Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	Luohe MSW Landfill Site LFG Recovery to Power Project
Reference number of the project activity	5238
Version number of the monitoring report	Version 02
Completion date of the monitoring report	29/10/2013
Registration date of the project activity	07/10/2011
Monitoring period number and duration of this monitoring period	1st monitoring period 07/10/2011-31/03/2013(both days inclusive)
Project participant(s)	Shanghai BCCY New Power Industry Co.,Ltd UPM Umwelt-Projekt-Management GmbH
Host Party(ies)	China
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope 1: Energy industries (renewable/non-renewable sources) Sectoral Scope 13: Waste handling and disposal AMS III.G Landfill Methane Recovery (version 06) AMS I.D Grid connected renewable electricity generation (version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	48,297 tCO2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	52,307 tCO2e (08/02/2012-31/12/2012: 43,253 tCO2e) (01/01/2013-31/03/2013: 9,054 tCO2e)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Luohe MSW Landfill Site LFG Recovery to Power Project (Hereinafter referred to as the project activity) is developed by Shanghai BCCY New Power Co., Ltd. ,which aims to recover and destroy landfill gas (LFG) generated at the municipal solid waste (MSW) landfill site in Luohe city, Henan province, P.R. China. The collected LFG is used for electricity production. The electricity generation offsets carbon emissions from the combustion of fossil fuel. Consequently ERs are claimed for both methane combustion and power displacement.

The project activity employs a gas collection system, a transmitting system, a pre-treatment system and gas engines with 4 sets of gas engines with capacity of 500kW each (a total capacity of 2 MW). The gas engines combust landfill gas, which contains methane, to produce electricity and export it to the grid. The project activity boundary is the site of the project activity, Luohe landfill, where the gas is captured and used. Moreover, since the electricity generated by the LFG is exported to Central China Power Grid, the project activity boundary also includes all the power generation sources connected to the Central China Power Grid.

The project construction began on 03/08/2009; and was commissioned on 31/05/2010.

The total claimed amount of ERs is 52,307 tCO2e in this monitoring period from 07/10/2011 to 31/03/2013(both days inclusive).

A.2. Location of project activity

The plant site of the project activity is located in the northeast area inside of Luohe City MSW landfill site, one kilometre south of Chengang village, Luohe City. The coordinate of engine house of the power plant is longitude 113˚59'59" E (113.9997 E) and latitude 33˚30'20" N (33.5056 N).

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 if the Party involved wishes to be considered as project participant (Yes/No)
China	Shanghai BCCY New Power Industry Co., Ltd	No
Germany	UPM Umwelt-Projekt-Management GmbH	No

A.4. Reference of applied methodology

Applied approved baseline and monitoring methodologies:

AMS-III.G. Landfill methane recovery (version 06)

AMS-I.D. Grid connected renewable electricity generation (version 16)

Used tools:

"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (version 5.1.0)

"Tool to calculate the emission factor for an electricity system" (version 02.2.0)

The above methodologies and tools are available at

http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

A.5. Crediting period of project activity

10-years fixed crediting period was chosen for the project activity,which is from 07/10/2011 to 06/10/2021.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The implementation of the project is in compliance with the registered PDD. The construction of the project started on 03/08/2009 and was connected to CCPG since 31/05/2010 for a total installed capacity of 1 MW (1# and 2# gas engine). 3# gas engine was connected to CCPG on 02/11/2012.

Table 1 Relevant dates for the project activity

No.	Project activity	Date
1	Installation of flow meter F	27/01/2010
2	Installation of gas analyser	27/01/2010
3	Installation of electricity meter E1,E2	10/04/2010
4	Installation of electricity meter E3	25/05/2010
5	Installation of engine flow meters F1, F2	31/08/2010
6	DCS system operation	20/10/2010
7	Replacement of gas analyser	14/12/2011

Table 2 Main events list

Start Time	Finish Time	Event/Cause
8:20 1710/2011/	1:05 19/10/2011	1# gas engine shut down for dredging high temperature heat exchanger.
9:26 05/06/2012	17:52 15/06/2012	1# gas engine shut down for malfunction of 12 NO. cylinder and medium maintenance.
20:48 16/06/2012	11:48 19/06/2012	2# gas engine shut down for the malfunction of motor and regular maintenance.
21:04 17/08/2012	23:04 21/08/2012	1# gas engine shut down for the high temperature of outlet water.
13:40 30/08/2012	16:34 08/09/2012	1# gas engine shut down for damage of under-voltage release unit.
13:30 08/09/2012	21:55 10/09/2012	2# gas engine shut down for replacing the circuit breaker and release.
14:20 10/09/2012	0:05 12/09/2012	1# gas engine shut down for replacement of NO. 9 cylinder.
15:50 14/09/2012	22:58 15/09/2012	1# gas engine shut down for fault of supercharger.
0:51 08/10/2012	Until 24:00 31/03/2013	2# gas engine shut down for fault of NO.6 cylinder and was sent back to manufacturer to repair.
14:37 06/11/2012	3:32 08/11/2012	1# gas engine shut down for reverse power.
17:07 08/11/2012	13:38 13/11/2012	3# gas engine shut down for reverse power.
13:38 13/11/2012	19:09 15/11/2012	1# gas engine shut down for interchange combustion control vavle.

7:39 29/01/2013	18:30 31/01/2013	1# gas engine shut down for minor maintenance.
8:20 20/02/2013	17:50 25/02/2013	1# gas engine shut down for medium maintenance.
10:38 02/03/2013	20:00 04/03/2013	1# gas engine shut down for leakage of pipeline.

There were no event or situation occurred during the monitoring period (07/10/2011-31/03/2013) which may impact on the applicability of the methodology.

Technology applied in the project

The technologies adopted in the project include a gas collection system, a gas pre-treatment system, gas engines, a transmitting system, and a monitoring system.

Gas collection system

The gas collection system consists of gas collecting wells, gas collecting sub-hoses and a main pipe. The numbers of gas wells are increased as waste accumulating in the landfill area. All sub-hoses are connected to the main pipe so that the recovered LFG from gas wells could be collected together for utilization. The operation pressure of the gas collection system is provided by draught fans.

Gas pre-treatment system

Prior to electricity generation, LFG is pre-treated to remove its impurities, moistures etc, to prevent corrosion in the engines. The gas pre-treatment is composed of leachate condensation separation; filtration, dewatering, drying, pressurization and removing solid impurities.

Gas engines and transmitting system

The project activity employs 4 sets of gas engines with capacity of 500kW each when the LFG generation hits the peak at the landfill site. The generated electricity is exported to CCPG through the transmitting system. The engines are produced by a domestic engine company named Jinan Diesel Engine Co., Ltd. The specification of the gas engines is listed in Table 3.

To transform the voltage from 400V to 10kV, a transformer is installed by the project activity.

Table 3: The specification of the gas engines

Model	**500GF-N1 (500GF-NK)**
Rated power	**500kW/625kVA**
Rated voltage	**400V**
Frequency	**50Hz**
Rated speed	**1,000r/min**
Size	**5,120*2,040*2,249mm**
Manufacturer	**Jinan Diesel Engine Co., Ltd**

Monitoring system

For the detailed information of monitoring system, please refer to section C.

B.2. Post registration changes

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

No temporary deviations from registered monitoring plan or applied methodology were applied during the monitoring period.

B.2.2. Corrections

N/A

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There have been no permanent changes from registered monitoring plan or applied methodology.

B.2.4. Changes to project design of registered project activity

There have been no changes to project design of registered project activity.

B.2.5. Changes to start date of crediting period

The start date of crediting period is changed from 01/12/2011 to 07/10/2011 by EB upon the request of PP.

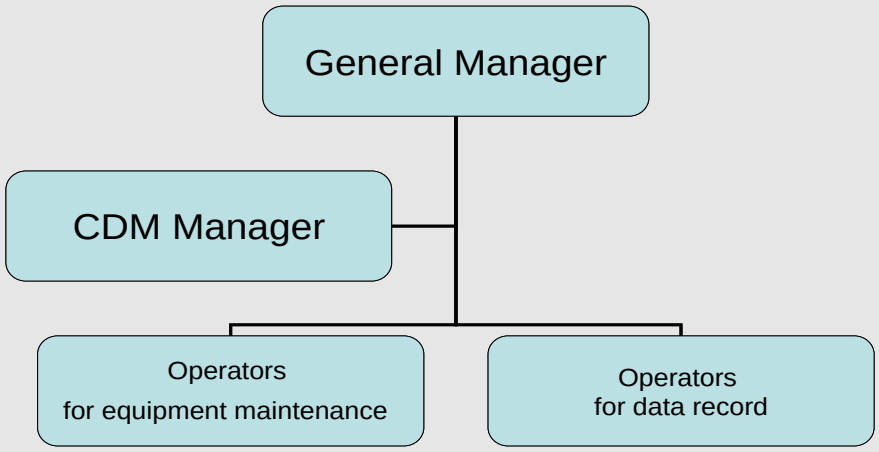
B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

The detailed monitoring plan is described as follow:

Organizational structure



Roles and responsibilities

Table 4 Roles and responsibilities

Job Title	Name	Responsibility
General manager	HAN Xu	In charge of and manages the issues related to CDM project monitoring
CDM manager	LIANG Nan	Double check the data collected; quality review and support general manager.
Operator	CHEN Jianhua	Data collection, data check, data archiving and data delivery
Operator	LI Dingfeng	Meter maintenance and calibration

Data monitoring

The location of the main meter and backup meter are displayed as following diagram:

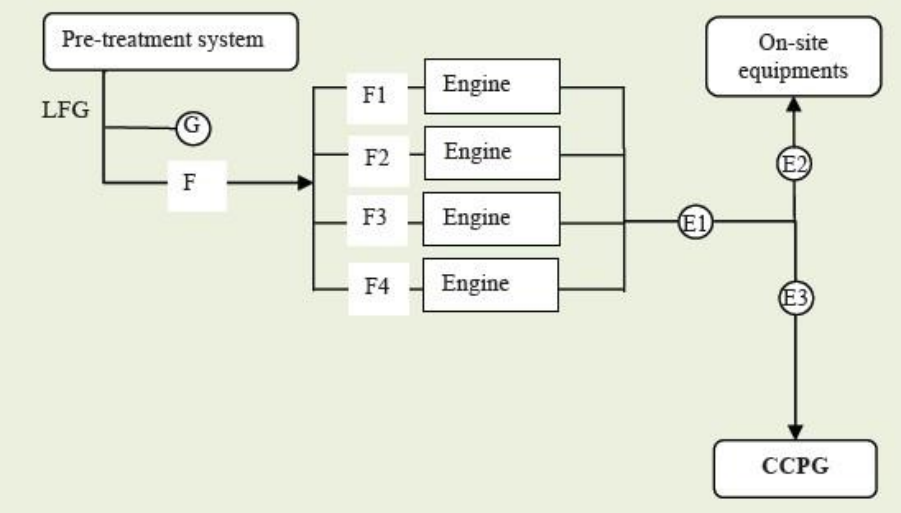


Figure 1: Chart of the monitoring meters

Legend:

G	**Gas analyzer to continuously measure methane fraction in collected LFG after pre-treatment.**
F	**Flow meter to continuously measure the flow of total collected LFG, which can automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.**
F1	**Flow meter to continuously measure the flow of LFG fed into 1# engine, which can automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.**
F2	**Flow meter to continuously measure the flow of LFG fed into 2# engine, which can automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.**
F3	**Flow meter to continuously measure the flow of LFG fed into 3# engine, which can automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.**
F4	**Flow meter to continuously measure the flow of LFG fed into 4# engine, which can automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.**
E1	**Electricity meter to continuously measure the electricity produced by all the engines.**
E2	**Electricity meter to continuously measure the electricity consumed by all the on-site equipments.**
E3	**Electricity meter (bi-directional) to continuously measure the electricity exported to the CCPG and imported from the grid in case of shut down of engines.**

3. Data collection procedures

The data are fully recorded and archived by DCS automatically and shown in the control system. The data are recorded once per one hour. DCS of a Historian database, primarily to provide data backup to the sheet of excel. Ultimately it forms the CDM Monitoring Operating Record. All data are kept 2 years after the end of the crediting period.

Total landfill gas captured ($LFG_{total,y}$)

Measured by a continuous flow meter and the data are recorded and electronic archived once per

one hour by computer automatically. The monitoring data are checked every day and summarized every month. The flow meter is calibrated annually to ensure the accuracy.

Landfill gas combusted in engines ($LFG_{engines,y}$; $LFG_{engines\ 2,y}$; $LFG_{engines\ 3,y}$; $LFG_{engines\ 4,y}$)

Each parameter is measured by a continuous flow meter and the data are recorded and electronic archived once per one hour by computer automatically. The data are checked by the operators every day and reported to General Manger by CDM manager monthly. The flow meter is calibrated annually to ensure the accuracy.

All the flow meters with temperature and pressure compensation are installed on site,which can automatically measure the temperature and pressure, expressing LFG volumes in normalized cubic meters.

For conservative, the monthly minimum of total LFG amount and sum of LFG to engines 1# 、2#、3#、4# is used for ER calculation.

Electricity produced by all the engines ($EL_{LFG,y}$)

The electricity produced by all engines in the project is continuously measured by the electricity meter E1 installed at the low voltage side of the on site transformer substation. The monitoring data are checked by the operators every day and reported to General Manger by CDM manager monthly. The electricity meter E1 is calibrated annually to ensure the accuracy.

The amount of electricity consumed by the project activity ($EL_{onsite,y}$)

The electricity consumed by the project is continuously measured by the electricity meter E2 installed at the low voltage side of the on site transformer substation. The monitoring data are checked by the operators every day and reported to General Manger by CDM manager monthly. The electricity meter E2 is calibrated annually to ensure the accuracy.

Net amount of electricity exported to CCPG by the project activity ($EL_{grid,y}$)

This meter is bidirectional and has two-way metering, recording both the electricity exported to the grid and the electricity imported from the grid . The electricity meter E3 is installed and sealed at the control room of project site by Luohe grid company. The data of electricity exports and imports are recorded and archived by DCS per hour automatically and shown in the control system. The monitoring data are checked by the operators every day and reported to General Manger by CDM manager monthly. The electricity meter E3 is calibrated annually to ensure the accuracy. The data could be cross-check by the sale receipts provided by the Luohe grid company.

Methane fraction in the landfill gas (W_{CH4})

Measured by a continuous gas analyser and the data are recorded and electronic archived once per one hour by computer automatically. The monitoring data are checked by the operators every day and reported to General Manger by CDM manager monthly. The gas analyser meter is calibrated annually to ensure the accuracy.

Operation hours of the generators

The data are recorded and archived by DCS automatically and shown in the control system. The data is recorded once per one hour. The monitoring data are checked by the operators every day and reported to General Manger by CDM manager monthly.

4.QA and QC

In order to ensure monitoring plan with high quality, QA/QC measures are carried out in monitoring data recording and checking, equipment calibrating and staff training.

Data recording and checking: all data collected are recorded in electronic files which are regularly backed up. The data are checked by the operators every day and reported to General Manger by CDM manager monthly.

Equipment calibration and maintenance: Flow meters, gas analyzers, other critical CDM project equipments are subject to regular maintenance and testing according to technical specifications from the manufactures to ensure accuracy and good performance. The detailed information of calibration could be referred to section D.

Training: All the staffs involved in this monitoring plan took training during the monitoring period, and the training plan includes CDM knowledge and special skill for monitoring, which is:

(1) Information about CDM

(2) Roles and responsibility of each staff

(3) Information about data to be collected

(4) Instruments calibration

5.Emergency procedures

As for the data acquisition system, the DCS consists of monitoring and recording the data. Once the system has some problems, the Technical Department would solve as soon as possible.

In case of equipment malfunction or breakdown, corrective actions are carried out to minimize the unintended emissions.

SECTION D. Data and parameters

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

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**GWP_{CH4}**
Unit:	tCO_2e/tCH_4
Description:	Global warming potential of CH_4
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied):	21
Purpose of data:	Baseline emission calculation
Additional comment:	-

Data / Parameter:	**GWP_{CH4}**
Unit:	tCO_2e/tCH_4
Description:	Global warming potential of CH_4
Source of data:	IPCC 2007 Guidelines for National Greenhouse Gas Inventories
Value(s) applied):	25
Purpose of data:	Baseline emission calculation
Additional comment:	-

Data / Parameter:	**D_{CH4}**
Unit:	tCH_4/m^3
Description:	Methane density
Source of data:	ACM0001
Value(s) applied):	0.0007168
Purpose of data:	Baseline emission calculation

Additional comment:	At standard temperature and pressure (0 degree Celsius and 1,013 bar) the density of methane is 0.0007168 tCH_4/m^3CH_4

Data / Parameter:	$\mathbf{EF_{grid,y}}$
Unit:	tCO_2/MWh
Description:	The baseline grid emission factor
Source of data:	PDD Section B.6.1
Value(s) applied):	0.8529
Purpose of data:	Baseline emission calculation
Additional comment:	The data are based on IPCC default value because the national specific value is unavailable.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$LFG_{total,y}$
Unit:	Nm^3
Description:	Total landfill gas captured at Normal Temperature and Pressure in the year y
Measured/ Calculated / Default:	Measured
Source of data:	Daily records of the flow meter F.
Value(s) of monitored parameter:	Totally 5,092,124 Nm^3 gas captured in the monitoring period (07/10/2011-31/03/2013)
Monitoring equipment:	Refer to Table 5 Detailed calibration information.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Flow meter is subject to a regular maintenance and testing regime to ensure accuracy. The calibration is being done once a year by a qualified third party.
Purpose of data:	Baseline emission calculation
Additional comment:	-

Data / Parameter:	$LFG_{engines,\ y}$; $LFG_{engines\ 2,\ y}$
Unit:	Nm^3
Description:	Landfill gas combusted in engines 1# 、2# at Normal

	Temperature and pressure in year y
Measured/ Calculated / Default:	Measured
Source of data:	Daily records of the flow meter F1-F2.
Value(s) of monitored parameter:	<table><tr><th>Name</th><th>LFG flow in total (Nm^3)</th><th>Monitoring period</th></tr><tr><td>flow meter F1</td><td>2,585,402</td><td>07/10/2011-31/03/2013</td></tr><tr><td>flow meter F2</td><td>1,800,874</td><td>07/10/2011-31/03/2013</td></tr><tr><td>LFG flow in engine 3#</td><td>706,772</td><td>02/11/2012-31/03/2013</td></tr></table>
Monitoring equipment:	Refer to Table 5 Detailed calibration information. Remarks: Because the engine 2# was out of order on 08/10/2012 and was sent back to manufacture to repair until 31/03/2013,and engine 3# utilizes communication facilities including flowmeter 2# since 02/11/2012 .LFG flowing in the engine 3# was monitored by flowmeter 2#.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Flow meter is subject to a regular maintenance and testing regime to ensure accuracy. The calibration is being done once a year by a qualified third party.
Purpose of data:	Baseline emission calculation
Additional comment:	-

Data / Parameter:	$W_{CH4,y}$
Unit:	Fraction
Description:	Methane fraction in the landfill gas
Measured/ Calculated / Default:	Measured
Source of data:	Daily records of the gas analyzer meter G.
Value(s) of monitored parameter:	The average value is 57.68% in the monitoring period (07/10/2011-31/03/2013)
Monitoring equipment:	Refer to Table 5 Detailed calibration information.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.

Calculation method (if applicable):	Not applicable
QA/QC procedures:	Gas analyzer is subject to a regular maintenance and testing regime to ensure accuracy. The calibration is being done once a year by a qualified third party.
Purpose of data:	Baseline emission calculation
Additional comment:	-

Data / Parameter:	$EL_{LFG, y}$
Unit:	MWh
Description:	Total amount of electricity produced by all the engines of the project in year y
Measured/ Calculated / Default:	Measured
Source of data:	Daily records of the electricity meter E1.
Value(s) of monitored parameter:	9,480.60
Monitoring equipment:	Refer to Table 5 Detailed calibration information.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Electricity meter is subject to a regular maintenance and testing regime to ensure accuracy. The calibration is being done once a year by a qualified third party.
Purpose of data:	-
Additional comment:	-

Data / Parameter:	$EL_{onsite, y}$
Unit:	MWh
Description:	The amount of electricity consumed by the project activity in year y
Measured/ Calculated / Default:	Measured
Source of data:	Daily of the electricity meter E2.
Value(s) of monitored parameter:	409.54

Monitoring equipment:	Refer to Table 5 Detailed calibration information.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Electricity meter is subject to a regular maintenance and testing regime to ensure accuracy. The calibration is being done once a year by a qualified third party.
Purpose of data:	-
Additional comment:	-

Data / Parameter:	$EL_{grid, y}$
Unit:	MWh
Description:	Net amount of electricity exported to CCPG by the project in year y
Measured/ Calculated / Default:	Measured
Source of data:	Daily records of the electricity meter E3
Value(s) of monitored parameter:	8,957.575
Monitoring equipment:	Refer to Table 5 Detailed calibration information.
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Crosschecked with the electricity sale receipts. Archived data and sales receipts are kept during the crediting period and two years after.
Purpose of data:	Baseline and project emission calculation
Additional comment:	-

Data / Parameter:	**Operation hours of the generators**
Unit:	hours
Description:	Operation hours of the generators in year y

Measured/ Calculated / Default:	Measured
Source of data:	Daily records
Value(s) of monitored parameter:	<table><tr><th>Name</th><th>Operating hours</th><th>Monitoring period</th></tr><tr><td>engine 1#</td><td>11,377</td><td>07/10/2011-31/03/2013</td></tr><tr><td>engine 2#</td><td>8,213</td><td>07/10/2011-31/03/2013</td></tr><tr><td>engine 3#</td><td>3,218</td><td>02/11/2012-31/03/2013</td></tr></table>
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	The Monitoring frequency was continuous. And the data were recorded and electronic archived once per one hour by computer automatically. The operators check the data everyday, and totalize the data every month.
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	-
Additional comment:	-

Data / Parameter:	$\mathbf{MD_{reg,y}}$
Unit:	tCO_2e
Description:	Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulation in the year y
Measured/ Calculated / Default:	-
Source of data:	No methane would be destroyed to comply with Chinese regulatory requirements relating to landfill gas
Value(s) of monitored parameter:	0
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	-
Additional comment:	-

Table 5 Detailed calibration information

Name	Type	Accuracy class	Serial number	Calibration frequency	Calibration validity	Period in use	Calibration entity
Flow meter F	V10FTH 3E5S	1.0	ZN10F 0302	annually	30/09/2011-29/09/2012	07/10/2011-21/09/2012	Henan Province Institute of Metrology
					24/09/2012-23/09/2013	26/09/2012-31/03/2013	
		1.0	ZN10F 0361	annually	25/05/2012-24/05/2013	21/09/2012-26/09/2012	
Flow meter F1	PRVZW-100	1.0	F61-1007-10318	annually	01/09/2011-31/08/2012	07/10/2011-16/08/2012	Shanghai Institute of Measurement and Testing Technology National Centre of Measurement and Test for East China.
					20/08/2012-19/08/2013	23/08/2012-31/03/2013	
	RLVZW-100	1.0	F61-1007-10321	annually	20/04/2012-19/04/2013	16/08/2012-23/08/2012	
Flow meter F2	PRVZW-100	1.0	F61-1007-10319	annually	01/09/2011-31/08/2012	07/10/2011-16/08/2012	Shanghai Institute of Measurement and Testing Technology National Centre of Measurement and Test for East China.
					20/08/2012-19/08/2013	23/08/2012-31/03/2013	
	RLVZW-100	1.0	F61-1007-10323	annually	20/04/2012-19/04/2013	16/08/2012-23/08/2012	
gas analyzer	97460	1.5%	30101	annually	18/01/2011-17/01/2012	07/10/2011-14/12/2011	JIANGSU INSUTUTE OF METROLOGY
	GTR196	2%	55300/7	annually	09/12/2011-08/12/2012	14/12/2011-15/09/2012	Shenzhen Academy of Metrology and Quality Inspection
			55300/7	annually	18/09/2012-17/09/2013	22/09/2012-31/03/2013	
			55477/3	annually	08/02/2012-07/02/2013	15/09/2012-22/09/2012	
electricity meter E1	DTSD546	0.5s	100308 008276	annually	07/09/2011-06/09/2012	07/10/2011-29/06/2012	Henan Province Institute of Metrology
					01/07/2012-30/06/2013	02/07/2012-31/03/2013	
			5154-10500264	annually	20/12/2011-19/12/2012	29/06/2012-02/07/2012	
electricity meter E2	DTSD546	0.5s	100308 008277	annually	07/09/2011-06/09/2012	07/10/2011-29/06/2012	Henan Province Institute of Metrology
					01/07/2012-30/06/2013	02/07/2012-31/03/2013	
			5154-10500266	annually	20/12/2011-19/12/2012	29/06/2012-02/07/2012	
electricity meter E3	DSSD 536	0.5s	100106 653840	annually	14/04/2011-13/04/2012	07/10/2011-31/03/2013	Metrology Centre of Luohe Power Supply company
					13/04/2012-12/04/2013		

D.3. Implementation of sampling plan

Not applicable

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

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

The emission reductions are calculated as follows:

$$BE_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} + EL_{grid,y} * EF_{grid,y} \quad (1)$$

Where:

BE_y: Baseline emissions in year y (tCO_2e);

$MD_{project,y}$: The amount of methane that would have been destroyed/combusted during the year, in tonnes of methane (tCH_4) in project scenario;

$MD_{reg,y}$: The amount of methane that would have been destroyed/combusted during the year in the absence of the project due to regulatory and/or contractual requirement, in tones of methane (tCH_4);

GWP_{CH4}: Global Warming Potential value for methane for the first commitment period is 21 tCO_2e/tCH_4;

$EL_{grid,y}$: Net quantity of electricity produced using LFG, which in the absence of the project activity would have been produced by power plants connected to the grid during year y, in megawatt hours (MWh);

$EF_{grid,y}$: The emission factor of CCPG in year y , in tCO_2e/MWh;

In the monitoring period from 07/10/2011 to 31/03/2013, the actual monitoring values are shown as follows:

According to the methodology, in this project, the smaller value of F and the sum of sub-pipeline LFG flow should be used to calculate the parameter $MD_{project,y}$ .The detailed calculation process has been showed in Luohe ER Sheet, and the value of $MD_{project,y}$ in this monitoring period is 2067.285 tCH_4.

For the project, there is no contractual requirement. And the local and national mandatory regulations are not enforced to be implemented. Therefore, $MD_{reg,y}$ is zero.

Parameter	Values	Monitoring period
$MD_{project,y}$	1753.64	07/10/2011-31/12/2012
	313.64	01/01/2013-31/03/2013
$MD_{reg,y}$	0	07/10/2011-31/03/2013
GWP_{CH4}	21	07/10/2011-31/12/2012
	25	01/01/2013-31/03/2013
$EL_{grid,y}$	8957.575	07/10/2011-31/03/2013
$EF_{grid,y}$	0.8529	07/10/2011-31/03/2013

$$BE_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} + EL_{grid,y} * EF_{grid,y}$$
$$= (1753.64-0) * 21 + (313.64-0) * 25 + 8957.575 * 0.8529$$
$$= 36826.44 + 7841 + 7639.91$$
$$= 52307.35 \ tCO2e$$

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

Since the project activity is a renewable energy project which generates electricity using LFG, and also electricity import is already considered in the net quantity of electricity calculation, hence the project activity dose not result in project emissions.

$PE_y=0$

E.3. Calculation of leakage

As per AMS III.G version 06 and AMS I.D version 16, the methane recovery technology is not equipment transferred from another activity, so leakage effects are not to be considered.

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO2e)	Project emissions or actual net GHG removals by sinks (t CO2e)	Leakage (t CO2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO2e)
Total	52,307	0	0	52,307

E.5. Comparison of actual emission reductions or net anthropogenic 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)	48,297[1]	52,307

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

The actual emission reductions during the monitoring period are 52,307 tCO2e, which is higher than the estimation value 48,297 tCO2e in the PDD in the same period.
The actual emission reductions increase due to following reasons: (1) the conservative value of methane fraction 50% was taken in the PDD, while the actual monitored value is up to 57.68% during the monitoring period.(2)the rate of self-consumption electricity is 10% assumptive, while the actual value is only 4.4% during the monitoring period. (3) the estimated quantity of waste is conservative in the PDD. The detailed data are listed in Table 6. (4) the weight fraction of waste components provided by the refuse landfill site of Luohe city is different from that in ex-ante calculation of registered PDD. The detailed data are listed in Table 7.

Table 6 Quantity of waste

Year	Estimated values(tons)	Actual values(tons)
2010	161695	169650
2011	168265	180630
2012	175314	189854
2013.1-2013.3	44820	54387

Table 7 Waste components

Component	Estimated values	Actual values
	Weight Fraction %(wet waste)	Weight Fraction %(wet waste)
Wood and wood products	3	4.2
Pulp, paper and cardboard	7	15.7

[1] According to PDD version 06, as the emission reduction in ex-ante calculation is different for each year, the average daily emission reduction for each year is adopted for analysis:
in 2011, the ex-ante daily reduction is 82.04tCO2e (29,945 tCO2e in the ex-ante ER calcuation sheet);
in 2012, the ex-ante daily reduction is 88.97 tCO2e (32,563 tCO2e in 366 days in the PDD version 06);
in 2013, the ex-ante daily reduction is 96.43 tCO2e (35,198 tCO2e in 365 days in the PDD version 06);
with consideration of the 542 days of the monitoring period (07/10/2011-31/03/2013) , the total ex-ante emission reduction is 48297.14 tCO2e (=86d×82.04 tCO2e/d +366d×88.97tCO2e/d+90×96.43 tCO2e/d)

Food, food waste, beverages and tobacco	**35**	**22.4**
Textiles	**4**	**5.4**
Garden, yard and park waste	**14**	**13.4**
Glass, plastic, metal other inert	**37**	**38. 9**

According to PDD, the total ex-ante emission reduction is 48,297 tCO2e during the period (08/02/2012-31/03/2013). But if the actual monitored data of methane fraction, rate of self-consumption electricity , waste quantity, waste components ,the value of GWP_{CH4} 25 for the second commitment and actual net amount of electricity exported to CCPG by the project replace the ex-ante estimated values in the ER sheet calculation in the project design stage, we can get the emission reduction 56,676 tCO2e during the period (08/02/2012-31/03/2013). Actual emission reduction achieved during this monitoring period is 52,307 tCO2e, which dosen't exceeded.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	43,253	9,054

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Document information

Version	*Date*	*Description*
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 anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, 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	28 May 2010	EB 54, Annex 34. Initial adoption.

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