Monitoring report form

(Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT		
Title of the project activity	Jinju Landfill Gas Recovery and Power Generation CDM Project	
UNFCCC reference number of the project activity	6922	
Version number of the monitoring report	1.0	
Completion date of the monitoring report	11/07/2017	
Monitoring period number and duration of this monitoring period	2nd monitoring period 01/09/2013 – 31/08/2015	
Project participant(s)	Nurieconet CO., LTD. Jinju City ECOEYE CO., LTD.	
Host Party	Republic Korea	
Sectoral scope(s)	01-Energy industry 13-Waste handling and disposal	
Selected methodology(ies)	AMS-I.D : Grid connected renewable electricity generation _ Ver. 17.0 AMS-III.G: Landfill methane recovery _ Ver. 7.0	
Selected standardized baseline(s)	N/A	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	2st year estimated ERs 38,703 t CO2e 3rd year estimated ERs 38,611 t CO2e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	-	38,065 tCO_2-eq

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Purpose of the Project Activity

The purpose of the project activity is to reduce greenhouse gas emissions by replacing fossil fuel with renewable energy.

Prior to this proposed project to UNFCCC, landfill gas (hereinafter referred to as the LFG) from Jinju Landfill emitted into the atmosphere directly without any treatment.

Since Nurieconet CO., LTD. developed this project, LFG from Jinju landfill has been all treated by capturing LFG and captured LFG has been burned to generate electricity as a renewable energy source.

The generated electricity has been transmitted to the grid of Korea Electric Power Corporation (hereinafter referred to as the KEPCO); a company in charge of exclusively managing the grid of Republic of Korea. Commercial operation of this project has started since 13 April 2012. Since then the period of commercial service is for 15years (13/04/2012-12/04/2027) and the length of crediting period for this project is 10years (fixed).

Installed Technology and Equipment

Landfill gas collecting system, a gas pre-treatment system, an electricity generation system (capacity of 925 kW) and a monitoring system (such as a mass flow meter and watt-hour meters for export and import electricity) are installed in Jinju landfill for this project.

Total GHG emission reductions achieved in this monitoring period

- Monitoring period: 01/09/2013-31/08/2015 (for 2 years)
- Total amount of emission reductions of the 2nd monitoring period: 38,065 tCO_2-eq.

01/09/2013-31/08/2014	01/09/2014-31/08/2015
23,736 tCO_2-eq	14,329 tCO_2-eq

Relevant dates for the project activity;

Date	Project Schedule
10th June 2011	Conclusion of a contract among Jinju City Hall, Korea Environment Corporation and Nurieconet CO., LTD.
14th October 2011	Starting date of the construction (civil engineering work)
26th October 2011	Approval of the construction business
5th December 2011	Approval of electricity generation business
12th January – 8th March 2012	The installation of 925 kW generator
9th March – 9th April 2012	Commissioning test of LFG electricity generation (Refer to completion report)
9th April 2012	Completion date of the construction (civil engineering work)
18th April 2012	A permit on the completion of construction

13th April 2012	The start date of commercial operation
16th August 2012	Registered date as a CDM project
1th September 2012-31th August 2013	The 1st monitoring period
20th February 2015	According to MR operating manual, reinstall a mass flow mater to new one Instead o f it's calibration
28th August 2014. 10th September 2015	According to MR operating manual, calibration of Gas analyser from Korea Gas Safety Corporation
1th September 2013–31th August 2015	The 2st monitoring period
13th February 2017	Added ECOEYE CO., LTD. As a PP(project participant)

A.2. Location of project activity

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Host party: Republic of Korea (host)

The project site is located in San 287, Yusu-Ri, Naedong-Myeon, Jinju-Si, Gyeongsangnam-Do, Republic of Korea, which is located in south-east part of Korea; latitude North 35.119074° and longitude East 128.014091° and Jinju landfill is located around mountain area at where is 1 ~ 1.3km away from the local village.

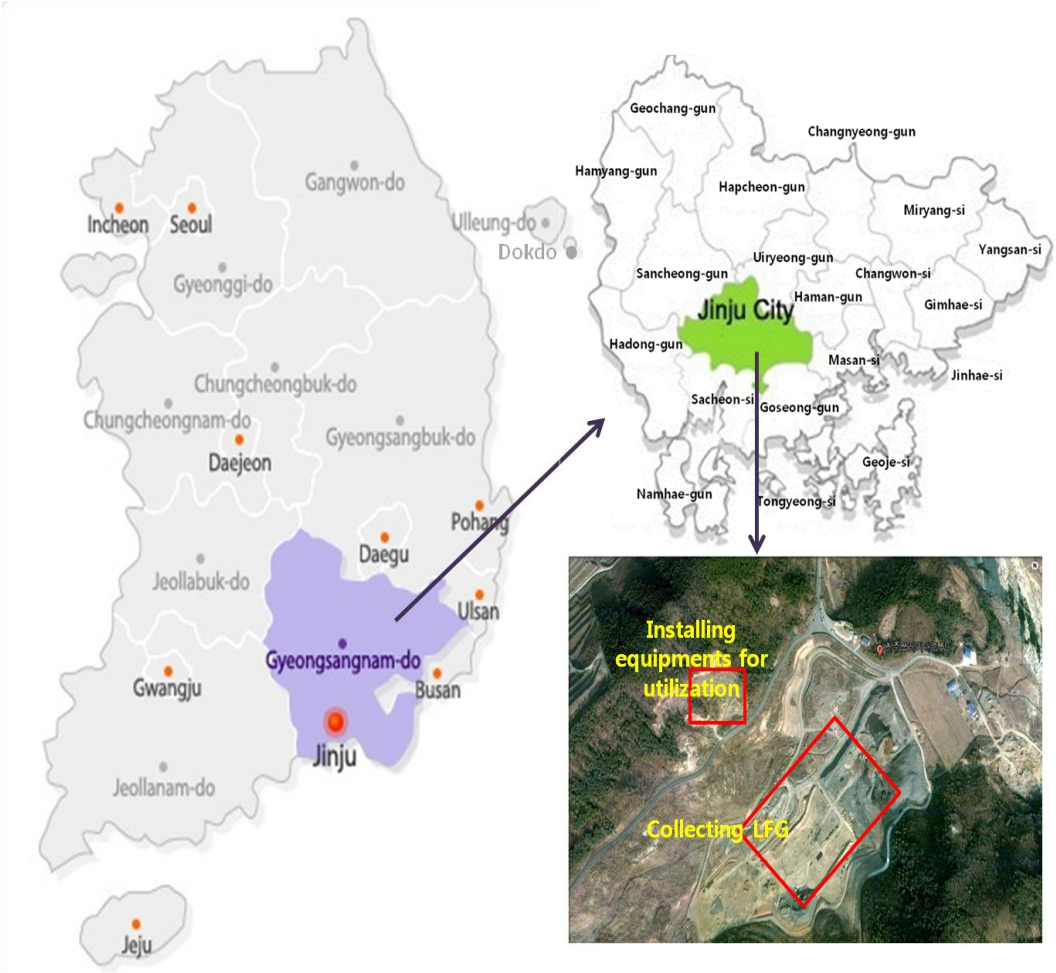

Figure A-1 Geographic location of the proposed project

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Republic of Korea (host)	**Private entity** Nurieconet CO., LTD. ECOEYE CO., LTD. **Public entity** Jinju City	No

A.4. Reference of applied methodology and standardized baseline

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The approved small-scale CDM baseline methodologies;

- AMS I. D: Grid connected renewable electricity gerneration_V.17
http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X
- AMS III. G: Landfill methane recovery_V.7
http://cdm.unfccc.int/methodologies/DB/XMQI6LMZWBPSIIXZFZU71T9EFV3OBM

The tools referred by the approved methodology;

- Emissions from solid waste disposal sites _V.6.0.1
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v6.0.1.pdf/history_view
- Tool to calculate the emission factor for an electricity system _V.2.2.1
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
- Tool for the demonstration and assessment of additionality_V.6.0.0
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf

A.5. Crediting period of project activity

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- Registration date as a CDM project: 16/08/2012

- The start date of 2st monitoring to request CERs: 1/09/2013
- The 2st monitoring period: 01/09/2013-31/08/2015
- Length of crediting period from this project activity: 1/09/2012 - 31/08/2022 (10years fixed)

A.6. Contact information of responsible persons/entities

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Organization: Nurieconet CO., LTD.
Department: New Regeneration Energy Department
Responsible person: Dongwook Kim
Title: Manager
Telephone: +82-55-251-5716
E-Mail: yeats90@hanmail.net

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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Jinju landfill operation team started construction of civil engineering work in October 2011 and the construction took about 7 months. After installed completely a power generator (925 kW), other

facilities such as a mass flow meter and a gas analyzer in consecutive order, Jinju Landfill Gas Recovery and Power Generation CDM Project got a permit on the completion of construction in April 2012.

The start date of actual monitoring activity for credits has been started since 1 September 2012 after registered by UNFCCC as a CDM project in 16 August 2012.

Figure B-1 The view of Jinju LFG power plant

The description of the technology in the proposed project is provided below

The main equipment of renewable energy project was installed in project site such as landfill gas collecting system, pre-treatment system, and electricity generation system and monitoring system. The proposed project boundary for this project is shown below.

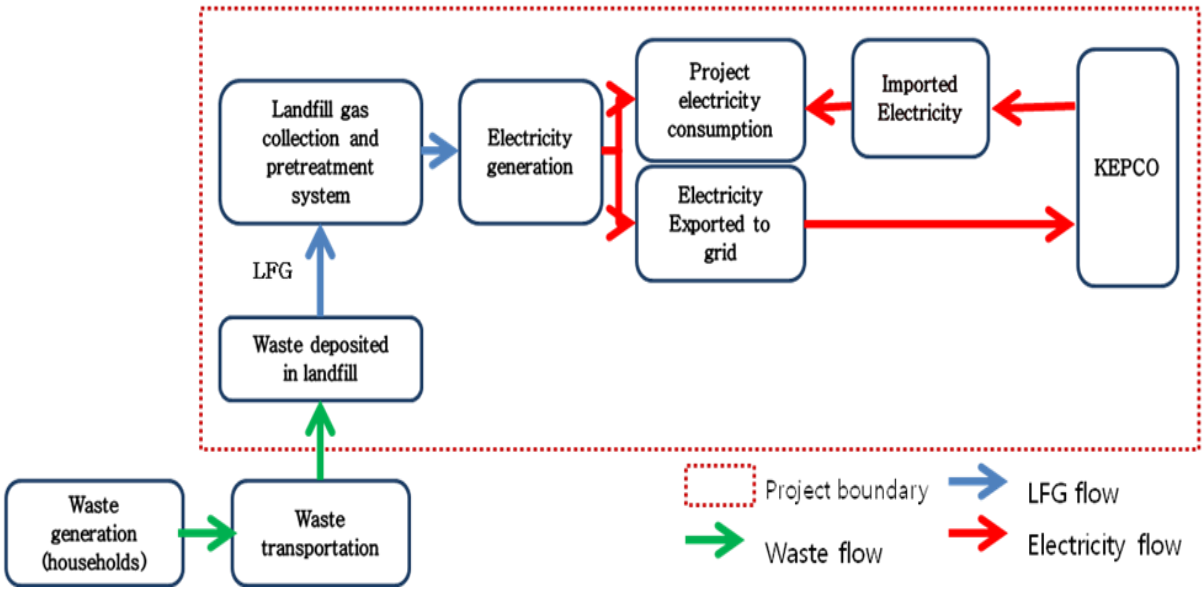

Figure B-2 The proposed project boundary

Landfill gas collecting system

The landfill gas collecting system is a gas transportation network, consisting of vertical/horizontal gas wells, well head station, J-Trap and B-Trap, a main pipeline (collecting all gas from all different kind of wells) and conveyer which sends the landfill gas to the gas pre-treatment system.

For increasing operation efficiency and continuous power generation, the collected landfill gas from gas wells, installed in project site should be continuously controlled by gas valves.

Gas pre-treatment system

Before sending LFG to electricity generator, the landfill gas should be pre-treated to remove its impurities and moisture to prevent corrosion of generator which causes generator shutdown. The pre-treatment consisted of 1) CSV (Condensate Separation Vessel), 2) separator, 3) heat exchange and chiller, 4) H2S remover, 5) gas filter, 6) receiver tank, and 7) gas boosting air blower.

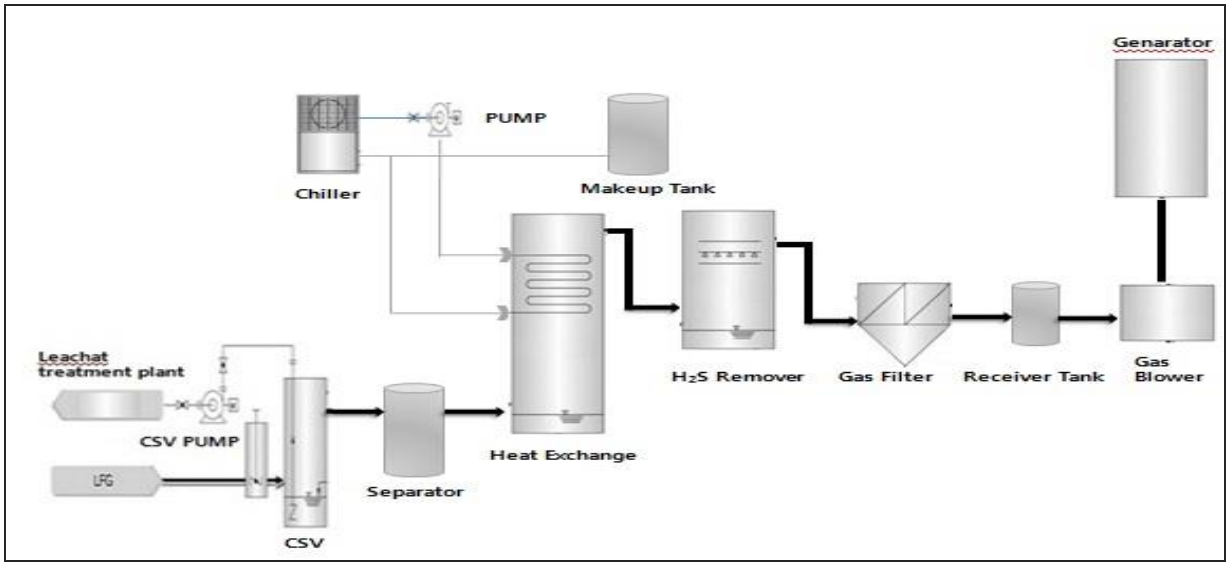

Figure B-3 The LFG pre-treatment process

Power generation technology

The proposed project was designed to install one generator with capacity of 925 kW in the Jinju landfill. The collected landfill gas is sent to a generator to make electricity and the generated electricity is exported to the grid-connected system owned by the Korea Electric Power Corporation (KEPCO) supply system.

Table B-1 The technical data of engine and power generator

LANDFILL GAS ENGINE GENERATOR (925 kW*1 SET)	Gas engine technical specification	Manufacturer	CATERPILLAR INC. (U.S.A)
		Model	G3516 LE SITA
		Engine power	974 kW
		Fuel consumption	546 Nm3/h (100% load)
	Generator technical specification	Manufacturer	CATERPILLAR INC. (U.S.A)
		Type	BRUSHLESS, REVOLVING FIELD EXCITATION
		Generator power	925 kW
		Frequency	60 Hz
		Voltage	480 V
		Speed	1200 rpm

There was no significant event affecting on the amount of reduction increasing during the monitoring period. And also, 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 and the monitoring was carried out in accordance with the registered PDD. And the monitoring is compliant with the monitoring plan as described in "Operating Manual-Mokpo LFG Power Plant".
Based on "Operating Manual-Mokpo LFG Power Plant", if there is system error or any difficulties due to natural disasters, a daily work log has been temporarily applied during the error period.
The details of operation events during this monitoring period are as follows:

During monitoring period, there were no other critical events or national rule/policy changes that could have affected the applicability of the methodology have been taken and there was not any activity to increase capacity by adding more facilities. As shown below there were some repair work or maintenance to operate electricity generation project;

Date	Project Schedule
14th - 16th September 2013	Stop generating electricity due to damaged generator's valve
27th October – 8th November 2013	Stop generating electricity due to over haul breakdown
2th December – 3th November 2013	Stop generator of R/P
30th December 2013 – 7th January 2014	Stop generating electricity due to repairing generator turbocharger
17th – 21th January 2013	Stop generating electricity due to breakdown of generator EGS 01 System Ready
1th – 4th August 2014	Stop generating electricity due to breakdown of connector and leakage of cooling water
3th – 13th October 2014	Shut off by generator breakdown
26th – 28th January 2015	Shut off by unusual breakdown of generator
17th – 22th February 2015	Breakdown in Generator igniter system and a flow meter calibration
28th – 30th March 2015	Stop generating electricity due to unstable power frequency
4th – 5th April 2015	The regular maintenance of generator Engine oil and Generator's oil cooler malfunction
6th –23th April 2015	Check and repair gas collecting facilities
2th – 5th May 2015	Breakdown in Reverse Power
8th – 11th 2015	Breakdown in Reverse Power
27th May - 17th June 2015	Reinstall and repair gas collecting facilities
12th – 16th July 2015	Breakdown in cooling water pump

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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There are no temporary deviations from the registered monitoring plan or the applied methodology.

B.2.2. Corrections

>>
There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Changes to start date of crediting period

>>
Not applicable

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

>>
Not applicable

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>>
No permanent changes from the registered monitoring plan or applied methodology have been approved during this monitoring period.

B.2.6. Changes to project design of registered project activity

>>
Not applicable

B.2.7. Types of changes specific to afforestation or reforestation project activity

>>
Not applicable

SECTION C. Description of monitoring system

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For providing actual monitoring data, emission reductions were calculated in accordance with approved methodologies (AMS I.D, AMS-III.G) and registered PDD in the procedure of monitoring plan and handling procedure of internal data handling procedure. The figure C-1 below is a flow diagram to show monitoring facilities and points.

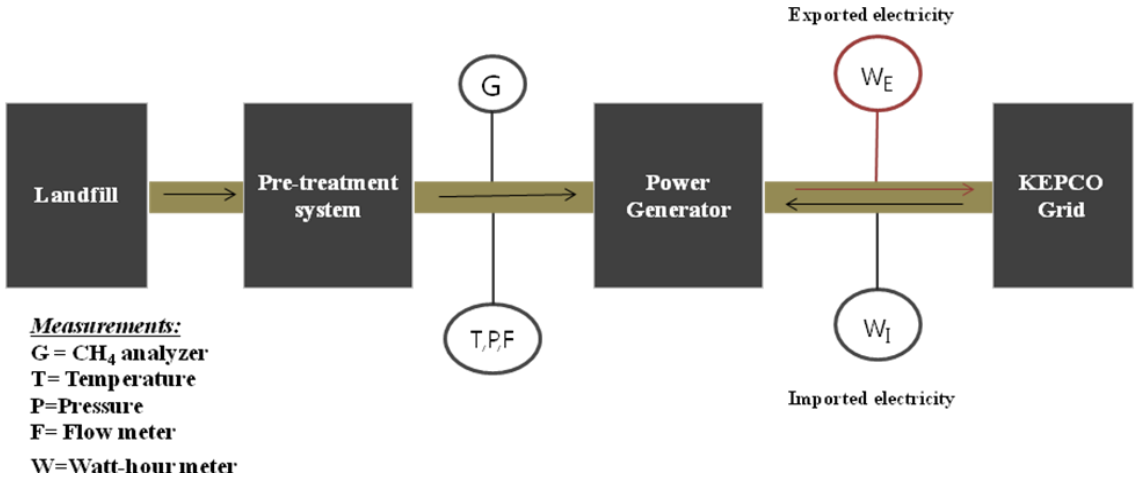


Figure C-1 Monitoring facilities location and point

For calculating emission reductions, measuring equipment:

- a mass flow meter
- a gas analyser
- and electricity meters, is installed in project monitoring location and point as shown in the figure above.

All data (methane concentration, flow of LFG gas and watt-hour meter) is continuously measured and automatically recorded during monitoring period.

Measuring equipment meets the relevant accuracy requirement and corresponding value, realized by each specification of equipment.

Data/Parameter Monitored	Unit	Monitoring data source	Brand
$LFG_{electricity,y}$	Nm^3/y	Mass flow mater	CS Instruments
$wCH_{4,y}$	% (Nm^3CH_4/ Nm^3 LFG)	Gas analyzer	Geotechnical Instruments(UK) Ltd
$EL_{EXP,PJT,y}$	MWh	KPX	Nam Jun CO., LTD.
$EL_{IMP,PJT,y}$	MWh	KEPCO	Nam Jun CO., LTD.

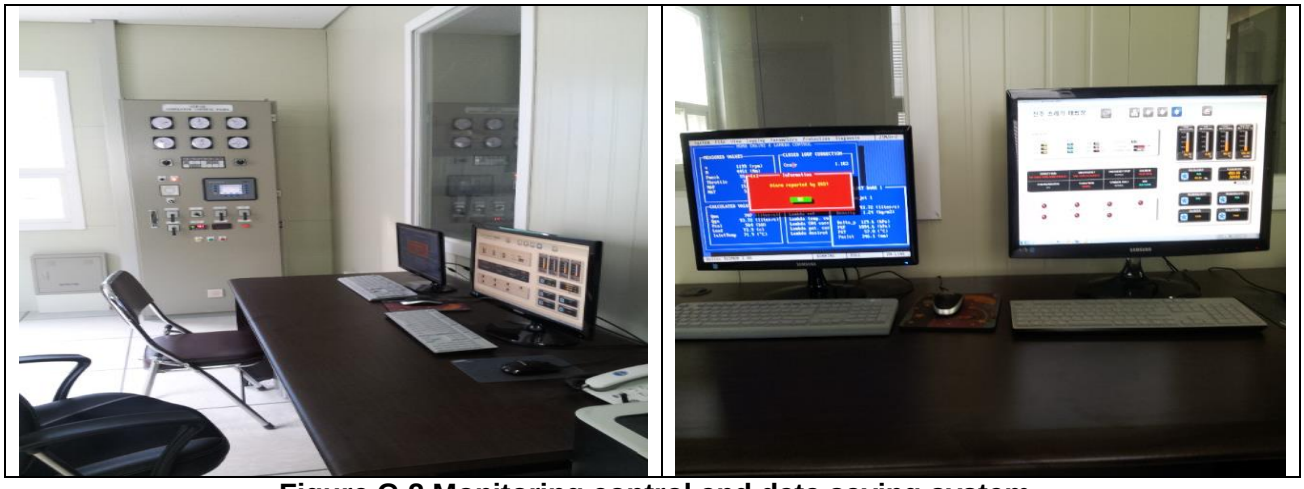


Figure C-2 Monitoring control and data saving system

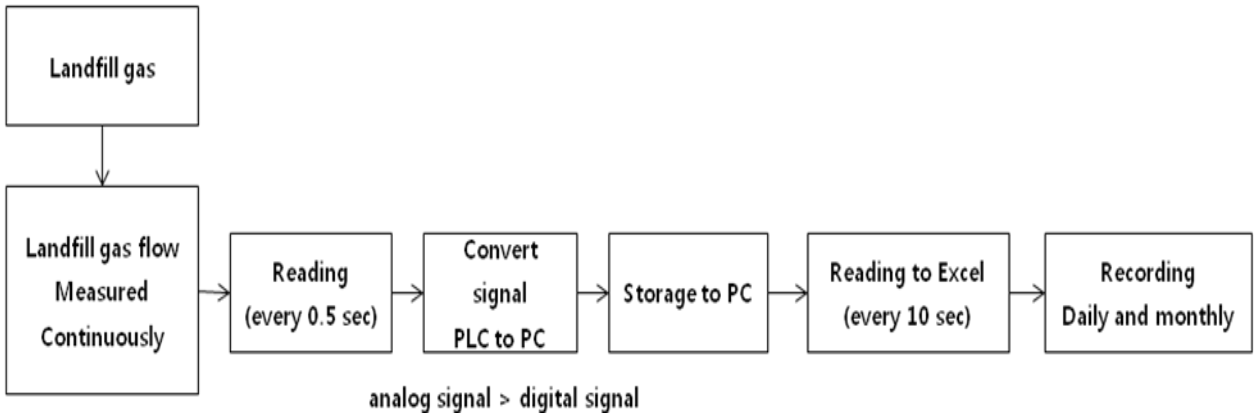
In accordance with the clean development mechanism project standard, Monitoring system and provide line diagram are described below and this description included data collection procedures like information flow including data generation, aggregation, recording, calculations and reporting as well.

The description of measuring equipment:

A mass flow meter is installed between blower and generator to measure LFG flow rate. Regarding to provision of the density of the methane combusted with normalised landfill gas flow, a thermometer and a pressure gauge are required but if the landfill gas flow meter employed temperature and pressure, and could display the normalised flow of landfill gas, there is no need to install them and monitoring temperature and pressure separately.

Jinju landfill has installed a mass flow meter which measures temperature and pressure simultaneously and the monitored landfill gas flow is automatically converted to Nm^3 (normal cubic meters).

Landfill gas flow into a generator has been continuously monitored by VA 450 thermal mass flow meter and recorded 0.5 seconds. The monitored data has been sent to PLC (Programmable Logic Controller) and then PLC recorded the data into PC after converting analogue signal to digital signal. Jinju landfill operation team has recorded all data daily and monthly, and aggregated monthly and yearly. The detailed monitoring flow line diagram is below.



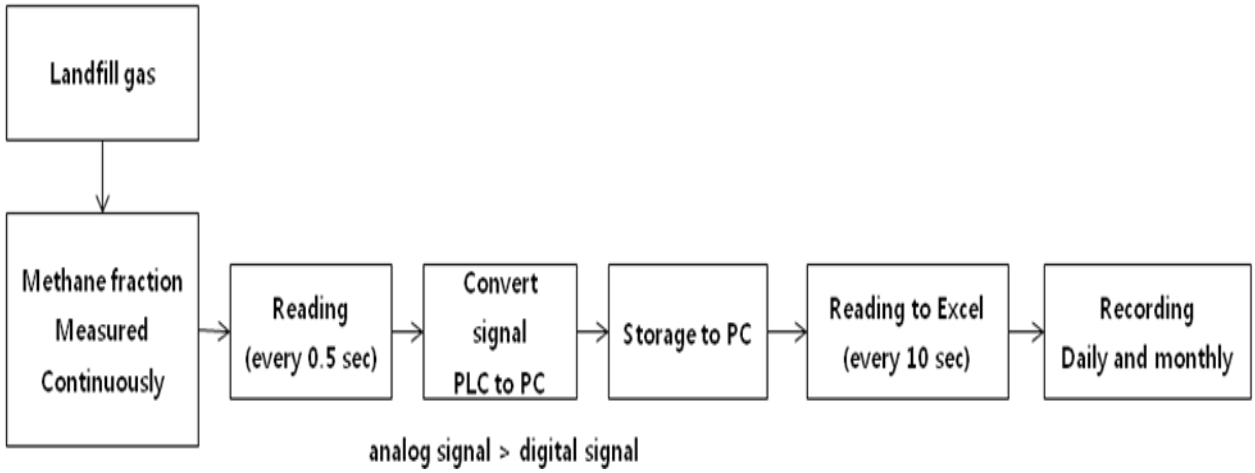
As to calibration of a mass flow meter, it is subject to a regular check and calibration every three years after first calibration and its specification is shown below.

Mass flow meter		
Model	CS-iTEC	VA 450 thermal mass flow meter
	Serial number	03178877
Spec.	Measuring range	0.4...92.7 sm/s (standard range calibration) 0.8 ... 185 sm/s (max range calibration) (refer to table for flow measurement ranges in different tube diameters)
	Accuracy	±1.5% of reading + 0.3% full scale
	Repeatability	0.25% of reading
	Measuring medium	Any gas where the components and the mixing ration are constant and known.
	Sampling rate	Display and outputs are refreshed every 200 msec.

	Response time t95	<5 seconds
	Operating temperature	-40 ~ +150℃ (medium temp. insertion type) -40 ~ +100℃ (medium temp. in line type) -40 ~ + 65℃ (ambient temperature)\
	Operating pressure	1.6 MPa (insertion type) 4.0 MPa (in line type)
First installation date		06/03/2012
Replacement date		20/02/2015 Replacement of CS Instruments to CS-iTEC
Last calibration date		22/02/2015
Expected calibration date		21/02/2018
Calibration frequency		Three year

A gas analyzer is installed in next to a mass flow meter to measure the fraction of methane in LFG volume fed into the gas engine. The methane fraction in LFG has been continuously monitored by GA3000 Range Gas Analyzer and recording every 0.5 seconds by measuring continuously. The measured data has been sent to PLC (Programmable Logic Controller) which is directly connected to the analyzer and then saved the data into PC after converting analogue signal to digital signal.

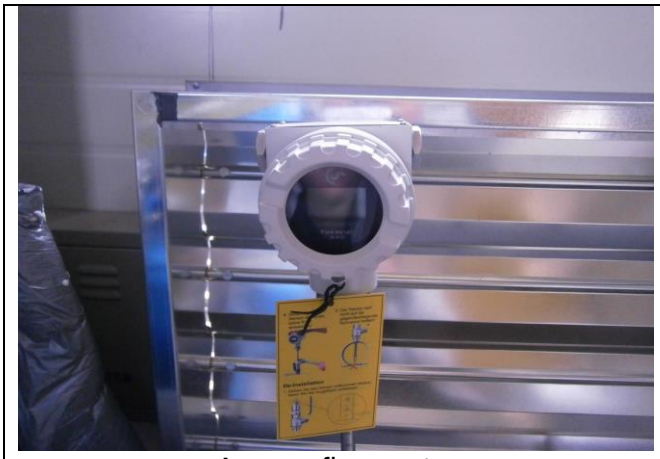
Jinju landfill operation team has recorded all data daily and monthly, and aggregated monthly and yearly. The detailed monitoring flow line diagram is below.



As to calibration of a gas analyzer, it is subject to a regular check and calibration every three years after first calibration and its specification is shown below.

Gas analyser		
Model	Geotechnical Instruments (UK) Ltd	GA3000 Range Gas Analyzer
	Serial number	GA14084_1/10034
Spec	Calibration gas	A 3 gas analyzer for measuring CH_4 CO_2 O_2 with optional H_2S. (Calibration accredited to ISO 17025)
	Measuring range	CH_4: 0-70% specification, 0-100% reading% CO_2: 0-60% specification, 0-100% reading O_2 : 0-25%

	Accuracy	CH_4: 0~5%: ±0.5%(vol), 5~15%: ±1.0%(vol), 15%-FS: ±3.0%(vol) CO_2: 0~5%: ±0.5%(vol), 5~15%: ±1.0%(vol), 15%-FS: ±3.0%(vol) O_2: 0~5%: ±1.0%(vol), 5~15%: ±1.0%(vol), 15%-FS: ±1.0%(vol)
	Measuring medium	Continuous for CH_4 CO_2 O_2
	Operating temperature	-5℃ to + 40℃
First installation date		01/06/2012 Model: GA3000 Range Gas Analyzer S/N: GA14084_1/9113
First calibration date		24/05/2012
Replacement date		18/03/2013 (S/N: GA14084_1/10034)
Last calibration date		10/09/2015 Also, Jinju operating team got calibrated before last calibration on 28th August 2014.
Expected calibration date		09/09/2018
Calibration frequency		Three year
* Information on installation of a gas analyzer: refer to D.2. Data and parameters monitored.		



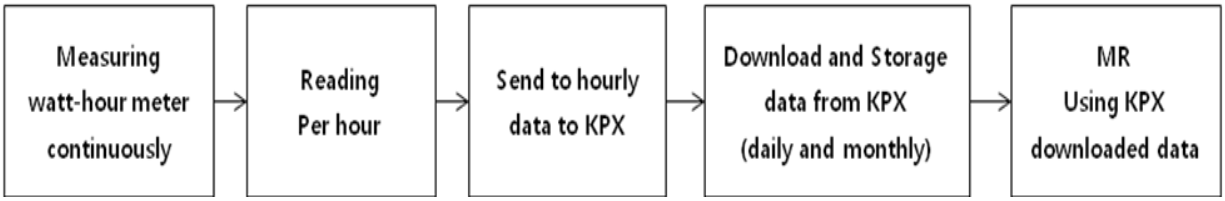
A mass flow meter

A gas analyzer

Figure C-3 A mass flow meter and a gas analyzer

The watt-hour meter for exported electricity is installed and sealed up after calibration for set-up transparently by Nam Jun CO., LTD. Exported electricity is continuously monitored and recorded in watt-hour meter per hour and recorded hourly to send the data to KPX.

Jinju landfill operation team has downloaded all data daily and monthly for storage, and aggregated monthly and yearly. The detailed monitoring flow line diagram is below.



The watt-hour meter is subject to a regular calibration to ensure accuracy. As to calibration of electricity exported meter, Jinju Landfill operation team will calibrate exported watt-hour meter after seven years in accordance with “Measures Act”.

Watt-hour meter for exported electricity		
Model	Nam Jun CO., LTD.	
	Serial number	98456288
Spec	Accuracy class	0.5class
	Rated Voltage	110/190V
	Rated normal current	5(2.5)A
	Rated Frequency	60Hz
Installation date		23/02/2012
Calibration frequency		Seven year.
Last calibration date		17/02/2012
Expected calibration date		16/02/2019

The watt-hour meter for imported electricity is installed and sealed up after calibration for set-up transparently under the authority of KEPCO. KEPCO reads a watt-hour meter every month remotely and charges a bill one month later to consumer.

Jinju landfill operation team has recorded monthly bill data from KEPCO and aggregated monthly and yearly. The detailed monitoring flow line diagram is below.

The watt-hour meter is subject to a regular calibration to ensure accuracy. As to calibration of electricity imported meter, KEPCO will calibrate imported watt-hour meter after seven years under the “Measures Act”.

Watt-hour meter for imported electricity		
Model	Nam Jun CO., LTD.	
	Serial number	0021784
Spec	Accuracy class	1.0 class
	Rated Voltage	110/190V
	Rated normal current	5(2.5)A
	Rated Frequency	60Hz
Installation date		15/03/2012

Test date in project site	15/03/2012
Calibration frequency	Seven year.
Last calibration date	15/03/2012
Expected calibration date	14/03/2019

The watt-hour meter for exported electricity

The watt-hour meter for imported electricity

Figure C-4 Watt-hour meters

Monitoring organization:

The following figure describes the operation and management structure for monitoring and shows the responsible party.

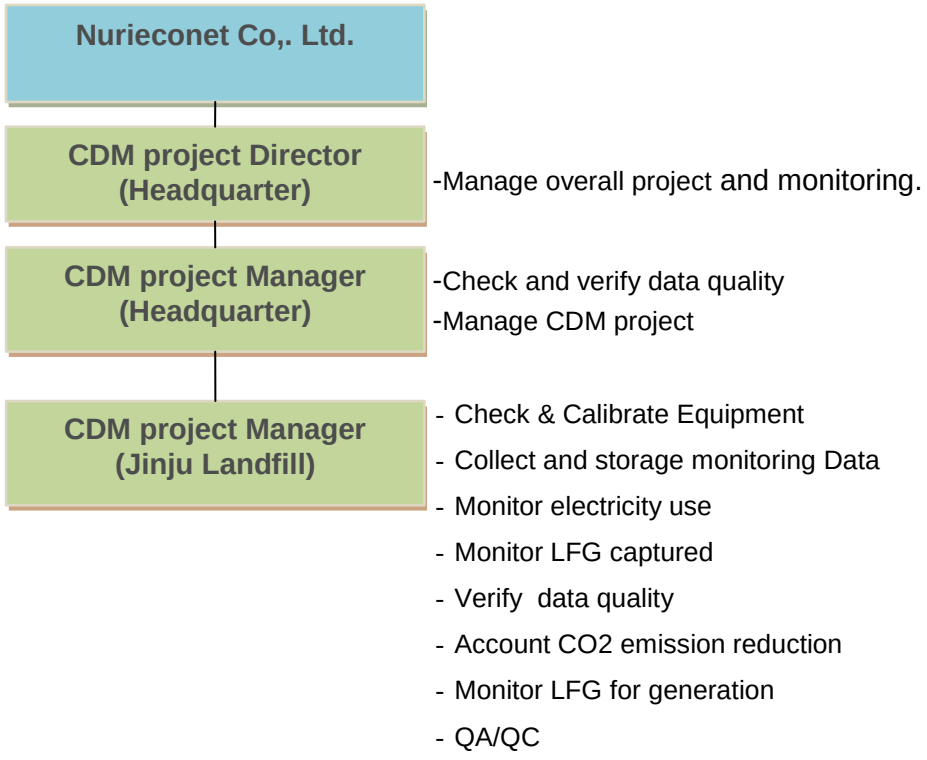


Figure C-4 The structure of monitoring organization

Table C-1 The responsible party for monitoring.

Item	Sub-item	Responsible party
Data reading, recording check and storage	$LFG_{electricity, y}$	Jinju Operating Team, Nurieconet
	$w_{CH4,y}$	
	$EL_{EXP, PJT, y}$	Korea Power Exchange Jinju Operating Team, Nurieconet
	$EL_{IMP, PJT, y}$	KEPCO Jinju Operating Team, Nurieconet
Calibration Authority of measuring equipments	Centralized monitoring system	Jinju Operating Team, Nurieconet
	A flow meter	Jinju Operating Team, Nurieconet
	A gas analyzer	Jinju Operating Team, Nurieconet
	Watt-hour meter for exported electricity	Jinju Operating Team, Nurieconet
	Watt-hour meter for imported electricity	KEPCO

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

Jinju landfill operation team is the responsible team for quality management, which ensures the quality and accuracy of the measured data. For quality management, the following items are included: data records and data storage, equipment calibration and maintenance, corrective action, and Emergency procedures for unintended emissions.

Data records and storage:

All the daily data related to CDM project are documented on paper and archived in electronic files and kept during the crediting period and two years after. The measured data is monitored and Jinju landfill operation team checks them continuously.

Emergency procedure:

In case of emergency situation, proper action is carried out to minimize damage in accordance with “Operating Manual-Jinju Landfill Gas Recovery and Power Generation CDM Project”.

Training:

All employees involved in this project had the training of knowledge/information of operating equipment and monitoring by skilled technician from the Generator manufacturer, and/or participate in training program in 13/12/2012.

- Generator, pretreatment system, collecting system, electric system etc.
- Data collection and storage
- Emergency procedure
- Operation manuals

SECTION D. Data and parameters

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

Data / Parameter:	Operation Margin Emission Factor (EF_{OM})
Unit:	ton CO_{2eq}/MWh
Description:	The generation-weighted average of CO_2 emission per electricity unit generated by the existing grid-connected power plants
Source of data:	Registered PDD
Value(s) applied):	0.6933
Purpose of data:	Calculation of Baseline emission
Additional comment:	This Operating Margin Emission Factor is fixed for the crediting period.

Data / Parameter:	Build Margin Emission Factor (EF_{BM})
Unit:	ton CO_{2eq}/MWh
Description:	The generation-weighted average of CO_2 emission per electricity unit generated by additionally constructed power plants.
Source of data:	Registered PDD
Value(s) applied):	0.6357
Purpose of data:	Calculation of Baseline emission
Additional comment:	This Operating Margin Emission Factor is fixed for the crediting period.

Data / Parameter:	CO_2 Emission Intensity of the Electricity displaced ($CEF_{electricity}$)
Unit:	ton CO_{2eq}/MWh
Description:	The weighted average of EF_{OM} and EF_{BM}
Source of data:	Registered PDD
Value(s) applied):	0.6645
Purpose of data:	Calculation of Baseline emission
Additional comment:	This Operating Margin Emission Factor is fixed for the crediting period.

Data / Parameter:	GWP_{CH4}
Unit:	ton CO_{2eq}/tCH_4
Description:	Global warming potential for methane (CH_4)
Source of data:	IPCC
Value(s) applied):	25 applied for 2nd commitment period
Purpose of data:	Calculation of Baseline emission
Additionalcomment:	N/A

Data / Parameter:	D_{CH4}
Unit:	ton CH_4/Nm^3
Description:	Density of methane
Source of data:	Default value in IPCC
Value(s) applied):	0.000716
Purpose of data:	Calculation of Baseline emissions
Additional comment:	N/A

D. 2. Data and parameters monitored

Data / Parameter:	$LFG_{electricity, y}$
Unit:	Nm^3/y
Description:	Amount of landfill gas combusted in power plant
Measured/Calculated/Default:	Measured
Source of data:	The flow meter measures the LFG flow continuously
Value(s) of monitored parameter:	See table below
Monitoring equipment:	- Model: CS Instruments/ VA 450 thermal mass flow meter (refer to "Section C") - Serial number: - Date of reinstallation: 20/02/2015
Measuring/Reading/ Recording frequency:	Refer to "Section C"
Calculation method (if applicable):	03178877

Date	Measured $LFG_{electricity, y}(Nm^3)$
2013.09.01-09.30	208,590
2013.10.01-10.31	190,555
2013.11.01-11.30	175,465
2013.12.01-12.31	172,471
2014.01.01-01.31	107,723
2014.02.01-02.28	209,216
2014.03.01-03.31	221,297
2014.04.01-04.30	222,471
2014.05.01-05.31	230,037
2014.06.01-06.30	236,132
2014.07.01-07.31	239,327
2014.08.01-08.31	216,633
2013.09.01-2014.08.31	**2,429,917**
2014.09.01-09.30	194,565
2014.10.01-10.31	132,911
2014.11.01-11.30	148,406
2014.12.01-12.31	147,786
2015.01.01-01.31	134,029
2015.02.01-02.28	100,800
2015.03.01-03.31	128,208
2015.04.01-04.30	60,797
2015.05.01-05.31	91,889
2015.06.01-06.30	84,513
2015.07.01-07.31	170,800
2015.08.01-08.31	189,269
2014.09.30-2015.08.31	**1,583,973**
Total emission reductions	**4,013,890**

QA/QC procedures:	To ensure accuracy, the flow meters are subject to regular maintenance by Jinju landfill operation team - Calibration frequency: 3 year - Date of last calibration: 22/02/2015 - Date of expected calibration: 21/02/2018
Purpose of data:	Calculation of Baseline emission
Additional comment:	

Data / Parameter:	$wCH_{4,y}$
Unit:	% (Nm^3CH_4/Nm^3 LFG)
Description:	Methane fraction in LFG
Measured/Calculated /Default:	Measured and calculated with weighted average
Source of data:	The gas analyser measures methane fraction continuously
Value(s) of monitored parameter:	Weighted average CH_4 concentration during the monitoring period

Date	Measured CH_4(%)
2013.09.01-2014.08.31	49.57
2014.09.30-2015.08.31	46.27

Monitoring equipment:	- Model: Geotechnical Instruments (UK) Ltd/ GA3000 Range Gas Analyser. (1) The date of initial installation: 01/06/2012 And it's last calibration date: 24/05/2012 (S/N: GA14084_1/9113) (2) Replacement date of gas analyser: 18/03/2013 (3) Last calibration date of gas analyser: 10/09/2015 (S/N: GA14084_1/10034)
Measuring/Reading/ Recording frequency:	Refer to "Section C"
Calculation method (if applicable):	Weighted average
QA/QC procedures:	To ensure accuracy, the flow meters are subject to regular maintenance by Jinju landfill operation team - Calibration frequency: 3 year - Date of last calibration: 10/09/2015 - Date of expected calibration: 09/09/2018
Purpose of data:	Calculation of Baseline emission
Additional comment:	

Data / Parameter:	$EL_{EXP, PJT, y}$
Unit:	MWh
Description:	Total amount of exported electricity

<table>
<tr><td>Measured/Calculated/ Default:</td><td>Measured</td></tr>
<tr><td>Source of data:</td><td>KPX Data</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>
<table>
<tr><th>Date</th><th>Measured $EL_{EXP, PJT, y}$ (MWh)</th></tr>
<tr><td>2013.09.01-09.30</td><td>240.55</td></tr>
<tr><td>2013.10.01-10.31</td><td>237.29</td></tr>
<tr><td>2013.11.01-11.30</td><td>268.12</td></tr>
<tr><td>2013.12.01-12.31</td><td>289.98</td></tr>
<tr><td>2014.01.01-01.31</td><td>163.71</td></tr>
<tr><td>2014.02.01-02.28</td><td>286.32</td></tr>
<tr><td>2014.03.01-03.31</td><td>307.25</td></tr>
<tr><td>2014.04.01-04.30</td><td>298.19</td></tr>
<tr><td>2014.05.01-05.31</td><td>298.33</td></tr>
<tr><td>2014.06.01-06.30</td><td>307.48</td></tr>
<tr><td>2014.07.01-07.31</td><td>313.48</td></tr>
<tr><td>2014.08.01-08.31</td><td>269.06</td></tr>
<tr><td>2013.09.01-2014.08.31</td><td>3,279.77</td></tr>
<tr><td>2014.09.01-09.30</td><td>235.21</td></tr>
<tr><td>2014.10.01-10.31</td><td>184.37</td></tr>
<tr><td>2014.11.01-11.30</td><td>197.30</td></tr>
<tr><td>2014.12.01-12.31</td><td>195.29</td></tr>
<tr><td>2015.01.01-01.31</td><td>165.77</td></tr>
<tr><td>2015.02.01-02.28</td><td>111.11</td></tr>
<tr><td>2015.03.01-03.31</td><td>122.09</td></tr>
<tr><td>2015.04.01-04.30</td><td>52.71</td></tr>
<tr><td>2015.05.01-05.31</td><td>71.99</td></tr>
<tr><td>2015.06.01-06.30</td><td>94.51</td></tr>
<tr><td>2015.07.01-07.31</td><td>200.15</td></tr>
<tr><td>2015.08.01-08.31</td><td>203.95</td></tr>
<tr><td>2014.09.30-2015.08.31</td><td>1,834.44</td></tr>
<tr><td>Total emission reductions</td><td>5,114.21</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment:</td><td>- Serial No: 98456288
- Accuracy level: 0.5s
- Date of installation: 203/02/2012</td></tr>
<tr><td>Measuring/Reading/ Recording frequency:</td><td>Refer to “Section C”</td></tr>
<tr><td>Calculation method (if applicable):</td><td></td></tr>
<tr><td>QA/QC procedures:</td><td>To ensure accuracy, the flow meters are subject to regular maintenance by Jinju landfill operation team
- Calibration frequency: 7 year
- Date of last calibration: 17/02/2012
- Date of expected calibration: 16/02/2019</td></tr>
<tr><td>Purpose of data:</td><td>Calculation of baseline emission</td></tr>
<tr><td>Additional comment:</td><td></td></tr>
</table>

Data / Parameter:	$EL_{IMP, PJT, y}$
Unit:	MWh
Description:	Total amount of imported electricity out of the project
Measured/Calculated/ Default:	Measured
Source of data:	Monthly bill of KEPCO
Value(s) of monitored parameter:	
Monitoring equipment:	-Serial No: 0021784 -Accuracy level: 1s -Date of installation: 15/03/2012
Measuring/Reading/ Recording frequency:	Refer to “Section C”
Calculation method (if applicable):	

Date	**Measured $EL_{IMP, PJT, y}$ (MWh)**
2013.09.01-09.30	0.279
2013.10.01-10.31	0.950
2013.11.01-11.30	1.114
2013.12.01-12.31	0.806
2014.01.01-01.31	1.977
2014.02.01-02.28	0.038
2014.03.01-03.31	0.144
2014.04.01-04.30	0.010
2014.05.01-05.31	0.163
2014.06.01-06.30	0.038
2014.07.01-07.31	0.480
2014.08.01-08.31	0.269
2013.09.01-2014.08.31	**6.268**
2014.09.01-09.30	0.125
2014.10.01-10.31	1.622
2014.11.01-11.30	0.528
2014.12.01-12.31	0.067
2015.01.01-01.31	0.489
2015.02.01-02.28	0.778
2015.03.01-03.31	0.538
2015.04.01-04.30	3.207
2015.05.01-05.31	2.160
2015.06.01-06.30	2.170
2015.07.01-07.31	0.394
2015.08.01-08.31	0.173
2014.09.30-2015.08.31	**12.251**
Total emission reductions	**18.519**

QA/QC procedures:	To ensure accuracy, the flow meters are subject to regular maintenance by KEPCO - Calibration frequency: 7 year - Date of last calibration: 15/03/2012 - Date of expected calibration: 14/03/2015
Purpose of data:	Calculation of baseline emission
Additional comment:	For conservative calculation of ERs, the amount of imported electricity values (2012.08.04-2012.09.03) was applied.

D. 3. Implementation of sampling plan

>>
N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

$ER_y = MD_y + (EL_{EXP, PJT, y} - EL_{IMP, PJT, y}) * EF - Leakage$

Parameter	Unit	Description
MDy	tCO_{2e}	CO_2 equivalent of the methane captured and destroyed/ gainfully used by the project activity in year y;
$EL_{EXP, PJT, y}$	tCO_{2e}	The quantity of electricity exported to the grid-connected system by this project activity during the year, y(MWh)
$EL_{IMP, PJT, y}$	tCO_{2e}	The quantity of electricity imported from gird-connected system by project activity during the year, y(MWh)
EF	tCO_{2e}	Combined emission factor in electricity generation by grid-connected system; weighted average of EF_{OM} and EF_{BM}.

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>
There are no project emissions.

E.3. Calculation of leakage

>>
There is no leakage effect in this project.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	38,065	-	-	-	38,065	38,065

Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 August 2014

Date	ER(s)	wCH_4,y	$LFG_{elecricity,y}$ (FLOW)	DCH_4,y	$GWPCH_4$	MDreg,y	ELexp	ELimp	CEF
2013.09.01-09.30	2,236	55.60	208,590	0.000716	25	-	240.55	0.279	0.6645
2013.10.01-10.31	2,057	55.71	190,555	0.000716	25	-	237.29	0.950	0.6645
2013.11.01-11.30	1,868	53.81	175,465	0.000716	25	-	268.12	1.114	0.6645
2013.12.01-12.31	1,773	51.21	172,471	0.000716	25	-	289.98	0.806	0.6645
2014.01.01-01.31	1,084	50.64	107,723	0.000716	25	-	163.71	1.977	0.6645
2014.02.01-02.28	1,873	44.93	209,216	0.000716	25	-	286.32	0.038	0.6645
2014.03.01-03.31	2,065	46.97	221,297	0.000716	25	-	307.25	0.144	0.6645
2014.04.01-04.30	2,039	46.22	222,471	0.000716	25	-	298.19	0.010	0.6645
2014.05.01-05.31	2,184	48.23	230,037	0.000716	25	-	298.33	0.163	0.6645
2014.06.01-06.30	2,230	47.93	236,132	0.000716	25	-	307.48	0.038	0.6645
2014.07.01-07.31	2,278	48.33	239,327	0.000716	25	-	313.48	0.480	0.6645
2014.08.01-08.31	2,050	48.27	216,633	0.000716	25	-	269.06	0.269	0.6645
2013.09.01-2014.08.31	**23,736.60**	**49.57**	**2,429,917**	**0.000716**	**25**	**-**	**3,279.77**	**6.268**	**0.6645**

Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period 31 August 2015

Date	ER(s)	wCH_4,y	$LFG_{elecricity,y}$ (FLOW)	DCH_4,y	$GWPCH_4$	MDreg,y	ELexp	ELimp	CEF
2014.09.01-09.30	1,883.37	49.59	194,565	0.000716	25	-	235.21	0.125	0.6645
2014.10.01-10.31	1,303.24	49.67	132,911	0.000716	25	-	184.37	1.622	0.6645
2014.11.01-11.30	1,362.29	46.36	148,406	0.000716	25	-	197.30	0.528	0.6645
2014.12.01-12.31	1,366.60	46.76	147,786	0.000716	25	-	195.29	0.067	0.6645
2015.01.01-01.31	1,207.90	45.77	134,029	0.000716	25	-	165.77	0.489	0.6645
2015.02.01-02.28	891.19	45.33	100,800	0.000716	25	-	111.11	0.778	0.6645
2015.03.01-03.31	1,090.74	44.01	128,208	0.000716	25	-	122.09	0.538	0.6645
2015.04.01-04.30	487.33	41.76	60,797	0.000716	25	-	52.71	3.207	0.6645
2015.05.01-05.31	726.59	41.35	91,889	0.000716	25	-	71.99	2.160	0.6645
2015.06.01-06.30	719.58	43.51	84,513	0.000716	25	-	94.51	2.170	0.6645
2015.07.01-07.31	1,597.54	47.91	170,800	0.000716	25	-	200.15	0.394	0.6645
2015.08.01-08.31	1,692.50	45.96	189,269	0.000716	25	-	203.95	0.173	0.6645
2014.09.30-2015.08.31	14,328.89	46.27	1,583,973	0.000716	25	-	1,834.44	12.251	0.6645

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO2e)	2st year estimated ERs 38,703 t CO2e 3rd year estimated ERs 38,611 t CO2e	2st year estimated ERs 23,736.60 t CO2e 3rd year estimated ERs 14,328.89 t CO2e

E.6. Remarks on difference from estimated value in registered PDD

>>
Actual values reached during the 2nd monitoring period (2013~2015): 38,065 tCO2e-eq.
Actual value reached during the 1st monitoring period: 28,405 tCO_2-eq.
Values applied in ex-ante calculation of the registered CDM-PDD (2013~2014): 38,703 tCO2e-eq.
Values applied in ex-ante calculation of the registered CDM-PDD (2014~2015): 38,611 tCO2e-eq.

Comparing ex-ante calculation to actual emission reductions, actual reductions are decreased because of skill-less of technology management during 1st year monitoring period and now the operational manager's operation ability has improved during operating project.

The main reason to decrease emission reductions is below;
Refer to 'SECTION A. DESCRIPTION OF PROJECT ACTIVIY';
During the 2nd monitoring period, generator shutdown and collecting system problems had occurred rather frequently.

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	Nurieconet CO.,LTD.
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Fax	+82-55-295-9246
E-mail	yeats90@hanmail.net
Website	
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Title	Manager
Salutation	Mr.
Last name	Kim
Middle name	
First name	Dongwook
Department	New Regeneration Energy Department
Mobile	+82-10-6411-9047
Direct fax	
Direct tel.	
Personal e-mail	yeats90@hanmail.net

Project participant and/or responsible person/ entity	■ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
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Street/P.O. Box	155 Dongjinro
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City	Jinju City
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Postcode	660-760
Country	Republic of Korea
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E-mail	
Website	
Contact person	Juyoung Jung
Title	
Salutation	Mr.
Last name	Jung
Middle name	
First name	Juyoung

Department	Department of Cleaning
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	bernouilli@korea.kr

Project participant and/or responsible person/ entity	■ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	ECOEYE CO.,LTD.
Street/P.O. Box	B-1503, , 70, Dusan-ro,
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