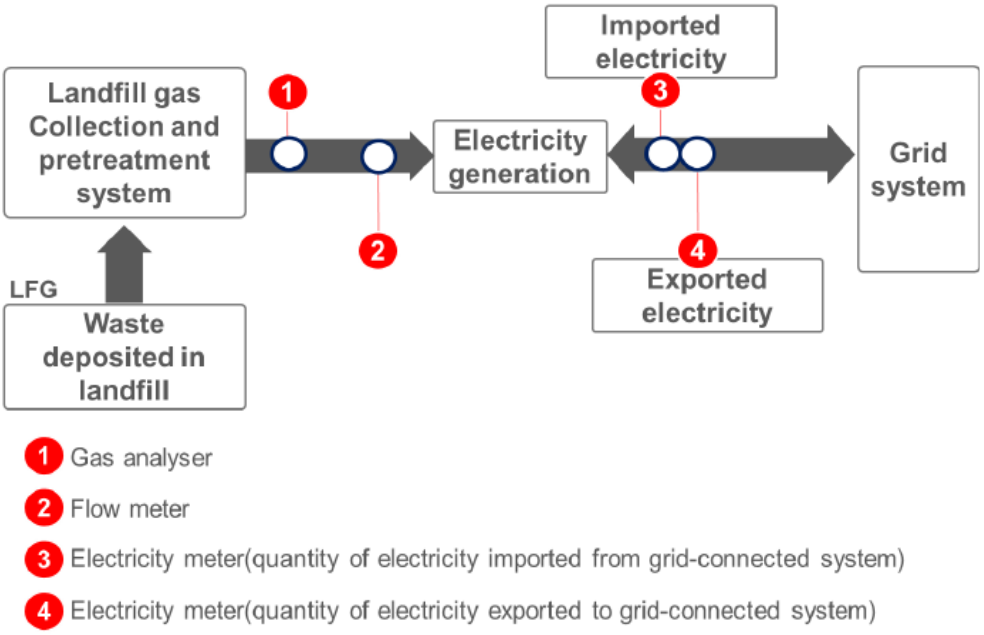
Item	Sub-item	Responsible person
Measure & Archive	$EG_{PJ,facility,y}$	CDM Operating Team
	$LFG_{i,y}$	
	$W_{CH4,y}$	
Measuring instrument check & Calibration	Centralized monitoring system	Facility Management Team
	Flow meter	
	Gas analyzer	
	Electricity meters	Facility Management Team Korea Electric Power Corporation
Establish monitoring plan		CDM Operating Team
Monitoring report		CDM Operating Team

The monitoring equipment to measure the amount of methane and electricity

- Gas flow meter is installed between the blower and generating facility to measure LFG flow amount, automatically corrected temperature and pressure.

- CH_4 analyzer is located before the above flow meter to measure the fraction of methane in LFG volume fed into the gas engine. That was carried out close to the location in the system where the LFG flow, temperature and pressure measurements take place, and at the same humidity content basis.

- Electricity meters are installed behind the generator and sealed up after affirmation of KEPCO.



<Figure C-2> The Location of the Monitoring facilities

Quality control (QC) and quality assurance (QA) procedures

LFG CDM Project manager is the responsible person for quality management, which ensures the quality and accuracy of the measured data. For quality management, the following items are included: data records and storage, equipment calibration and maintenance, corrective action and emergency procedures for unintended emissions.

- The amounts of the quantity of electricity exported (a) by the project plant and the imported (b) to the project is measured by each certified meter. The quantity of exported electricity (a) is reported by KEPCO meterman visiting at once a month the Wonju landfill. The measured data (b) are transferred to KEPCO and are checked and achieved monthly in electronic way by Wonju CDM Operating team.

- Gas flow meter are subject to a regular maintenance and testing regime to ensure accuracy according to “Operating Manual-Wonju LFG Power Plant related CDM project”.

- CH_4 analyzer is subject to a regular maintenance and testing regime to ensure accuracy according to “Operating Manual-Wonju LFG Power Plant related CDM project”

- Electricity meters are subject to a regular maintenance and testing to ensure accuracy. The calibration frequency of the meters measuring electricity exported to the grid and imported from the grid was in accordance with the “ENFORCEMENT DECREE OF MEASURES ACT”

Data records and storage

The measured data is archived in electronic file or documented in paper.
All data must be accurate and must be kept for at least two years after the end of the final crediting period or the last issuance of CERs, whichever occurs later. CDM operating team should check them continuously.

Equipment calibration and maintenance

Calibration of equipment consists of verifying, by comparison with a standard, the accuracy of a measuring instrument. Measuring instruments were periodically and appropriately calibrated according to the procedures, timing and methods recommended by the manufacturer, or national/international standards, as available.

- Gas flow meter are subject to a regular maintenance and testing regime to ensure accuracy according to “Operating Manual-Wonju LFG Power Plant related CDM project”.

- CH_4 analyzer is subject to a regular maintenance and testing regime to ensure accuracy according to “Operating Manual-Wonju LFG Power Plant related CDM project”.

- Electricity meters are subject to a regular maintenance and testing to ensure accuracy. The calibration frequency of the meters measuring electricity exported to the grid and imported from grid will be in accordance with the “ENFORCEMENT DECREE OF MEASURES ACT”.

Corrective action

LFG plant manager will report all issues and data related to plant operation to LFG CDM project manager (CDM Operating Team). Operation review, internal audit and corrective action are carried out by CDM Operating Team according to the “Operating Manual-Wonju LFG Power Plant related CDM project”.

Emergency procedure

In case of emergency situation, proper action is carried out to minimize damage in accordance with “Operating Manual-Wonju LFG Power Plant related CDM project”.

Training

Employees involved in the monitoring took the training on the overall CDM project activity.
Trainings for emissions trading scheme, the monitoring and operation was done by experts (from consulting company) and LFG CDM project manager of headquarter on 28/11/2019.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

>>

Data / Parameter	D_{CH4}
Unit	tCH_4/m^3CH_4
Description	Methane density
Source of data	"Tool to determine project emissions from flaring" Version 02 (EB 68 Annex 15)
Value(s) applied	0.0007168
Choice of data or Measurement methods and procedures	At standard temperature and pressure (0 degree Celsius and 1.013bars), the density of methane is 0.0007168 t/m^3
Purpose of data	Estimated as baseline emissions
Additional comment	-

Data / Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data	Decisions under the UNFCCC and the Kyoto Protocol (a value of 25 is to be applied for the second commitment period of the Kyoto Protocol) As per EB 69 Report Annex 3 and IPCC 2007 - Climate Change 2007: Working Group I: The Physical Science Basis (Contribution to Fourth Assessment Report of IPCC), Chapter 2, Table 2.14
Value(s) applied	25
Choice of data or Measurement methods and procedures	Default Global Warming potential of Methane
Purpose of data	Estimated as baseline emissions Calculation of project emissions
Additional comment	-

Data / Parameter	OX
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value "Emissions from solid waste disposal sites" version 08.0
Purpose of data	Estimated as baseline emissions
Additional comment	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2. This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS.

Data / Parameter	$EG_{m,y}$
Unit	MWh
Description	Net quantity of electricity generated and delivered to the grid by power unit m in year y
Source of data	"2013~2015 Statistics of Electric Power in Korea"
Value(s) applied	-
Choice of data or Measurement methods and procedures	$EG_{m,y}$ should be determined either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)
Purpose of data	Estimated as baseline emissions Calculation of project emissions
Additional comment	-

Data / Parameter	$FC_{i,m,y}$
Unit	Mass or volume unit
Description	Amount of fuel type i consumed by power unit m in year y
Source of data	"2013~2015 Statistics of Electric Power in Korea"
Value(s) applied	-
Choice of data or Measurement methods and procedures	$FC_{i,m,y}$ should be determined either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)
Purpose of data	Estimated as baseline emissions Calculation of project emissions
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fuel type i in year y
Source of data	The following data sources may be used if the relevant conditions apply: Data source / Conditions for using the data source: Values provided by the fuel supplier of the power plants in invoices — If data is collected from power plant operators (e.g. utilities) Regional or national average default values — If values are reliable and documented in regional or national energy statistics/ energy balances IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories As per "2013~2015 Statistics of Electric Power in Korea" provided by KEPCO, $NCV_{i,y}$ values provided by the national energy statistics
Value(s) applied	values provided by the national energy statistics
Choice of data or Measurement methods and procedures	$NCV_{i,y}$ should be determined either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)
Purpose of data	Estimated as baseline emissions Calculation of project emissions
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of fuel type i used in power unit m in year y
Source of data	"Tool to calculate the emission factor for an electricity system" Version 05.0 The following data sources may be used if the relevant conditions apply: Data source / Conditions for using the data source: Values provided by the fuel supplier of the power plants in invoices — If data is collected from power plant operators (e.g.utilities) Regional or national average default values — If values are reliable and documented in regional or national energy statistics/energy balances IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories Emission factor by fuel in "Guideline for the greenhouse gas target management system(2016.12.30)", $EF_{CO2,i,y}$ values provided by the national average default values
Value(s) applied	National average default values
Choice of data or Measurement methods and procedures	$EF_{CO2,m,i,y}$ is determined either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)
Purpose of data	Estimated as baseline emissions
Additional comment	-

Data / Parameter	$EF_{OM,y}$
Unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for the project electricity system in year y
Source of data	"2013~2015 Statistics of Electric Power in Korea"
Value(s) applied	0.7403
Choice of data or Measurement methods and procedures	The simple OM method is used to calculate EF_{OM} in accordance with the guidance of AMS-I.D, which allows the above method where low-cost/must-run resources constitute less than 50% of total grid generation. The generating sources do not include low-cost and must-run plant in conformity with the direction of AMS-I.D EF_{OM} is calculated using the data for the most recent 3 years (2013-2015) for which data are available at time of this PDD submission, and fixed for the crediting period.
Purpose of data	Estimated as baseline emissions
Additional comment	-

Data / Parameter	$EF_{BM,y}$
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor for the project electricity system in year y
Source of data	"2013~2015 Statistics of Electric Power in Korea"
Value(s) applied	0.5644

Choice of data or Measurement methods and procedures	EF_{BM} is calculated ex ante based on the most recent information available on plants already built for sample group at this PDD submission. According to AMS-I.D, the sample group consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently. In this project, the latter is selected because project participant has to select the sample group that comprise the larger annual generation in guidance with the direction of AMS-I.D the value EF_{BM} is fixed for the crediting period.
Purpose of data	Estimated as baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,y}$
Unit	tCO_2/MWh
Description	CO_2 emission factor of the grid electricity in year y
Source of data	Calculated
Value(s) applied	0.6523
Choice of data or Measurement methods and procedures	The baseline emission factor ($EF_{grid,y}$) is calculated as the weighted average of the simple OM emission factor ($EF_{grid,OM,y}$) and the BM emission factor ($EF_{grid,BM,y}$). By default, both margins have equal weights (50%)
Purpose of data	Estimated as baseline emissions
Additional comment	-

D.2. Data and parameters monitored

>>

Data/Parameter	$W_{CH4,y}$
Unit	%, volume basis (m^3 CH_4/m^3 LFG)
Description	Methane content in landfill gas in the year y
Measured/calculated/default	Measured
Source of data	Measured by using a methane analyzer (measuring methane content directly)
Value(s) of monitored parameter	**Date**: 01/07/2019-30/06/2020; **Measured CH_4 (%) (Weighted average CH_4 concentration)**: 42.680
Monitoring equipment	Serial No: 34001096; Accuracy level: Rel. 5%; Type: stationary gas analyzer; Calibration frequency: 3 years; Date of last calibration: 04/09/2019; Validity: 03/09/2022
Measuring/reading/recording frequency	Measuring frequency: continuously Recording frequency: hourly
Calculation method (if applicable)	Weighted average CH_4 concentration
QA/QC procedures	Gas analyzer was subject to maintenance and calibration according to manufacturer recommendations. Zero-span test was accomplished by means of reference gas (mixture calibration gas) bottles, which was available at the plant.
Purpose of data/parameter	Calculation of baseline emissions (ex post)
Additional comments	The methane content measurement is carried out close to the location in the system where the landfill gas flow, temperature and pressure measurements take place, and at the same humidity content basis.

Data/Parameter	$LFG_{i,y}$
Unit	m^3
Description	Landfill gas destroyed via combustion in power plant in year y
Measured/calculated/default	Measured
Source of data	Measured by using gas flow meter.

Value(s) of monitored parameter

Date	**$LFG_{i,y}$**
01/07/2019-31/07/2019	256,961.000
01/08/2019-31/08/2019	267,442.000
01/09/2019-30/09/2019	221,587.000
01/10/2019-31/10/2019	276,414.000
01/11/2019-30/11/2019	257,550.000
01/12/2019-31/12/2019	224,275.000
01/01/2020-31/01/2020	201,512.000
01/02/2020-29/02/2020	194,310.000
01/03/2020-31/03/2020	189,693.000
01/04/2020-30/04/2020	178,119.000
01/05/2020-31/05/2020	217,763.000
01/06/2020-30/06/2020	205,812.000
01/07/2019~30/06/2020	**2,691,438.000**

Monitoring equipment	<table><tr><th>Tag</th><th>$LFG_{i,y}$</th></tr><tr><td>Serial No</td><td>K-1609083</td></tr><tr><td>Accuracy level</td><td>±0.5% of F.S</td></tr><tr><td>Type</td><td>Gas Flow Meter</td></tr><tr><td>Calibration frequency</td><td>3 years</td></tr><tr><td>Date of last calibration</td><td>04/09/2019</td></tr><tr><td>Validity</td><td>03/09/2022</td></tr></table> The LFG combusted in power plant is monitored by a continuous thermal gas mass flow meter, the readings is compensated for normal pressure and temperature values.
Measuring/reading/recording frequency	Measuring frequency: continuously Recording frequency: hourly
Calculation method (if applicable)	Not applied
QA/QC procedures	The gas flow meter is subject to a regular maintenance and testing, to ensure accuracy. The gas flow meter e subject to maintenance and calibration according to is manufacturer recommendations.
Purpose of data/parameter	Calculation of baseline emissions (ex post)
Additional comments	-

Data/Parameter	$EG_{PJ,facility,y}$
Unit	MWh
Description	Total amount of net electricity exported to grid-connected system.
Measured/calculated/default	Measured
Source of data	Electricity meter records
Value(s) of monitored parameter	(a) the quantity of electricity exported by the project plant/unit to the grid <table><tr><th>Date</th><th>Measured $EG_{PJ,facility,y}$ (MWh)</th></tr><tr><td>01/07/2019-31/07/2019</td><td>246.506</td></tr><tr><td>01/08/2019-31/08/2019</td><td>273.528</td></tr><tr><td>01/09/2019-30/09/2019</td><td>233.100</td></tr><tr><td>01/10/2019-31/10/2019</td><td>272.297</td></tr><tr><td>01/11/2019-30/11/2019</td><td>237.823</td></tr><tr><td>01/12/2019-31/12/2019</td><td>182.506</td></tr><tr><td>01/01/2020-31/01/2020</td><td>183.982</td></tr><tr><td>01/02/2020-29/02/2020</td><td>157.399</td></tr><tr><td>01/03/2020-31/03/2020</td><td>152.899</td></tr><tr><td>01/04/2020-30/04/2020</td><td>140.796</td></tr><tr><td>01/05/2020-31/05/2020</td><td>179.777</td></tr><tr><td>01/05/2020-30/06/2020</td><td>167.566</td></tr><tr><td>01/07/2019~30/06/2020</td><td>2,428.179</td></tr></table>

(b) the quantity of electricity imported to the project plant/unit from the grid

Date	Measured $EG_{PJ,facility,y}$ (MWh)
01/07/2019-14/07/2019	0.007
15/07/2019-14/08/2019	0.021
15/08/2019-14/09/2019	0.108
15/09/2019-14/10/2019	0.734
15/10/2019-14/11/2019	0.114
15/11/2019-14/12/2019	0.972
15/12/2019-14/01/2020	1.030
15/01/2020-14/02/2020	0.317
15/02/2020-14/03/2020	1.295
15/03/2020-14/04/2020	0.216
15/04/2020-14/05/2020	0.101
15/05/2020-14/06/2020	0.122
15/06/2020-30/06/2020	0.122
01/07/2019~30/06/2020	**5.159**

- The quantity of imported electricity (b) in (01/07/2019-14/07/2019) and (15/06/2020-30/06/2020) were confirmed to be 0.007MWh and 0.122MWh from KEPCO. The entire quantity of electricity imported of the month was included in this monitoring period (15/06/2019-14/07/2019) and (15/06/2020-14/07/2020).

Monitoring equipment

Tag	$EG_{PJ,facility,y}$	
	Electricity meter (exported)	Electricity meter (imported)
Serial No	8162027757	24176002263
Accuracy level	±0.5s	±0.5s
Type	Watt-hour meter	Watt-hour meter
Calibration frequency	7 years	7 years
Date of last calibration	04/07/2016	22/12/2017
Validity	03/07/2023	21/12/2024

- To ensure accuracy, electricity meter (SN: 24176002263) are subject to regular maintenance by KEPCO.

Measuring/reading/recording frequency	Measuring frequency: Continuously Recording frequency: Monthly
Calculation method (if applicable)	This parameter is either monitored using each electricity meter and calculated as difference between (a) the quantity of electricity exported by the project plant/unit to the grid; and (b) the quantity of electricity imported to the project plant/unit from the grid.
QA/QC procedures	Electricity meters are subject to a regular maintenance and testing to ensure accuracy. Electricity meter for (a) is calibrated every 7 years in accordance with "ENFORCEMENT DECREE OF MEASURES ACT". Electricity meter for (b) is calibrated every 7 years in accordance with "ENFORCEMENT DECREE OF MEASURES ACT". The value is cross-checked with the invoice from KEPCO.
Purpose of data/parameter	Calculation of baseline emissions (ex post)
Additional comments	-

D.3. Implementation of sampling plan

>>

N/A

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

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$BE_y = BE_{CH4,y} + BE_{electricity,y}$

Parameter	Unit	Description
BE_y	tCO_2e	Baseline emission for in year y
$BE_{CH4,y}$	tCO_2e	Baseline emission from LFG avoidance that otherwise would be emitted to the atmosphere in absence of the Project in year y (tCO_2e) which is estimated as per AMS-Ⅲ.G
$BE_{electricity,y}$	tCO_2e	Baseline emission from electricity displacement that otherwise would be provided by grid in year y (tCO_2e) which is estimated as per AMS-I.D

Baseline emission from LFG avoidance ($BE_{CH4,y}$)

Baseline emissions shall exclude methane emissions that would have to be removed to comply with national or local safety requirements or legal regulations and is based on the amount of methane that is actually captured and combusted (destroyed) by the project activity.

$BE_{CH4,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} - (1\text{-}OX) \times F_{CH4,BL,y} \times GWP_{CH4}$

Baseline emission from electricity displacement ($BE_{electricity,y}$)

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity.

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

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

>>

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

Parameter	Unit	Description
PE_y	tCO_2e	Project emissions in year y
$PE_{power,y}$	tCO_2e	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y
$PE_{flare,y}$	tCO_2e	Emissions from flaring or combustion of the landfill gas stream in the year y
$PE_{process,y}$	tCO_2e	Emissions from the landfill gas upgrading process in the year y, determined by following the relevant procedures described in annex 1 of AMS-III.H

$EF_{grid,y}$ is 0.6523 tCO_2/MWh and this is fixed factor during the crediting period.

$PE_y = PE_{power,y}$

Project emissions consist of CO_2 emissions related to the power used by this project facility.

E.3. Calculation of leakage emissions

>>

There is no leakage effect in this project.

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	15,727.337	0	0	0	15,727.337	15,727

The actual emission reduction achieved by the project activity during the crediting period was calculated using the amount of methane recovered and destroyed/gainfully used by the project activity and electricity displacement by the project activity, calculated as:

$$ER_{y,calculated} = (1 - OX) \times (F_{CH4,PJ,y} - F_{CH4,BL,y}) \times GWP_{CH4} + (EG_{PJ,facility,y} \times EF_{grid,y}) - LE_y$$

Parameter	Unit	Description
$ER_{y,calculated}$	tCO_2e	Emission reduction from both methane destruction and grid displacement
OX	-	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste) (dimensionless). A default value of 0.1 may be used
$F_{CH4,PJ,y}$	tCH_4	Methane captured and destroyed/gainfully used by the project activity in the year
$F_{CH4,BL,y}$	tCH_4	Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year (tCH_4). The relevant procedures in "ACM0001: Flaring or use of landfill gas" may be followed, as well as taking into account the compliance with the relevant local laws and regulation if such laws and regulations exist
GWP_{CH4}	-	Global Warming Potential for methane (value of 25)
$EG_{PJ,facility,y}$	MWh	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
$EF_{grid,y}$	tCO_2/MWh	CO_2 emission factor of the grid electricity in year y
LE_y	tCO_2e	Leakage emissions from both methane destruction and grid displacement

The values for this monitoring period are:

Period	OX	$F_{CH4,PJ,y}$	$F_{CH4,BL,y}$	GWP_{CH4}	$EG_{PJ,facility,y}$	$EF_{grid,y}$	LE_y	$ER_{y,calculated}$
	-	tCH_4	tCH_4	-	MWh	tCO_2/ MWh	tCO_2e	tCO_2e
01/07/2019-30/06/2020	0.100	785.933	157.187	25	2,423.020	0.6523	0	15,727

Determination of $F_{CH4,PJ,y}$:

Methane captured and destroyed/gainfully used by the project activity ($F_{CH4,PJ,y}$) may be calculated as follows, based on monitoring methane flow and concentration:

$$F_{CH4,PJ,y} = D_{CH4,y} \times w_{CH4,y} \times \sum_i LFG_{i,y}$$

Parameter	Unit	Description
$F_{CH4,PJ,y}$	tCH_4	Methane captured and destroyed/gainfully used by the project activity in the year
$D_{CH4,y}$	tonnes/m^3	Density of methane at the temperature and pressure of the landfill gas in year. If $LFG_{i,y}$ is reported at normal conditions of temperature and pressure, the density of methane is also determined at normal conditions
$W_{CH4,y}$	m^3CH_4/ m^3LFG	Methane content in landfill gas in year. Landfill gas composition shall be measured either on a dry basis or at the same humidity as used to determine $LFG_{i,y}$
$LFG_{i,y}$	m^3LFG	Landfill gas destroyed via method i (flaring, fuelling, combustion, injection to a grid, etc.) in year. The flow or volume measurement shall be made either on a dry basis or at the same humidity as $W_{CH4,y}$

The values for this monitoring period are:

Period	$F_{CH4,PJ,y}$	$D_{CH4,y}$	$W_{CH4,y}$	$LFG_{i,y}$
	(tCH_4)	(tonnes/m^3)	(m^3CH_4/m^3LFG)	(m^3LFG)
01/07/2019-30/06/2020	785.933	0.0007168	42.680	2,691,438.000

Determination of $F_{CH4,BL,y}$:

$F_{CH4,BL,y}$ was determined in accordance with case 4 of "ACM0001: Flaring or use of landfill gas" and PDD as below.

$$F_{CH4,BL,y} = max\{F_{CH4,BL,R,y}; F_{CH4,BL,sys,y}\} = 0.2 \times F_{CH4,PJ,y}$$

The values for this monitoring period are:

Period	$F_{CH4,PJ,y}$	$F_{CH4,BL,y}$
	(tCH_4)	(tCH_4)
01/07/2019-30/06/2020	785.933	157.187

The actual $EG_{PJ,\ facility,y}$ monitoring values are shown as follows;

Period	$EG_{PJ,\ facility,y}$ (a)	$EG_{PJ,\ facility,y}$ (b)	$EG_{PJ,facility,y}$	$EF_{grid,y}$
	(MWh)	(MWh)	(MWh)	(tCO_2/MWh)
01/07/2019-30/06/2020	2,428.179	5.159	2,423.020	0.6523

$EG_{PJ,facility,y}$ is either monitored using each electricity meter and calculated as the difference between (a) the quantity of electricity exported by the project plant/unit to the grid; and (b) the quantity of electricity imported to the project plant/unit from the grid.

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)
15,727	15,774

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

>>

The detail amount estimated ex-ante for this monitoring period in the CDM-PDD ver3.1 are as follow;

Year	total days	ER_y (tCO2e)	monitoring days	ER_y (tCO2e)
2019	365	16,395	184	7,621
2020	366	16,174	182	8,153
Total	**731**	**32,569**	**366**	**15,774**

E.6. Remarks on increase in achieved emission reductions

>>

Actual values reached during the monitoring period: 15,727 tCO_2e
Values applied in ex-ante calculation of the CDM-PDD(version 3.1) : 15,774 tCO_2e

The emission reductions decreased to 0.3% during the monitoring period compared to the expected emission reductions, which are on the CDM-PDD(version 3.1).

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

>>

NA

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	NEWGEN ELECTRICS Co., Ltd.
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Website	-
Contact person	Moon Gu, Lee
Title	Rep. Director
Salutation	Mr.
Last name	Lee
Middle name	-
First name	Moon Gu
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Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
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Contact person	Sang Hyeok Park
Title	Rep. Director
Salutation	Mr.
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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.

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