



**Monitoring report form
(Version 05.1)**

MONITORING REPORT

Title of the project activity	UPOIC Wastewater Treatment for Energy Generation, Krabi	
UNFCCC reference number of the project activity	4322	
Version number of the monitoring report	05	
Completion date of the monitoring report	06/10/2015	
Monitoring period number and duration of this monitoring period	18/10/2011 to 31/07/2014	
Project participant(s)	1. United Palm Oil Industry PCL. (Thailand) 2. Swiss Carbon Asset Ltd. (Switzerland)	
Host Party	Thailand	
Sectoral scope(s)	Sectoral scope 1: Energy Industries Sectoral scope 13: Waste handling and disposal	
Selected methodology(ies)	AMS-I.D. version 16 AMS-III.H. version 15	
Selected standardized baseline(s)	-	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	52,506 tCO ₂ e	
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
	18,467 tCO ₂ e	37,010 tCO ₂ e

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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(a) Purpose of the project activity and the measures taken for GHG emission reductions;

The purpose of project activity is to treat the wastewater from the CPO mill factory in order to generate biogas. The project activity entails the installation of an anaerobic wastewater treatment facility, based on a "Completely Stirred Tank Reactor" (CSTR) system; to complement the existing open lagoon based system. The implementation of the project activity will enable the generation and capture of biogas which are utilised for electricity generation. The electricity generated is supplied to the national grid and CPO mill.

(b) Brief description of the installed technology and equipment;

Equipment	Manufacturer / Technology provider	Type/Model	Specifications
Wastewater treatment system	Energy Research and Development Institute (ERDI)	Completely Stirred Tank Reactor (CSTR)	The biogas system has a designed COD reduction efficiency of 90%. The expected biogas production is around 8,741 Nm ³ per day (at 65% of CH ₄).
Gas engine	Guascor	SFGLD 560	Two sets of electricity generators are installed with each capacity of 952 kWe approximately.
Flare	BKE	Enclosed flare	The enclosed flare has a maximum capacity of 500 Nm ³ /hr.

(c) Relevant dates for the project activity

Event	Date	Reference
The project owner signed contract with the technology provider of biogas system.	01/04/2008	Contract between Lam Soon and ERDI
Commissioning of project activity	01/10/2009	Commissioning certificate by ERDI
Commissioning of gas engines	24/10/2009	Commissioning test report
Registration under CDM scheme	18/10/2011	UNFCCC website
1 st monitoring period	18/10/2011 to 31/07/2014	-

(d) Total GHG emission reductions in this monitoring period are 55,477 tCO₂e.**A.2. Location of project activity**

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(a) Host Party (ies); Thailand

- (b) Region/State/Province; Trang province
 (c) City/Town/Community; Kalasae sub-district, Sikao District
 (d) Physical/Geographical location;
 - Latitude: 8° 9' 2382" N
 - Longitude: 99° 1' 4009" E

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)
Thailand (host)	United Palm Oil Industry Public Company Limited (private entity)	No
Switzerland	Swiss Carbon Asset Ltd. (private entity)	No

A.4. Reference of applied methodology and standardized baseline

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- (a) The applied methodologies;

- AMS-III.H: "Methane recovery in wastewater treatment" (version 15)
(<http://cdm.unfccc.int/methodologies/DB/4ND00PCGC7WXR3L0LOJTS6SVZP4NSU>)
- AMS-I.D: "Grid connected renewable electricity generation" (version 16)
(<http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X>)

- (b) Within the applied methodologies, the following tools are used for this project activity;

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
(version 02.1.0)
(<http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-05-v1.pdf>)
- "Tool to determine project emissions from flaring gases containing methane" (version 01)
(<http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-06-v2.0.pdf>)
- "Tool to calculate the emission factor for an electricity system" (version 02.1.0)
(<http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v4.0.pdf>)

A.5. Crediting period of project activity

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Type: Fixed crediting period

Start date and end of the crediting period: 18/10/2011 to 17/10/2021

Current monitoring period: 18/10/2011 to 31/07/2014

Length of the current monitoring period: 2 years, 9 months, 18 days

A.6. Contact information of responsible persons/entities

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Renat Heuberger
 Swiss Carbon Asset Ltd.
 Technoparkstrass 1
 8005 Zürich
 Switzerland

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project activity replaces the existing wastewater treatment practice (open lagoon system) and thus avoids the release of methane into the atmosphere that results from the anaerobic digestion in the lagoon system. The implementation of the project activity enables the generation and capture of biogas, which is utilised for electricity generation.

The biogas captured by project activity is supplied to the gas engines. The electricity generated by the gas engine is used in the biogas plant and remaining is supplied to the CPO mill and exported the grid that displaces electricity mainly produced from fossil fuels. In the emergency case, the excess biogas is flared in the enclosed flare system.

Technical description:

The technology installed under the project activity is the anaerobic wastewater treatment facility based on CSTR system. This biogas system is designed by local technology provider; the Energy Research and Development Institute of Chaing Mai University (ERDI). The biogas system is a hybrid system that combines the advantage of completely stirred reactor (CSTR) and Plug-Flow digester. This system can treat the wastewater with high COD and high loading of suspended solids.

The CSTR system receives the wastewater from CPO mill factory with a maximum production capacity of 60 ton FFB/hour. In the project activity, the wastewater is supplied to pre-treatment system in order to reduce the temperature. Then the elimination of solid component in the wastewater is done via sedimentation process. Accordingly, the wastewater is sent to the hybrid system which ensures a continuous high contact rate of bacteria in the reactor. The COD removal efficiency of the biogas system is about 90%, the production of biogas expected around 8,741 Nm³ per day (with the methane of 65%). The treated wastewater is pumped to the open lagoon system. The wastewater in the final lagoon is applied to the factory's grass area.

In order to utilize biogas for electricity generation, the biogas captured is first treated to remove the sulphur content by H₂S scrubber. Then, the cleaned biogas is consumed in the generators. The electricity generated is supplied to CPO mill and national grid. The excess biogas is flared by the enclosed flaring system. The figure 1: project diagram is shown below.

Implementation status of the project activity during the monitoring period:

During the monitoring period, there were no significant occurrences of events, which affected the project activity as described above. The data monitoring of the project activity were carried out as described in the registered PDD.

Further, the calibration of the equipment was conducted as per the plan of the project activity. In case of calibration delay, the measured values during the delay period are adjusted by applying an identified error in a calibration report in a conservative manner, which is in line with the latest version of clean development mechanism validation and verification standard (VVS).

B.2. Post-registration changes

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

Monitoring parameter of volume of wastewater treated discharged ($Q_{ww,discharged,y(outlet)}$)

In the registered PDD, the parameter of $Q_{ww,discharged,y(outlet)}$ shall be measured continuously by flow meter. Hourly value shall be recorded on the memory card of the recorder and weekly transferred and recorded in computer then; the data will be aggregated monthly and annually for verification report and calculations.

During this monitoring period, data monitoring of this parameter was not conducted properly. It was unable to produce any evidence for determining volume of wastewater treated discharged. In order to be conservative to project emission calculation of methane emissions on account inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$), the parameter of $Q_{ww,discharged,y(outlet)}$ is based on the monitored value of volume of wastewater treated ($Q_{ww,y}$) at the inlet of the project activity. While the other parameters applied for calculating $PE_{ww,discharge,y}$ are carried out as per the registered monitoring plan. This temporary deviation is in line with para 3 of Appendix 1 under the CDM project standard.

B.2.2. Corrections

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No corrections to project implementation or parameters fixed at validation during the monitoring period.

B.2.3. Changes to start date of crediting period

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No changes to start date of crediting period during the current monitoring period.

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

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No inclusion of a monitoring plan to the registered PDD during the current monitoring period.

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

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No permanent changes from the registered monitoring plan, applied methodology or applied standardized baseline during the current monitoring period.

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

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No changes to project design of the registered project activity during the current monitoring period.

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

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This is not applicable to the project activity.

SECTION C. Description of monitoring system

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1. Monitoring Management

The required monitoring equipment is installed in the project activity. The monitoring procedures are followed as mentioned in section D of this monitoring report. The data is recorded on a

continuous basis or as indicated in section D and fed into the log sheets and the data logger. The monitoring data is kept in both soft and hard copy format. The calibrations of monitoring equipment are conducted on regular intervals.

All biogas plant staffs have been trained by the technology provider prior to full commissioning of biogas plant. Figure 1 outlines the structure of operation and management of the Project activity.

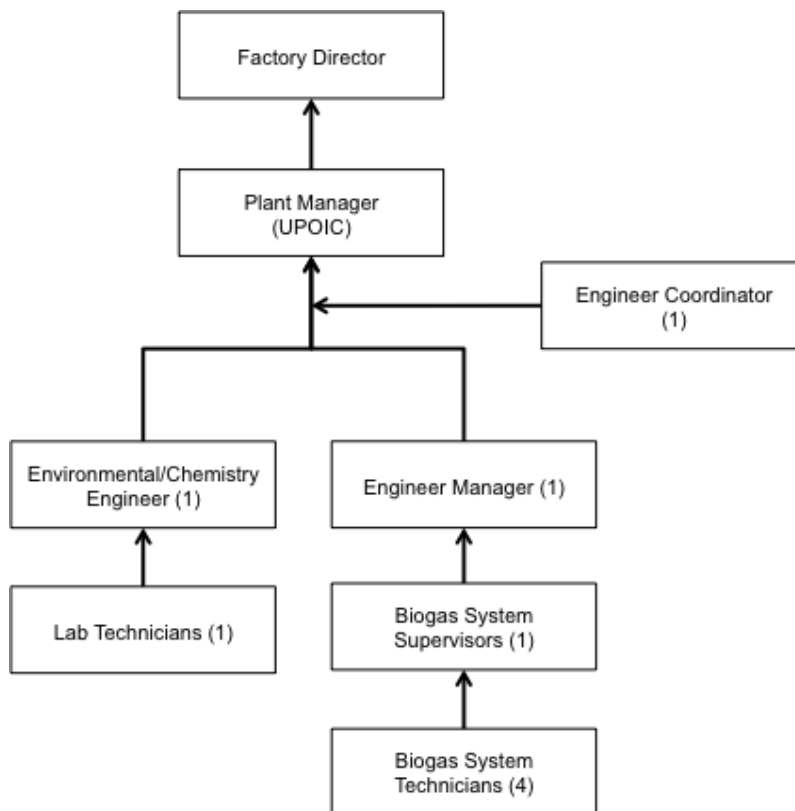


Figure 1: Organisation chart showing the responsible persons in the project activity

Role and Responsibility:

Factory director	The factory director is responsible to set and revise the monitoring policy and communicate with the UNFCCC regarding the CDM project.
Plant manager	The plant manager is responsible to supervise overall biogas and electricity generation system by interacting with engineering manager, environmental/chemistry engineer, engineer coordinator, and staffs in the factory. The plant manager is a coordinating point of the factory with external stakeholder i.e. local people, NGO, PEA, DOE, etc. for smooth biogas and electricity system operation, sustainability management, and CDM process.
Engineering manager	The engineering manager is responsible for supporting and guiding the biogas system supervisor in order to ensure the effective operation of biogas system management. This position reports to the plant manager.
Bioas system supervisor	The supervisor is responsible to control the entire operation, guiding decision making on process management and changes, and resolving equipment, operational and monitoring issues; include managing all monitoring data from data of Biogas Plant to

	prepare monthly Operational, Maintenance and Monitoring Report of Biogas Project and submitting to Engineer Manager including corporation with the Provincial Electricity Authority (PEA)
Biogas plant technicians	The technician is responsible to maintain daily operational and maintenance for smooth operational of the biogas system, electricity generation system, flare and monitoring system. Detailed information on site concerning the operation of the plant will be recorded and reported to the biogas system supervisor.
Environment/chemistry engineer	The environmental/chemistry engineer is responsible to supervise Lab Technician to assure quality of waste water sampling and analysis as well as preparing laboratory report and arrange quality control check with QC manager and checking daily on the quality control data collection and filing procedure.
Lab technician	The lab technician is responsible for maintaining all daily laboratories testing to international standards, including COD and oxidation substances. The parameters required by the CDM projects are done by an internal laboratory and periodically crosschecked with the external certified laboratory. Laboratory results will be daily recorded in electronic file and reported to Environmental/Chemistry engineer.
Engineer coordinator	The coordinator works with CPO factory and biogas plants. This position coordinates and reviews annual calibration checks of equipment with equipment suppliers and the external certified agencies for equipment calibration. All of CDM monitoring data are gathered by the coordinator. The monitoring data are submitted to the plant manager.

2. Quality Assurance and Quality Control

The biogas plant supervisor monitors the overall biogas plant’s performance, ensuring proper and timely calibration (in accordance with the manufacturer specifications) of systems, data acquisition and storage. Either erroneous data or uncertainties found in measurement of the monitoring devices for the biogas plant (i.e. flow rate, methane analyser, etc.) are included in the quality assurance and quality control procedures for individual monitoring parameters as per Section D of this monitoring report.

3. Data Storage and Filing

All monitoring data are stored in the log-sheets and electronically. The monitoring records has been archived for a period of the crediting period plus 2 years.

4. Emergency preparedness

The project activity is not expected to result in any emergency that can result in substantial emissions. However, leakages, if any, in the piping or digester shall come to the attention of the plant operator either instantly on the control screen, or at the time of data logging. The team shall take necessary action to stop any such leakage etc. and put plant operation back on track.

5. Uncertainty in data

Some uncertainties may result due to malfunction of meters, calibration issues and wrong data collection (gaps in manual log sheets, human errors by plant operators). The operators are

expected to put best efforts to prevent such errors; however regular internal audits shall rectify any such uncertainty in the monitored data.

6. Monitoring equipment of the project activity

Tag no.	Parameters	Equipment	Brands	Serial Number
1a, 1b, 7	Q _{ww,y} (Influent)	Magnetic flow meter	Kobold (previous installation)	A0792017
		Magnetic flow meter	ABB (new one)	401123
2	COD _{ww,untreated, PJ,k,y}	Analysis equipment/method applied	Mettler Toledo Burette	474804802
3	COD _{ww,untreated, PJ,k,y}			
4	COD _{ww,treated, PJ,k,y}			
5	COD _{ww,treated, PJ,k,y}			
6	COD _{ww,treated, PJ,k,y}			
8	COD _{ww,treated, PJ,k,y}			
9	COD _{ww,discharged, PJ,k,y}			
10	FV _{digester,y}	Gas flow meter	KOBOLD	5843
		Flow Computing	Fuji Electric	863676T
11	W _{CH4,y}	Methane analyzer (Portable)	Geotechnical Instrument (Previous installation)	BM11818109
			Geotechnical Instrument (New one)	G502475
12,13, 18	Temp. & Pressure sensor	Temperature sensor (TS)	1. at biogas out of digester: Kobold	C0046105
			2. at flare: Kobold	193118
			3. at generator no. 1: Kobold	Not specify
			4. at generator no. 2: Kobold	Not specify
12,13, 18	Temp. & pressure sensor	Pressure Transmitter	1. at biogas leaving digester: Honeywell	1006 80027880002
			2. at flare: Kobold	260O422
			3. at generator no. 1: Kobold	260O502
			4. at generator no. 2: Kobold	260 TZXA
14	FV _{RG,h}	Gas flow meter	Kobold	5594
		Flow computing	Fuji Electric	9422144T
15	fV _{CH4,RG,h}	Methane analyzer	JE Gas Sensor	28959
16	T _{flare}	Thermocouple	WRW	255070001/02
17	T _{flare operation}	N/A	N/A	N/A
19	FV _{electricity,y}	Gas flow meter (at generator no.1)	Kobold	5592
		Flow computing (at generator no.1)	Fuji Electric	8623677T
		Gas flow meter (at generator no.2)	Kobold	5593
		Flow computing (at generator no.2)	Fuji Electric	8623675T
20	W _{CH4,y}	Methane analyzer	at generator no.1 :JE Gas Sensor (previous installation)	1 st : 28960

Tag no.	Parameters	Equipment	Brands	Serial Number
			:Ambetronics (new one)	2 nd : 2160913
			At Generator no.2: JE Gas Sensor	29193
21	Total electricity generated	Power meter at generator no. 1 (internal)	Carlo Gavazzi	BI1290012101P
		Power meter at generator no. 2 (internal)	Carlo Gavazzi	BI0980037101I
22	EC_PJ,y	Power meter (internal consumption)	Merlin Gerin	0058033222
23	EC_PJ,y	PEA meter and Invoice/Receipt to PEA (Electricity consumed from grid)	(Internal meter) Merlin Gerin (PM210)	0058010741
24	EG_PJ,y	Power meter (internal) for CPO mill	Schneider (PM7 10MG CA)	4A943A98
25	EG_PJ,y	PEA meter and Invoice/Receipt to PEA	EDMI	206500126

7. Flow diagram of current implementation of project activity

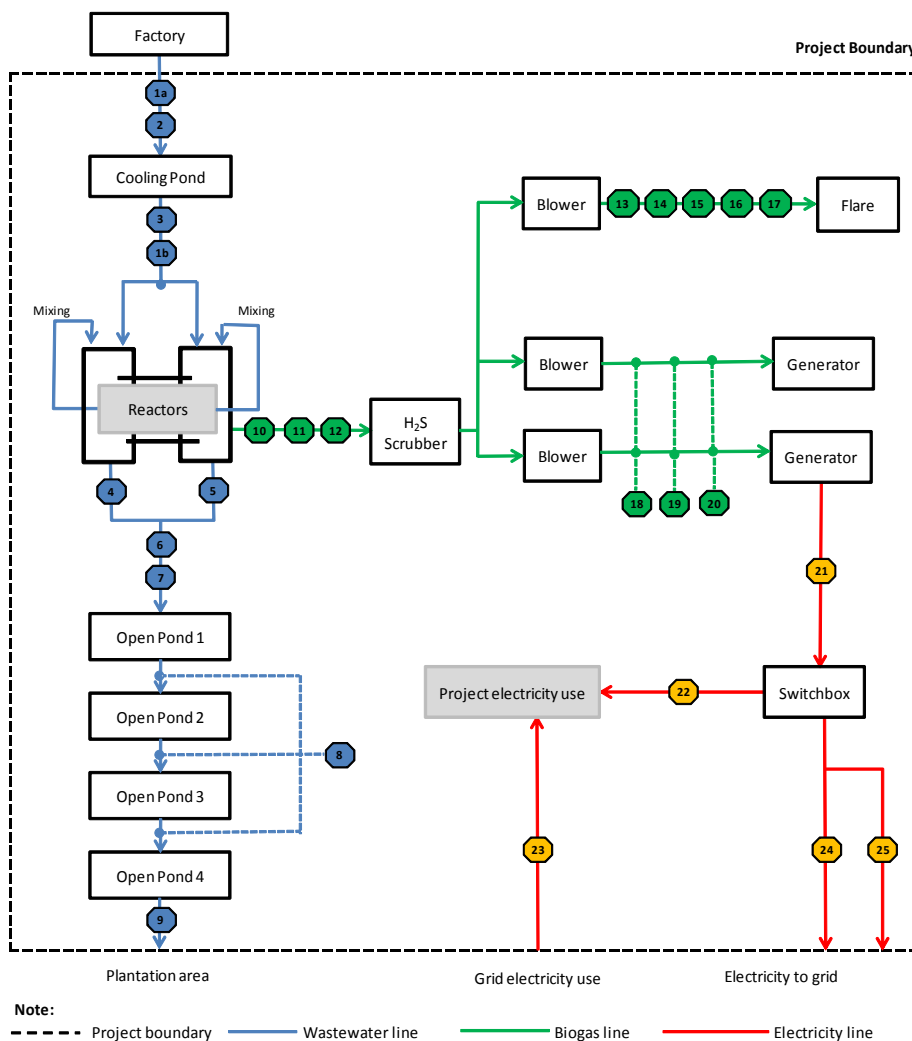


Figure 2: project activity diagram

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

Data/parameter:	GWP_{CH4}
Unit	-
Description	Global warming potential of methane
Source of data	Intergovernmental Panel on Climate Change, Climate Change 1995: The Science of Climate Change (Cambridge, UK: Cambridge University Press, 1996)
Value(s) applied)	21 - Applied from 18/10/2011 to 31/12/2012 25* - Applied from 01/01/2013 to 31/07/2014
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline and project emissions
Additional comments	*According EB 69 - Annex 3, the 2 nd commitment period GWP shall be effective from 01/01/2013.

Data/parameter:	B_{o,ww}
Unit	kg CH ₄ / kg COD
Description	Methane producing capacity of wastewater
Source of data	IPCC default value
Value(s) applied)	0.25
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline and project emissions
Additional comments	-

Data/parameter:	UF_{BL}
Unit	Factor
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H, version 15
Value(s) applied)	0.89
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter:	UF_{PJ}
Unit	Factor
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H, version 15
Value(s) applied)	1.12

Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data/parameter:	$MCF_{ww,BL,discharge} / MCF_{ww,PJ,discharge}$
Unit	Fraction
Description	Methane correction factor based on discharge pathway in the baseline situation/Methane correction factor based on discharge pathway in the project situation
Source of data	AMS-III.H, version 15
Value(s) applied)	0.1
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline and project emissions
Additional comments	-

Data/parameter:	$MCF_{ww, treatment, BL,j}$
Unit	Fraction
Description	Methane correction factor for the baseline anaerobic wastewater treatment systems
Source of data	Table III.H.1. of AMS III.H., Version 15
Value(s) applied)	0.8 (for anaerobic deep lagoon) 0.3 (for aerobic poor managed)
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	The wastewater treatment system in the baseline scenario consists of series of ponds containing the different conditions. The details of baseline system is described as shown in Figure 5 of the registered PDD.

Data/parameter:	$MCF_{ww, treatment, PJ,k}$
Unit	Fraction
Description	Methane conversion factor for the wastewater treatment system that will be equipped with methane recovery and combustion.
Source of data	Table III.H.1. of AMS III.H., Version 15
Value(s) applied)	0.8
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data/parameter:	COD_{removal,y}
Unit	Tonnes/m ³
Description	The chemical oxygen demand removed by the anaerobic wastewater treatment system in the baseline
Source of data	Measurement campaign in the baseline wastewater system for 10 days
Value(s) applied)	From anaerobic pond, COD _{removal, y} = 0.0622 From aerobic, poorly manage pond, COD _{removal, y} = 0.00048
Choice of data or measurement methods and procedures	The COD removed value is based on COD campaign data and multiplied by a factor of 0.89 to account of uncertainty due to data from the campaign measurement. This is in line with the guidance given in paragraph 19 (a) which requires a measurement campaign of the baseline waste water treatment system for at least 10 days. The campaign was conducted by Lam Soon Laboratory. The data results were cross-checked with the value done by accredited laboratory for accuracy purpose.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter:	CFE_{ww}
Unit	Fraction
Description	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems.
Source of data	Default value specified in AMS-III.H, Version 15 methodology
Value(s) applied)	0.9
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data/parameter:	DE_{CH4}
Unit	Kg/m ³
Description	Density of methane at normal conditions
Source of data	"Tool to determine project emissions from flaring gases containing methane"
Value(s) applied)	0.716
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

Data/parameter:	EF_{CO2, grid, y}
Unit	tCO ₂ /MWh
Description	CO ₂ emission factor of the Thailand grid
Source of data	EGAT, DEDE, EPPO, IPCC
Value(s) applied)	0.52

Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline and project emissions.
Additional comments	Please refer to details in Annex 3 of the registered Annex 3.

Data/parameter:	Q_{FFB}
Unit	t _{FFB} /year
Description	Quantity of FFB processed per annum
Source of data	Mill owner
Value(s) applied)	Approximately 175,200 ton FFB/year
Choice of data or measurement methods and procedures	Based on average 3-year historical data of the production rate in (2006 to 2008), the average FFB processed per year was approximately 175,200 as conservative.
Purpose of data	Ex-ante calculation of baseline and project emission
Additional comments	-

Data/parameter:	Q_{ww}
Unit	m ³ /year
Description	Volume of wastewater from the mill to the lagoons per annum in project baseline
Source of data	Measuring
Value(s) applied)	102,730
Choice of data or measurement methods and procedures	FFB production rate obtained from 3-year historical data (175,200 multiply with wastewater generation rate obtained from 10-day measuring campaign at project site.)
Purpose of data	Ex-ante calculation of baseline and project emission
Additional comments	-

Data/parameter:	COD_{untreated}
Unit	tonnes/m ³
Description	Chemical oxygen demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline
Source of data	Laboratory (external lab)
Value(s) applied)	0.0646
Choice of data or measurement methods and procedures	Sample analysis was carried out for 10 days by external accredited laboratory following standard. The result shall be multiplied with 0.89 to account for the uncertainty range.
Purpose of data	Ex-ante calculation of baseline emission
Additional comments	-

D.2. Data and parameters monitored

Data / Parameter:	Q_{ww,y}
Unit:	m ³ /y

Description:	Volume of wastewater treated in year y entering the cooling pond and entering the digester.																																						
Measured/ Calculated / Default:	Measured by the flow meter																																						
Source of data:	Plant records																																						
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>22,117</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>92,008</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>95,631</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>75,867</td> </tr> </tbody> </table>	Monitoring period	Total value (m ³)	18/10/2011 – 31/12/2011	22,117	01/01/2012 – 31/12/2012	92,008	01/01/2013 – 31/12/2013	95,631	01/01/2014 – 31/07/2014	75,867																												
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Monitoring equipment:	<table border="1"> <tbody> <tr> <td>Tag no.</td> <td>1b (before digester)</td> </tr> <tr> <td>Equipment Type</td> <td>Magnetic flow meter</td> </tr> <tr> <td>Manufacturer</td> <td>Kobold</td> </tr> <tr> <td>Model</td> <td>MID-2C1FA0AA00L</td> </tr> <tr> <td>Maximum permissible error</td> <td>±0.30%</td> </tr> <tr> <td>Serial No.</td> <td>A0792017 (Previous Installation period: 18/10/2011 to 19/01/2014)</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specified in the guideline.</td> </tr> <tr> <td>Date of previous calibration</td> <td>01/03/2011 07/03/2012</td> </tr> <tr> <td>Date of latest calibration</td> <td>04/02/2013</td> </tr> <tr> <td>Validity of calibration</td> <td>03/02/2014</td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>Tag no.</td> <td>1b (before digester)</td> </tr> <tr> <td>Equipment Type</td> <td>Magnetic flow meter</td> </tr> <tr> <td>Manufacturer</td> <td>ABB</td> </tr> <tr> <td>Model</td> <td>FEP 311.xxx.AIAI01</td> </tr> <tr> <td>Maximum permissible error</td> <td>±0.40%</td> </tr> <tr> <td>Serial No.</td> <td>1401123 (New installation period: 20/01/2014 to present)</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specified in the guideline.</td> </tr> <tr> <td>Date of latest calibration</td> <td>December 2013 As per certificate</td> </tr> <tr> <td>Validity of calibration</td> <td>30/11/2014</td> </tr> </tbody> </table>	Tag no.	1b (before digester)	Equipment Type	Magnetic flow meter	Manufacturer	Kobold	Model	MID-2C1FA0AA00L	Maximum permissible error	±0.30%	Serial No.	A0792017 (Previous Installation period: 18/10/2011 to 19/01/2014)	Calibration Frequency	Not specified in the guideline.	Date of previous calibration	01/03/2011 07/03/2012	Date of latest calibration	04/02/2013	Validity of calibration	03/02/2014	Tag no.	1b (before digester)	Equipment Type	Magnetic flow meter	Manufacturer	ABB	Model	FEP 311.xxx.AIAI01	Maximum permissible error	±0.40%	Serial No.	1401123 (New installation period: 20/01/2014 to present)	Calibration Frequency	Not specified in the guideline.	Date of latest calibration	December 2013 As per certificate	Validity of calibration	30/11/2014
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Date of latest calibration	December 2013 As per certificate																																						
Validity of calibration	30/11/2014																																						
Measuring/ Reading/ Recording frequency:	The data was measured continuously using magnetic flow meters. The data were recorded hourly into memory card of the recorder and the log-sheets during this monitoring period. The daily data were summarised and integrated into the spreadsheets monthly. The daily data were applied in the calculation of emission reductions.																																						
Calculation method (if applicable):	n/a																																						
QA/QC procedures:	The magnetic flow meter was calibrated periodically based on manufacturer's specification from a certified testing agency but at least once per year.																																						

Purpose of data:	Calculation of baseline and project emissions
Additional comment:	<ul style="list-style-type: none"> The volume of wastewater treated at the 1b is monitored before entering the digester; therefore the data recorded at this monitoring point were applied in the emission reduction calculation. The flow meter with S/N: A0792017 was installed during 18/01/2011 to 19/01/2014. Then, it was replaced by the flow meter with S/N 1401123 on 20/01/2014. The calibration of flow meter was conducted periodically and mostly on time as described above. The calibration frequency is not specified in the guideline. However, the calibration shall be done at least once in a year according to the registered PDD. The calibration gap was considered during the delay of the calibration schedule until the date of calibration. Therefore, The calibration gap of flow meter with S/N A0792017 identified during 18/10/2011 to 07/03/2012, the monitored value during this gap are applied with the maximum error found in the latest calibration report of year 2012. While the calibration gap of the same meter identified on 04/02/2013, the monitored value during this gap are applied with higher value of the maximum permissible error recommended by manufacturer.

Data / Parameter:	$COD_{ww,untreated, PJ,k y}$																				
Unit:	tCOD/m ³																				
Description:	Chemical oxygen demand of wastewater before the treatment system k																				
Measured/ Calculated / Default:	Measured.																				
Source of data:	Plant records (as per the laboratory report)																				
Value(s) of monitored parameter:	<p>At the cooling pond for aerobic poor managed system (ID-2)</p> <table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.0575</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0649</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0682</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0715</td> </tr> </tbody> </table> <p>At the digester for anaerobic treatment system (ID-3)</p> <table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.0480</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0509</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0549</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0577</td> </tr> </tbody> </table>	Monitoring period	Average value (tCOD/m ³)	18/10/2011 – 31/12/2011	0.0575	01/01/2012 – 31/12/2012	0.0649	01/01/2013 – 31/12/2013	0.0682	01/01/2014 – 31/07/2014	0.0715	Monitoring period	Average value (tCOD/m ³)	18/10/2011 – 31/12/2011	0.0480	01/01/2012 – 31/12/2012	0.0509	01/01/2013 – 31/12/2013	0.0549	01/01/2014 – 31/07/2014	0.0577
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Monitoring equipment:	<table border="1"> <tr> <td>Equipment Type</td> <td>Burette</td> </tr> <tr> <td>Manufacturer</td> <td>Mettler Toledo</td> </tr> <tr> <td>Model</td> <td>N/A</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 0.20 %</td> </tr> <tr> <td>Serial No.</td> <td>399004802</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specified in the guideline.</td> </tr> <tr> <td>Date of previous calibration</td> <td>17/10/2011 27/09/2012 10/09/2013</td> </tr> <tr> <td>Date of latest calibration</td> <td>15/09/2014</td> </tr> <tr> <td>Validity</td> <td>14/09/2015</td> </tr> </table>	Equipment Type	Burette	Manufacturer	Mettler Toledo	Model	N/A	Maximum permissible error	+/- 0.20 %	Serial No.	399004802	Calibration Frequency	Not specified in the guideline.	Date of previous calibration	17/10/2011 27/09/2012 10/09/2013	Date of latest calibration	15/09/2014	Validity	14/09/2015
Equipment Type	Burette																		
Manufacturer	Mettler Toledo																		
Model	N/A																		
Maximum permissible error	+/- 0.20 %																		
Serial No.	399004802																		
Calibration Frequency	Not specified in the guideline.																		
Date of previous calibration	17/10/2011 27/09/2012 10/09/2013																		
Date of latest calibration	15/09/2014																		
Validity	14/09/2015																		
Measuring/ Reading/ Recording frequency:	The measurement was conducted in an onsite laboratory. The COD content was analysed in compliance with the closed-reflux method. The analysis method applied is international standard. The results were logged in the plant operation report on a daily basis. However, the weekly values are input into the ER calculation sheet as per the registered PDD. The measurement shall ensure a 90/10-confidence level.																		
Calculation method (if applicable):	n/a																		
QA/QC procedures:	The monitoring equipment was calibrated at regular interval based on manufacturer specification from a certified testing agency or institution. Furthermore, monthly samples were collected and analyzed by accredited laboratory using the similar or equal standard in order to obtain the accuracy of the crosschecked results.																		
Purpose of data:	Calculation of baseline emissions																		
Additional comment:	<ul style="list-style-type: none"> This parameter is used for the determination of $COD_{y,removed,j}$. The monitored data analysed by internal laboratory is compared with the value analysed by the accredited laboratory in order to crosschecked analysing results. By considering 10% difference between both values, the higher value is applied for project emission calculation, while the lower value is applied for baseline emission. Since, the operation manual of equipment does not specify the calibration frequency. The equipment shall be calibrated at least once a year. The calibration was conducted before the end of validity. The calibration gap was considered only during the time of equipment calibration. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap. 																		

Data / Parameter:	COD _{ww,treated,PJ,k,y}
Unit:	tCOD/m ³
Description:	Chemical oxygen demand of the wastewater after the treatment system k
Measured/ Calculated / Default:	Measured.
Source of data:	Plant data (as per the laboratory report)

<p>Value(s) of monitored parameter:</p>	<p>ID4 & ID5: The average value of two monitoring points after the digester.</p> <table border="1" data-bbox="609 219 1313 414"> <thead> <tr> <th rowspan="2">Monitoring period</th> <th>ID 4 and ID 5</th> </tr> <tr> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.0086</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0044</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0053</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0051</td> </tr> </tbody> </table> <p>ID6: The monitored value at the combining point of wastewater leaving the digesters.</p> <table border="1" data-bbox="609 510 1313 705"> <thead> <tr> <th rowspan="2">Monitoring period</th> <th>ID 6</th> </tr> <tr> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.0087</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0046</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0053</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0052</td> </tr> </tbody> </table> <p>ID8: The monitored value at the sampling point before facultative pond 1-2, oxidation pond and polish pond in the post treatment system.</p> <table border="1" data-bbox="609 801 1313 996"> <thead> <tr> <th rowspan="2">Monitoring period</th> <th>ID 8</th> </tr> <tr> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.0015</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0022</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0029</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0024</td> </tr> </tbody> </table>	Monitoring period	ID 4 and ID 5	Average value (tCOD/m ³)	18/10/2011 – 31/12/2011	0.0086	01/01/2012 – 31/12/2012	0.0044	01/01/2013 – 31/12/2013	0.0053	01/01/2014 – 31/07/2014	0.0051	Monitoring period	ID 6	Average value (tCOD/m ³)	18/10/2011 – 31/12/2011	0.0087	01/01/2012 – 31/12/2012	0.0046	01/01/2013 – 31/12/2013	0.0053	01/01/2014 – 31/07/2014	0.0052	Monitoring period	ID 8	Average value (tCOD/m ³)	18/10/2011 – 31/12/2011	0.0015	01/01/2012 – 31/12/2012	0.0022	01/01/2013 – 31/12/2013	0.0029	01/01/2014 – 31/07/2014	0.0024
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	Average value (tCOD/m ³)																																	
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<p>Monitoring equipment:</p>	<table border="1" data-bbox="541 1115 1409 1496"> <tbody> <tr> <td>Equipment Type</td> <td>Burette</td> </tr> <tr> <td>Manufacturer</td> <td>Mettler Toledo</td> </tr> <tr> <td>Model</td> <td>N/A</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 0.20 %</td> </tr> <tr> <td>Serial No.</td> <td>399004802</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specified in the guideline.</td> </tr> <tr> <td>Date of previous calibration</td> <td>17/10/2011 27/09/2012 10/09/2013</td> </tr> <tr> <td>Date of latest calibration</td> <td>15/09/2014</td> </tr> <tr> <td>Validity</td> <td>14/09/2015</td> </tr> </tbody> </table>	Equipment Type	Burette	Manufacturer	Mettler Toledo	Model	N/A	Maximum permissible error	+/- 0.20 %	Serial No.	399004802	Calibration Frequency	Not specified in the guideline.	Date of previous calibration	17/10/2011 27/09/2012 10/09/2013	Date of latest calibration	15/09/2014	Validity	14/09/2015															
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Validity	14/09/2015																																	
<p>Measuring/ Reading/ Recording frequency:</p>	<p>The measurement was conducted onsite laboratory. The COD content was analysed in compliance with the closed-reflux method. The analysis method applied is international standard. The results were logged in the plant operation report on a daily basis. However, the weekly values are input into the ER calculation sheet as per the registered PDD. The measurement shall ensure a 90/10-confidence level.</p>																																	
<p>Calculation method (if applicable):</p>	<p>n/a</p>																																	
<p>QA/QC procedures:</p>	<p>The monitoring equipment was calibrated at least once a year. Furthermore, monthly samples were collected and analyzed by accredited laboratory using the similar or equal standard in order to obtain the accuracy of the crosschecked results.</p>																																	
<p>Purpose of data:</p>	<p>Calculation of baseline and project emissions</p>																																	

Additional comment:	<ul style="list-style-type: none"> The value of each monitoring point is considered as per the condition of treatment system as following; <ul style="list-style-type: none"> ID 3 is monitored for calculation of $COD_{removed\ PJ,k,y}$ under aerobic poor managed condition (cooling pond). The COD removal is considered between COD value at ID2 and at ID3. ID 4, 5, 6 are monitored for anaerobic digester. ID 8 is monitored for aerobic poor managed condition (facultative pond 1&2, oxidation pond and polishing pond in the post treatment system). This parameter is used for the determination of $COD_{y,removed,j}$. The monitored data analysed by internal laboratory is compared with the value analysed by the accredited laboratory in order to crosschecked analysing results. By considering 10% difference between both values, the higher value is applied for project emission calculation, while the lower value is applied for baseline emission. Since, the operation manual of equipment does not specify the calibration frequency. The equipment shall be calibrated at least once a year. The calibration was conducted before the end of validity. The calibration gap was considered only during the time of equipment calibration. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap.
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Data / Parameter:	$COD_{ww, discharged, PJ,y}$											
Unit:	tCOD/m ³											
Description:	Chemical oxygen demand of the final treated wastewater discharged into the plantation area in the project activity											
Measured/ Calculated / Default:	Measured											
Source of data:	Plant data (as per the laboratory report)											
Value(s) of monitored parameter:	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Monitoring period</th> <th>ID-9</th> </tr> <tr> <th>Average value (tCOD/m³)</th> </tr> </thead> <tbody> <tr> <td>10/08/2011 – 31/12/2011</td> <td>0.0012</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.0015</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.0019</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.0018</td> </tr> </tbody> </table>	Monitoring period	ID-9	Average value (tCOD/m ³)	10/08/2011 – 31/12/2011	0.0012	01/01/2012 – 31/12/2012	0.0015	01/01/2013 – 31/12/2013	0.0019	01/01/2014 – 31/07/2014	0.0018
Monitoring period	ID-9											
	Average value (tCOD/m ³)											
10/08/2011 – 31/12/2011	0.0012											
01/01/2012 – 31/12/2012	0.0015											
01/01/2013 – 31/12/2013	0.0019											
01/01/2014 – 31/07/2014	0.0018											

Monitoring equipment:	Equipment Type	Burette
	Manufacturer	Mettler Toledo
	Model	N/A
	Maximum permissible error	±0.20 %
	Serial No.	399004802
	Calibration Frequency	Not specified in the guideline.
	Date of previous calibration	17/10/2011 27/09/2012 10/09/2013
	Date of latest calibration	15/09/2014
	Validity	14/09/2015
Measuring/ Reading/ Recording frequency:	The measurement was conducted onsite laboratory. The COD content was analysed in comply with closed-reflux method. The analysis method applied is international standard. The results were logged in the plant operation report on a daily basis. However, the weekly values are input into the ER calculation sheet as per the registered PDD. The measurement shall ensure a 90/10-confidence level.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	The monitoring equipment was calibrated at regular interval based on manufacturer specification from a certified testing agency or institution. Furthermore, monthly samples were collected and analyzed by accredited laboratory using the similar or equal standard in order to obtain the accuracy of the crosschecked results.	
Purpose of data:	Calculation of project emission	
Additional comment:	<ul style="list-style-type: none"> The monitored data analysed by internal laboratory is compared with the value analysed by the accredited laboratory in order to crosschecked analysing results. By considering 10% difference between both values, the higher value is applied for project emission calculation, while the lower value is applied for baseline emission. Since, the operation manual of equipment does not specify the calibration frequency. The equipment shall be calibrated at least once a year. The calibration was conducted before the end of validity. The calibration gap was considered only during the time of equipment calibration. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap. 	

Data / Parameter:	$Q_{ww, discharge, y}$ (outlet)
Unit:	m ³ /year
Description:	Volume of wastewater treated discharged in year y
Measured/ Calculated / Default:	Measured by the flow meter
Source of data:	Plant records

Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>22,117</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>92,008</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>95,631</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>75,867</td> </tr> </tbody> </table>	Monitoring period	Total value (m ³)	18/10/2011 – 31/12/2011	22,117	01/01/2012 – 31/12/2012	92,008	01/01/2013 – 31/12/2013	95,631	01/01/2014 – 31/07/2014	75,867
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	01/01/2012 – 31/12/2012	92,008									
	01/01/2013 – 31/12/2013	95,631									
01/01/2014 – 31/07/2014	75,867										
Monitoring equipment:	Please see detail in parameter of Q _{ww,y} (ID1b)										
Measuring/ Reading/ Recording frequency:	The data was measured continuously using magnetic flow meters. The measurement was conducted hourly. The data monitored was recorded in the data logger and the log sheets. The data were recorded hourly into the log-sheets during this monitoring period. The daily data were summarised and integrated into electronic spreadsheets monthly. The daily data were applied in the calculation of emission reductions.										
Calculation method (if applicable):	n/a										
QA/QC procedures:	The magnetic flow meter was calibrated periodically based on manufacturer's specification from a certified testing agency but at least once per year.										
Purpose of data:	Calculation of project emission										
Additional comment:	In order to consider conservativeness of project emission calculation, the amount of Q _{discharge,y (outlet)} at ID-7 is based on the monitored value of Q _{ww,y} , at ID-1b. This data is applied for determination of PE _{ww,discharge,y} . This conservative approach is in line with paragraph 3, Appendix 1 of project CDM project.										

Data / Parameter:	S_{final,PJ,y}										
Unit:	t (tonnes) / year										
Description:	End use of treated sludge generated in year y										
Measured/ Calculated / Default:	Measured.										
Source of data:	Plant operation records										
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (tonnes)</th> </tr> </thead> <tbody> <tr> <td>10/08/2011 – 31/12/2011</td> <td>0</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0</td> </tr> </tbody> </table>	Monitoring period	Total value (tonnes)	10/08/2011 – 31/12/2011	0	01/01/2012 – 31/12/2012	0	01/01/2013 – 31/12/2013	0	01/01/2014 – 31/07/2014	0
	Monitoring period	Total value (tonnes)									
	10/08/2011 – 31/12/2011	0									
	01/01/2012 – 31/12/2012	0									
	01/01/2013 – 31/12/2013	0									
01/01/2014 – 31/07/2014	0										

Monitoring equipment:	Equipment Type	Weight bridge
	Manufacturer	Matter tolede
	Model	8530
	Maximum permissible error	Not specified
	Serial No.	5445595-5HP
	Calibration Frequency	Not specified
	Date of previous calibration	08/04/2010 05/04/2011 29/06/2012 24/04/2013 13/02/2014
	Date of latest calibration	11/03/2014
	Validity	10/03/2016
Measuring/ Reading/ Recording frequency:	The practice of final disposal of the sludge shall be documented in the plant operation log sheets and documented with additional evidence such as pictures. Data will be archived electronically, for at least 2 years after last issuance of CERs.	
Calculation method (if applicable):	n/a	
QA/QC procedures:	n/a	
Purpose of data:	The calculation of project emissions	
Additional comment:	There was none of excess sludge generated during this monitoring period.	

Data / Parameter:	FV_{digester y}										
Unit:	Nm ³ in year y										
Description:	Volumetric flow rate of biogas on dry basis leaving the digester in year y (BG _{burnt,y})										
Measured/ Calculated / Default:	Measured.										
Source of data:	Plant records										
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (Nm³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>631,827</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>2,641,673</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>3,083,443</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>2,688,513</td> </tr> </tbody> </table>	Monitoring period	Total value (Nm ³)	18/10/2011 – 31/12/2011	631,827	01/01/2012 – 31/12/2012	2,641,673	01/01/2013 – 31/12/2013	3,083,443	01/01/2014 – 31/07/2014	2,688,513
Monitoring period	Total value (Nm ³)										
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Monitoring equipment:	<table border="1"> <tr><td>Tag no.</td><td>ID-10</td></tr> <tr><td>Equipment Type</td><td>Gas flow meter</td></tr> <tr><td>Manufacturer</td><td>Kobold</td></tr> <tr><td>Model</td><td>DOG-1120</td></tr> <tr><td>Maximum permissible error</td><td>+/- 1.5%</td></tr> <tr><td>Serial No.</td><td>5843</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>01/03/2011 06/03/2012</td></tr> <tr><td>Date of latest calibration</td><td>12/12/2013</td></tr> <tr><td>Validity</td><td>11/12/2014</td></tr> </table>	Tag no.	ID-10	Equipment Type	Gas flow meter	Manufacturer	Kobold	Model	DOG-1120	Maximum permissible error	+/- 1.5%	Serial No.	5843	Calibration Frequency	Annually	Date of previous calibration	01/03/2011 06/03/2012	Date of latest calibration	12/12/2013	Validity	11/12/2014
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Serial No.	5843																				
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Date of latest calibration	12/12/2013																				
Validity	11/12/2014																				
	<table border="1"> <tr><td>Tag no.</td><td>ID-10 (FC1)</td></tr> <tr><td>Equipment Type</td><td>Flow computing</td></tr> <tr><td>Manufacturer</td><td>Fuji Electric</td></tr> <tr><td>Model</td><td>PXH9A211-5V000</td></tr> <tr><td>Maximum permissible error</td><td>+/- 0.1%</td></tr> <tr><td>Serial No.</td><td>8623676T</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>01/03/2011 06/03/2012</td></tr> <tr><td>Date of latest calibration</td><td>10/12/2013</td></tr> <tr><td>Validity</td><td>11/12/2014</td></tr> </table>	Tag no.	ID-10 (FC1)	Equipment Type	Flow computing	Manufacturer	Fuji Electric	Model	PXH9A211-5V000	Maximum permissible error	+/- 0.1%	Serial No.	8623676T	Calibration Frequency	Annually	Date of previous calibration	01/03/2011 06/03/2012	Date of latest calibration	10/12/2013	Validity	11/12/2014
Tag no.	ID-10 (FC1)																				
Equipment Type	Flow computing																				
Manufacturer	Fuji Electric																				
Model	PXH9A211-5V000																				
Maximum permissible error	+/- 0.1%																				
Serial No.	8623676T																				
Calibration Frequency	Annually																				
Date of previous calibration	01/03/2011 06/03/2012																				
Date of latest calibration	10/12/2013																				
Validity	11/12/2014																				
Measuring/ Reading/ Recording frequency:	The monitoring equipment set of biogas quantity consists of a gas flow meter and a flow computing. The measurement has been taken on an hourly basis. Using gas flow meter, it can monitor the amount of biogas in m ³ /hour unit. Then the conversion of monitored unit to normal condition unit in Nm ³ /hour was done by the flow computing. The values received were integrated with data logger to have real time data monitoring and control. The normalized flow of biogas was shown on the display. The daily data monitored were recorded into log-sheets.																				
Calculation method (if applicable):	n/a																				
QA/QC procedures:	The monitoring devices were calibrated at regular intervals based on manufacturer specification from a certified testing agency or institution. The calibration was done at least once a year.																				
Purpose of data:	The calculation of baseline emissions.																				
Additional comment:	The monitoring equipment was calibrated annually. However, the daily data monitored were not recorded properly into the log-sheets. The value applied of this parameter is calculated based on the amount of biogas sent to gas engines plus the amount of biogas sent to flare.																				

Data / Parameter:	W _{CH₄,y}
Unit:	Kg CH ₄ /m ³ biogas (it is presented in percentage fraction.)
Description:	Methane content in the biogas in the year y (volume fraction)
Measured/ Calculated / Default:	Measured.
Source of data:	Plant records
Value(s) of monitored	

parameter:

Lower value

Monitoring period	Total value (%)
18/10/2011 – 31/12/2011	51.32%
01/01/2012 – 31/12/2012	55.34%
01/01/2013 – 31/12/2013	53.48%
01/01/2014 – 31/07/2014	54.23%

Upper value

Monitoring period	Total value (%)
18/10/2011 – 31/12/2011	62.29%
01/01/2012 – 31/12/2012	60.51%
01/01/2013 – 31/12/2013	60.04%
01/01/2014 – 31/07/2014	56.08%

Monitoring equipment:

Tag no.	ID 11 (at biogas leaving digester)
Equipment Type	Portable gas analyzer
Manufacturer	Geotechnical Instrument
Model	Biogas
Maximum permissible error	+/- 0.5%
Serial No.	BM11818109 (Previous installation: 18/10/2011 to 04/11/2014) G502475* (New installation: 05/11/2014 to present)
Calibration Frequency	Once a year
Date of previous calibration	13/03/2012 21/11/2013
Date of latest calibration	05/11/2014* (for S/N: G502475)
Validity	04/11/2015

Tag no.	ID 20.1 (at the generator no.1)
Equipment Type	Continuous gas analyser (IR sensor)
Manufacturer	JE gas sensor
Model	MJE
Maximum permissible error	+/- 2%
Serial No.	28960 (Previous installation: 18/10/2011 to 20/04/2014)
Calibration Frequency	Once a year
Date of previous calibration	20/05/2012
Date of latest calibration	21/11/2013
Validity	20/11/2014

Tag no.	ID 20.1 (at the generator no.1)
Equipment Type	Continuous gas analyser (IR sensor)
Manufacturer	Ambtronics
Model	IR 5000 WP
Maximum permissible error	+/- 2%
Serial No.	No2: 2160913 (New installation: 20/04/2014 to present)
Calibration Frequency	Once a year
Date of previous calibration	N/A
Date of latest calibration	17/12/2014
Validity	16/12/2015

Tag no.	ID 20.2 (at the generator no.2)
Equipment Type	Continuous gas analyser (IR sensor)
Manufacturer	JE gas sensor

	<table border="1"> <tr> <td>Model</td> <td>MJE</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 2%</td> </tr> <tr> <td>Serial No.</td> <td>29193</td> </tr> <tr> <td>Calibration Frequency</td> <td>Once a year</td> </tr> <tr> <td>Date of previous calibration</td> <td>13/03/2012</td> </tr> <tr> <td>Date of latest calibration</td> <td>21/11/2013</td> </tr> <tr> <td>Validity</td> <td>13/12/2014</td> </tr> </table>	Model	MJE	Maximum permissible error	+/- 2%	Serial No.	29193	Calibration Frequency	Once a year	Date of previous calibration	13/03/2012	Date of latest calibration	21/11/2013	Validity	13/12/2014
Model	MJE														
Maximum permissible error	+/- 2%														
Serial No.	29193														
Calibration Frequency	Once a year														
Date of previous calibration	13/03/2012														
Date of latest calibration	21/11/2013														
Validity	13/12/2014														
Measuring/ Reading/ Recording frequency:	<p>At the monitoring point of biogas leaving digester, the fraction of methane in biogas was measured by a portable gas analyzer (ID 11).</p> <p>At the monitoring point of biogas consumed in the generator no.1 and no.2, the methane fractions were measured by continuous gas analyzers (ID 20.1 and ID 20.2). The data were recorded hourly into the log-sheets. The measurement of this parameter ensures 90/10 confidence/precision level.</p>														
Calculation method (if applicable):	n/a														
QA/QC procedures:	The gas analyser was periodically calibrated according to manufacturer's specifications/recommendation or once a year														
Purpose of data:	The calculation of baseline and project emissions.														
Additional comment:	<ul style="list-style-type: none"> At the monitoring of methane in biogas at generator no.1, the analyser with S/N was replaced by a new one with S/N 2160913. All of the gas analysers are infrared sensor type. In order to adjust monitoring value during the calibration gap, the monitored data are applied with the maximum value identified in the calibration test report. The gap of calibration was considered during the delay of validity scheduled to the date of calibration. All of the monitored value are averaged and ensured 90/10-confidence/precision levels. The higher average value is applied for project emission calculation. The lower average value is applied for baseline emission calculation. 														

Data / Parameter:	T_{biogas} and P_{biogas}
Unit:	°C and Bar
Description:	Temperature and pressure of produced biogas
Measured/ Calculated / Default:	Measured.
Source of data:	Plant records

Value(s) of monitored parameter:	Average temperature value (°C)				
	Monitoring period	ID12	ID13*	ID18.1	ID18.2
	18/10/2011 – 31/12/2011	39.13	0	44.53	43.93
	01/01/2012 – 31/12/2012	39.60	0	45.22	46.87
	01/01/2013 – 31/12/2013	38.63	0	51.17	52.38
	01/01/2014 – 31/07/2014	39.75	0	55.71	53.99
	Note:*There were no flaring during the monitoring period.				
	Average pressure value (mBar)				
	Monitoring period	ID12	ID13*	ID18.1	ID18.2
	18/10/2011 – 31/12/2011	-2.71	0	149.1	152.4
01/01/2012 – 31/12/2012	-2.97	0	159.8	166.7	
01/01/2013 – 31/12/2013	-8.72	0	153.2	167.8	
01/01/2014 – 31/07/2014	-7.52	0	152.4	168.3	
Note:*There were no flaring during the monitoring period.					

Monitoring equipment:

Tag no.	ID-12 (T) at the digester
Equipment Type	Temperature sensor
Manufacturer	Kobold
Model	TWD-B9410213BY
Maximum permissible error	±0.11% (The error value is not specified in the guideline. This value is based on the latest calibration report.)
Serial No.	-
Calibration Frequency	Not specified in the guideline
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-13 (T) at the flaring system
Equipment Type	Temperature sensor
Manufacturer	Kobold
Model	TWD-B9410213TY
Maximum permissible error	+/- 1.36% (The error value is not specified in the guideline. This value is based on the latest calibration report.)
Serial No.	193118
Calibration Frequency	Not specified in the guideline
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-18.1 (T) at the generator no.1
Equipment Type	Temperature sensor
Manufacturer	Kobold
Model	TWD-B9410213BY
Maximum permissible error	+/- 0.53% (The error value is not specified in the guideline. This value is based on the latest calibration report.)
Serial No.	-
Calibration Frequency	Not specified in the guideline
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-18.2 (T) at the generator no.2
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Equipment Type	Temperature sensor
Manufacturer	Kobold
Model	TWD-B9410213TY
Maximum permissible error	+/- 0.24% (The error value is not specified in the guideline. This value is based on the latest calibration report.)
Serial No.	-
Calibration Frequency	Not specified in the guideline
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-12 (P) at the digester
Equipment Type	Pressure transmitter
Manufacturer	Honeywell
Model	ST 3000
Maximum permissible error	+/- 1.00 %
Serial No.	1006 800278800002
Calibration Frequency	Not specify in the guideline
Date of previous calibration	02/03/2011 07/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-13 (P) at the flaring system
Equipment Type	Pressure transmitter
Manufacturer	Kobold
Model	SEN3251
Maximum permissible error	+/- 1.00 %
Serial No.	260 0 422
Calibration Frequency	Not specify in the guideline
Date of previous calibration	02/02/2011
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-18.1 (P) at the generator no.1
Equipment Type	Pressure transmitter
Manufacturer	Kobold
Model	SEN3251
Maximum permissible error	+/- 1.00 %
Serial No.	260 0 502
Calibration Frequency	Not specify in the guideline
Date of previous calibration	02/03/2011
Date of latest calibration	10/12/2013
Validity	09/12/2014

Tag no.	ID-18.2 (P) at the generator no2
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	<table border="1"> <tr> <td>Equipment Type</td> <td>Pressure transmitter</td> </tr> <tr> <td>Manufacturer</td> <td>Kobold</td> </tr> <tr> <td>Model</td> <td>SEN3251</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 1.00 %</td> </tr> <tr> <td>Serial No.</td> <td>260TZXA</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specify in the guideline</td> </tr> <tr> <td>Date of previous calibration</td> <td>02/03/2011</td> </tr> <tr> <td>Date of latest calibration</td> <td>10/12/2013</td> </tr> <tr> <td>Validity</td> <td>09/12/2014</td> </tr> </table>	Equipment Type	Pressure transmitter	Manufacturer	Kobold	Model	SEN3251	Maximum permissible error	+/- 1.00 %	Serial No.	260TZXA	Calibration Frequency	Not specify in the guideline	Date of previous calibration	02/03/2011	Date of latest calibration	10/12/2013	Validity	09/12/2014
Equipment Type	Pressure transmitter																		
Manufacturer	Kobold																		
Model	SEN3251																		
Maximum permissible error	+/- 1.00 %																		
Serial No.	260TZXA																		
Calibration Frequency	Not specify in the guideline																		
Date of previous calibration	02/03/2011																		
Date of latest calibration	10/12/2013																		
Validity	09/12/2014																		
Measuring/ Reading/ Recording frequency:	The temperature and pressure of the produced biogas were measured continuously with the volume to allow for normalization. The measurements are conducted at four monitoring points of the biogas outlet; at digester, at the flaring system, at the generator no.1 and at generator no.2. The conversion unit to Nm ³ is made directly and the flow rates unit is recorded in Nm ³ unit. The data was recorded hourly into the log-sheet.																		
Calculation method (if applicable):	n/a																		
QA/QC procedures:	Calibration as per manufacturer's recommendations or at least once per year is conducted. Maintenance was performed as per the guideline/maintenance schedule recommended by. The uncertainty level of the data is expected to be low. The records of calibration were kept at site.																		
Purpose of data:	The parameters were not used in the emission reduction calculation. The purpose of data is for monitoring only.																		
Additional comment:	n/a																		

Data / Parameter:	FV_{RG,h}										
Unit:	m ³ / h (It is converted and reported in Nm ³ /year)										
Description:	Volumetric flow rate of the biogas to the flare in dry basis at normal condition in hour h (BG _{flare,y})										
Measured/ Calculated / Default:	Measured.										
Source of data:	Plant records										
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (Nm³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0</td> </tr> </tbody> </table>	Monitoring period	Total value (Nm ³)	18/10/2011 – 31/12/2011	0	01/01/2012 – 31/12/2012	0	01/01/2013 – 31/12/2013	0	01/01/2014 – 31/07/2014	0
Monitoring period	Total value (Nm ³)										
18/10/2011 – 31/12/2011	0										
01/01/2012 – 31/12/2012	0										
01/01/2013 – 31/12/2013	0										
01/01/2014 – 31/07/2014	0										

Monitoring equipment:	<table border="1" data-bbox="528 221 1394 607"> <tr><td>Tag no.</td><td>ID-14</td></tr> <tr><td>Equipment Type</td><td>Gas flow meter</td></tr> <tr><td>Manufacturer</td><td>Kobold</td></tr> <tr><td>Model</td><td>DOG-1120</td></tr> <tr><td>Maximum permissible error</td><td>+/- 1.5%</td></tr> <tr><td>Serial No.</td><td>5594</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>01/03/2011 06/03/2012</td></tr> <tr><td>Date of latest calibration</td><td>12/12/2013</td></tr> <tr><td>Validity</td><td>11/12/2014</td></tr> </table> <table border="1" data-bbox="528 674 1394 1059"> <tr><td>Tag no.</td><td>ID-14 (FC3)</td></tr> <tr><td>Equipment Type</td><td>Flow computing</td></tr> <tr><td>Manufacturer</td><td>Fuji Electric</td></tr> <tr><td>Model</td><td>PXH9A211-5V000</td></tr> <tr><td>Maximum permissible error</td><td>+/- 0.1%</td></tr> <tr><td>Serial No.</td><td>9422144T</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>01/03/2011 06/03/2012</td></tr> <tr><td>Date of latest calibration</td><td>10/12/2013</td></tr> <tr><td>Validity</td><td>09/12/2014</td></tr> </table>	Tag no.	ID-14	Equipment Type	Gas flow meter	Manufacturer	Kobold	Model	DOG-1120	Maximum permissible error	+/- 1.5%	Serial No.	5594	Calibration Frequency	Annually	Date of previous calibration	01/03/2011 06/03/2012	Date of latest calibration	12/12/2013	Validity	11/12/2014	Tag no.	ID-14 (FC3)	Equipment Type	Flow computing	Manufacturer	Fuji Electric	Model	PXH9A211-5V000	Maximum permissible error	+/- 0.1%	Serial No.	9422144T	Calibration Frequency	Annually	Date of previous calibration	01/03/2011 06/03/2012	Date of latest calibration	10/12/2013	Validity	09/12/2014
Tag no.	ID-14																																								
Equipment Type	Gas flow meter																																								
Manufacturer	Kobold																																								
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Measuring/ Reading/ Recording frequency:	The monitoring equipment set of biogas quantity consists of a gas flow meter and a flow computing. The measurement has been taken on an hourly basis. Using gas flow meter, it can monitor the amount of biogas in m3/hour unit. Then the conversion of monitored unit to normal condition in Nm3/hour was done by the flow computing. The values received were integrated with data logger in order to have real time data monitoring and control. The normalized flow of biogas flared was shown on the display. The daily data monitored were recorded into log-sheets and applied in the ER calculation.																																								
Calculation method (if applicable):	n/a																																								
QA/QC procedures:	The monitoring devices were calibrated at regular intervals based on manufacturer specification from a certified testing agency or institution. The calibration was done at least once a year.																																								
Purpose of data:	The calculation of project emissions.																																								

Additional comment:	<ul style="list-style-type: none"> The daily data was summarised and integrated into electronic spreadsheets monthly. Due to the maximum permissible error of gas flow meter is higher than the flow computing, therefore this value are considered for applying with the monitored data. The calibration shall be done at least once in a year as per the registered PDD. Thus, the calibration gap was considered during; 29/02/2012 to 06/03/2013, and 05/03/2013 to 10/12/2013. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap. However, no flaring during this monitoring period, therefore the delay has no impact in the ER calculation.
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Data / Parameter:	$f_{V_{CH_4,RG,h}}$																				
Unit:	fraction																				
Description:	Volumetric fraction of component <i>i</i> in the residual gas in the hour <i>h</i> where $i=CH_4$ and N_2 of the residual gas in dry basis at normal conditions in the hour <i>h</i>																				
Measured/ Calculated / Default:	Measured.																				
Source of data:	Plant records																				
Value(s) of monitored parameter:	<p style="text-align: center;">Lower value</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Monitoring period</th> <th>Total value (%)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>51.32%</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>55.34%</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>53.48%</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>54.23%</td> </tr> </tbody> </table> <p style="text-align: center;">Upper value</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Monitoring period</th> <th>Total value (%)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>62.29%</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>60.51%</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>60.04%</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>56.08%</td> </tr> </tbody> </table>	Monitoring period	Total value (%)	18/10/2011 – 31/12/2011	51.32%	01/01/2012 – 31/12/2012	55.34%	01/01/2013 – 31/12/2013	53.48%	01/01/2014 – 31/07/2014	54.23%	Monitoring period	Total value (%)	18/10/2011 – 31/12/2011	62.29%	01/01/2012 – 31/12/2012	60.51%	01/01/2013 – 31/12/2013	60.04%	01/01/2014 – 31/07/2014	56.08%
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Monitoring equipment:	<table border="1" style="width: 100%;"> <tr> <td>Tag no.</td> <td>ID-15</td> </tr> <tr> <td>Equipment Type</td> <td>Continuous gas analyser (IR sensor)</td> </tr> <tr> <td>Manufacturer</td> <td>JE gas sensor</td> </tr> <tr> <td>Model</td> <td>MJE</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 2%</td> </tr> <tr> <td>Serial No.</td> <td>28958</td> </tr> <tr> <td>Calibration Frequency</td> <td>Once a year</td> </tr> <tr> <td>Date of previous calibration</td> <td>20/05/2012</td> </tr> <tr> <td>Date of latest calibration</td> <td>10/04/2013</td> </tr> <tr> <td>Validity</td> <td>09/04/2014</td> </tr> </table>	Tag no.	ID-15	Equipment Type	Continuous gas analyser (IR sensor)	Manufacturer	JE gas sensor	Model	MJE	Maximum permissible error	+/- 2%	Serial No.	28958	Calibration Frequency	Once a year	Date of previous calibration	20/05/2012	Date of latest calibration	10/04/2013	Validity	09/04/2014
Tag no.	ID-15																				
Equipment Type	Continuous gas analyser (IR sensor)																				
Manufacturer	JE gas sensor																				
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Maximum permissible error	+/- 2%																				
Serial No.	28958																				
Calibration Frequency	Once a year																				
Date of previous calibration	20/05/2012																				
Date of latest calibration	10/04/2013																				
Validity	09/04/2014																				
Measuring/ Reading/ Recording frequency:	The monitoring parameter was measured hourly or at a shorter time interval by using the continuous gas analyzer during flaring. The data were recorded hourly into the log-sheets. The average values of daily																				

	data were transferred to the spreadsheets. The measurement of this parameter ensures 90/10-confidence/precision levels.
Calculation method (if applicable):	n/a
QA/QC procedures:	The gas analyser was periodically calibrated according to manufacturer's specifications/recommendation or once a year.
Purpose of data:	The calculation of baseline and project emissions.
Additional comment:	Data recording of this parameter during this monitoring period was not conducted properly. The monitoring data was not fully available for emission reduction calculation. Therefore, the methane fraction that is applied for project emission in flaring activity is based on the parameter ID11, ID 20.1 and ID 20.2 mentioned above. The upper value has been applied for project emission.

Data / Parameter:	T_{flare}																
Unit:	°C																
Description:	Temperature of methane flare used for flame detection																
Measured/ Calculated / Default:	Measured.																
Source of data:	Plant records																
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (°C)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>No data record</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>No data record</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>No data record</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>No data record</td> </tr> </tbody> </table>	Monitoring period	Total value (°C)	18/10/2011 – 31/12/2011	No data record	01/01/2012 – 31/12/2012	No data record	01/01/2013 – 31/12/2013	No data record	01/01/2014 – 31/07/2014	No data record						
Monitoring period	Total value (°C)																
18/10/2011 – 31/12/2011	No data record																
01/01/2012 – 31/12/2012	No data record																
01/01/2013 – 31/12/2013	No data record																
01/01/2014 – 31/07/2014	No data record																
Monitoring equipment:	<table border="1"> <tr> <td>Tag no.</td> <td>ID-16</td> </tr> <tr> <td>Equipment Type</td> <td>Thermocouple</td> </tr> <tr> <td>Manufacturer</td> <td>WRW</td> </tr> <tr> <td>Model</td> <td>Type N</td> </tr> <tr> <td>Serial No.</td> <td>25507001/02</td> </tr> <tr> <td>Calibration Frequency</td> <td>Not specify in the guideline</td> </tr> <tr> <td>Date of latest calibration</td> <td>30/07/2012</td> </tr> <tr> <td>Validity</td> <td>29/07/2013</td> </tr> </table>	Tag no.	ID-16	Equipment Type	Thermocouple	Manufacturer	WRW	Model	Type N	Serial No.	25507001/02	Calibration Frequency	Not specify in the guideline	Date of latest calibration	30/07/2012	Validity	29/07/2013
Tag no.	ID-16																
Equipment Type	Thermocouple																
Manufacturer	WRW																
Model	Type N																
Serial No.	25507001/02																
Calibration Frequency	Not specify in the guideline																
Date of latest calibration	30/07/2012																
Validity	29/07/2013																
Measuring/ Reading/ Recording frequency:	The flare temperature was measured with a type N thermocouple continuously and data will be logged digitally and stored (1 min aggregated average value) in an easily accessible and transparent format. A temperature above 500°C indicated that a significant amount of gases are still being burnt and that the flare is operating.																
Calculation method (if applicable):	n/a																
QA/QC procedures:	The temperature sensor will undergo maintenance / calibration subject to appropriate industry standards, or as per recommendation of supplier, or at least once per year. Data shall be archived for at least 2 years after crediting period ends. Level of uncertainty for data is expected to be low.																

Purpose of data:	The calculation of project emissions.
Additional comment:	The monitored data were not recorded properly. The data package of considering flare efficiency is incomplete. The value of flare efficiency is assumed as zero % in order to calculate the project emission. This is conservative.

Data / Parameter:	T_{flare operation}										
Unit:	hours										
Description:	Operation time of the flare per year y										
Measured/ Calculated / Default:	Measured.										
Source of data:	Plant records										
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (hours)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>No data record</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>No data record</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>No data record</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>No data record</td> </tr> </tbody> </table>	Monitoring period	Total value (hours)	18/10/2011 – 31/12/2011	No data record	01/01/2012 – 31/12/2012	No data record	01/01/2013 – 31/12/2013	No data record	01/01/2014 – 31/07/2014	No data record
Monitoring period	Total value (hours)										
18/10/2011 – 31/12/2011	No data record										
01/01/2012 – 31/12/2012	No data record										
01/01/2013 – 31/12/2013	No data record										
01/01/2014 – 31/07/2014	No data record										
Monitoring equipment:	The measurement of this parameter is done continuously using gas flow meter, please see detail of monitoring parameter: FV _{,RG,h} (ID13) above.										
Measuring/ Reading/ Recording frequency:	This parameter was measured continuously with the flow rate during the operation of flaring. The recording of time period was based on data logger software that can display relevant parameter during the operation.										
Calculation method (if applicable):	n/a										
QA/QC procedures:	The maintenance of flaring system was conducted as per manufacture's recommendations. The QA/QC procedure and the calibration can be referred from the monitoring parameter of FV _{,RG,h} (ID13) above.										
Purpose of data:	The calculation of project emissions.										
Additional comment:	The monitored data were not recorded properly. The data package of considering flare efficiency is incomplete. The value of flare efficiency is assumed as zero % in order to calculate the project emission. This is conservative.										

Data / Parameter:	FV_{electricity,y}
Unit:	Nm ³ in year y
Description:	Volumetric flow rate of biogas on dry basis entering for power generation (BG _{electricity,y})
Measured/ Calculated / Default:	Measured.
Source of data:	Plant records

Value(s) of monitored parameter:	Monitoring period	Total value (Nm³)
	18/10/2011 – 31/12/2011	631,827
	01/01/2012 – 31/12/2012	2,641,673
	01/01/2013 – 31/12/2013	3,083,443
	01/01/2014 – 31/07/2014	2,688,513

Monitoring equipment:

Tag no.	ID-19.1 at generator no.1
Equipment Type	Gas flow meter
Manufacturer	Kobold
Model	DOG-1120
Maximum permissible error	+/- 1.5%
Serial No.	5592
Calibration Frequency	Annually
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	12/12/2013
Validity	11/12/2014

Tag no.	ID-19.1 (FC) at generator no.1
Equipment Type	Flow computing
Manufacturer	Fuji Electric
Model	PXH9A211-5V000
Maximum permissible error	+/- 0.1%
Serial No.	8623677T
Calibration Frequency	Annually
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	11/12/2014

Tag no.	ID-19.2 at generator no.2
Equipment Type	Gas flow meter
Manufacturer	Kobold
Model	DOG-1120
Maximum permissible error	+/- 1.5%
Serial No.	5593
Calibration Frequency	Annually
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	12/12/2013
Validity	11/12/2014

Tag no.	ID-19.2 (FC) at generator no.2
Equipment Type	Flow computing
Manufacturer	Fuji Electric
Model	PXH9A211-5V000
Maximum permissible error	+/- 0.1%
Serial No.	8623675T
Calibration Frequency	Annually
Date of previous calibration	01/03/2011 06/03/2012
Date of latest calibration	10/12/2013
Validity	09/12/2014

Measuring/ Reading/ Recording frequency:	The monitoring equipment set of biogas quantity consists of a gas flow meter and a flow computing. The measurement has been taken on an hourly basis. Using gas flow meter, it can monitor the amount of biogas in m ³ /hour unit. Then the conversion of monitored unit to normal condition unit in Nm ³ /hour was done by the flow computing. The values received were integrated with data logger to have real time data monitoring and control. The normalized flow of biogas was shown on the display. The daily data monitored were recorded into log-sheets.
Calculation method (if applicable):	n/a
QA/QC procedures:	The monitoring devices were calibrated at regular intervals based on manufacturer specification from a certified testing agency or institution. The calibration was done at least once a year.
Purpose of data:	The calculation of baseline emissions.
Additional comment:	<ul style="list-style-type: none"> The daily data was summarised and integrated into electronic spreadsheets monthly. Due to the maximum permissible error of gas flow meter is higher than the flow computing, therefore this value are considered for applying with the monitored data. The calibration shall be done at least once in a year as per the registered PDD. Thus, the calibration gap was considered during; 29/02/2012 to 06/03/2012 and 05/03/2013 to 12/12/2013. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap.

Data / Parameter:	- (EG_{total,y})											
Unit:	MWh/y											
Description:	Total annual electricity generated from the project in year y											
Measured/ Calculated / Default:	Measured.											
Source of data:	Plant records											
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (MWh)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>1,423</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>4,543</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>4,885</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>4,614</td> </tr> </tbody> </table>		Monitoring period	Total value (MWh)	18/10/2011 – 31/12/2011	1,423	01/01/2012 – 31/12/2012	4,543	01/01/2013 – 31/12/2013	4,885	01/01/2014 – 31/07/2014	4,614
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18/10/2011 – 31/12/2011	1,423											
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Monitoring equipment:	<table border="1"> <tr><td>Tag no.</td><td>ID-21.1 at generator no.1</td></tr> <tr><td>Equipment Type</td><td>Power meter</td></tr> <tr><td>Manufacturer</td><td>Carlo Gavazzi</td></tr> <tr><td>Model</td><td>WM3-96</td></tr> <tr><td>Maximum permissible error</td><td>+/- 0.20% (Class 2)</td></tr> <tr><td>Serial No.</td><td>BI1290012101P</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>N/A</td></tr> <tr><td>Date of latest calibration</td><td>24/12/2014</td></tr> <tr><td>Validity</td><td>23/12/2015</td></tr> </table>	Tag no.	ID-21.1 at generator no.1	Equipment Type	Power meter	Manufacturer	Carlo Gavazzi	Model	WM3-96	Maximum permissible error	+/- 0.20% (Class 2)	Serial No.	BI1290012101P	Calibration Frequency	Annually	Date of previous calibration	N/A	Date of latest calibration	24/12/2014	Validity	23/12/2015
	Tag no.	ID-21.1 at generator no.1																			
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	Serial No.	BI1290012101P																			
	Calibration Frequency	Annually																			
	Date of previous calibration	N/A																			
	Date of latest calibration	24/12/2014																			
	Validity	23/12/2015																			
	<table border="1"> <tr><td>Tag no.</td><td>ID-21.2 at generator no.2</td></tr> <tr><td>Equipment Type</td><td>Power meter</td></tr> <tr><td>Manufacturer</td><td>Carlo Gavazzi</td></tr> <tr><td>Model</td><td>WM3-96</td></tr> <tr><td>Maximum permissible error</td><td>+/- 0.20% (Class 2)</td></tr> <tr><td>Serial No.</td><td>BI0980037101I</td></tr> <tr><td>Calibration Frequency</td><td>Annually</td></tr> <tr><td>Date of previous calibration</td><td>N/A</td></tr> <tr><td>Date of latest calibration</td><td>24/12/2014</td></tr> <tr><td>Validity</td><td>23/12/2015</td></tr> </table>	Tag no.	ID-21.2 at generator no.2	Equipment Type	Power meter	Manufacturer	Carlo Gavazzi	Model	WM3-96	Maximum permissible error	+/- 0.20% (Class 2)	Serial No.	BI0980037101I	Calibration Frequency	Annually	Date of previous calibration	N/A	Date of latest calibration	24/12/2014	Validity	23/12/2015
	Tag no.	ID-21.2 at generator no.2																			
	Equipment Type	Power meter																			
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	Serial No.	BI0980037101I																			
	Calibration Frequency	Annually																			
	Date of previous calibration	N/A																			
Date of latest calibration	24/12/2014																				
Validity	23/12/2015																				
Measuring/ Reading/ Recording frequency:	The total of electricity generated by the project was continuously measured using the energy meters. The monitored data were recorded hourly into the log-sheets. The daily data were summarised and integrated into the spreadsheets monthly.																				
Calculation method (if applicable):	n/a																				
QA/QC procedures:	The calibration of power meters shall be conducted annually by external laboratory.																				
Purpose of data:	This is not applied directly for emission reduction calculation.																				
Additional comment:	<ul style="list-style-type: none"> The error value found in the calibration test report is applied with the monitored data during the delay of calibration schedule. The monitoring value of power production is crossed check with the amount of biogas consumed in the generator and with the specification required by the generator. 																				

Data / Parameter:	EG_{y, consumed}
Unit:	MWh/y
Description:	Annual electricity to operate the facilities or power auxiliary equipment
Measured/ Calculated / Default:	Measured.
Source of data:	Plant records

Value(s) of monitored parameter:	<p>ID-22: Internal consumption</p> <table border="1" data-bbox="644 221 1279 383"> <thead> <tr> <th>Monitoring period</th> <th>Total value (MWh)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>39.95</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>133.54</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>143.25</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>116.34</td> </tr> </tbody> </table> <p>ID-23: Grid consumption</p> <table border="1" data-bbox="644 450 1279 611"> <thead> <tr> <th>Monitoring period</th> <th>Total value (Mwh)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>4.18</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>46.58</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>39.46</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>17.83</td> </tr> </tbody> </table>	Monitoring period	Total value (MWh)	18/10/2011 – 31/12/2011	39.95	01/01/2012 – 31/12/2012	133.54	01/01/2013 – 31/12/2013	143.25	01/01/2014 – 31/07/2014	116.34	Monitoring period	Total value (Mwh)	18/10/2011 – 31/12/2011	4.18	01/01/2012 – 31/12/2012	46.58	01/01/2013 – 31/12/2013	39.46	01/01/2014 – 31/07/2014	17.83																				
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Monitoring equipment:	<table border="1" data-bbox="528 721 1394 1070"> <thead> <tr> <th>Tag no.</th> <th>ID-22 (Internal consumption)</th> </tr> </thead> <tbody> <tr> <td>Equipment Type</td> <td>Power meter</td> </tr> <tr> <td>Manufacturer</td> <td>Merlin Gerin</td> </tr> <tr> <td>Model</td> <td>PM210</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 1%</td> </tr> <tr> <td>Serial No.</td> <td>0058033222</td> </tr> <tr> <td>Calibration Frequency</td> <td>Annually</td> </tr> <tr> <td>Date of previous calibration</td> <td>N/A</td> </tr> <tr> <td>Date of latest calibration</td> <td>24/12/2014</td> </tr> <tr> <td>Validity</td> <td>23/12/2015</td> </tr> </tbody> </table> <table border="1" data-bbox="528 1137 1394 1487"> <thead> <tr> <th>Tag no.</th> <th>ID-23 (Grid consumption)</th> </tr> </thead> <tbody> <tr> <td>Equipment Type</td> <td>Power meter</td> </tr> <tr> <td>Manufacturer</td> <td>Merlin Gerin</td> </tr> <tr> <td>Model</td> <td>PM210</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 1%</td> </tr> <tr> <td>Serial No.</td> <td>0058010741</td> </tr> <tr> <td>Calibration Frequency</td> <td>Annually</td> </tr> <tr> <td>Date of previous calibration</td> <td>N/A</td> </tr> <tr> <td>Date of latest calibration</td> <td>27/11/2014</td> </tr> <tr> <td>Validity</td> <td>26/11/2015</td> </tr> </tbody> </table>	Tag no.	ID-22 (Internal consumption)	Equipment Type	Power meter	Manufacturer	Merlin Gerin	Model	PM210	Maximum permissible error	+/- 1%	Serial No.	0058033222	Calibration Frequency	Annually	Date of previous calibration	N/A	Date of latest calibration	24/12/2014	Validity	23/12/2015	Tag no.	ID-23 (Grid consumption)	Equipment Type	Power meter	Manufacturer	Merlin Gerin	Model	PM210	Maximum permissible error	+/- 1%	Serial No.	0058010741	Calibration Frequency	Annually	Date of previous calibration	N/A	Date of latest calibration	27/11/2014	Validity	26/11/2015
Tag no.	ID-22 (Internal consumption)																																								
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Date of latest calibration	27/11/2014																																								
Validity	26/11/2015																																								
Measuring/ Reading/ Recording frequency:	<p>The electricity consumed by the project activity was monitored continuously by two power meters. The internal power meter of ID-22 monitored the electricity consumption from the electricity production of project activity. The internal power meter of ID-23 monitored the electricity consumption of the project from grid. The monitored data were recorded hourly into the log-sheet. The daily data were summarised and integrated into the spread sheets monthly.</p>																																								
Calculation method (if applicable):	n/a																																								
QA/QC procedures:	The calibration of the power meters was conducted at least once in a year.																																								
Purpose of data:	The calculation of project emissions.																																								

Additional comment:	<ul style="list-style-type: none"> The project emission is considered the electricity consumption from the grid (ID-23) only. Since, the electricity generated by the project (ID-21) is from renewable energy source, therefore none of emission from this activity is taken into the calculation. The error value found in the calibration test report is applied with monitored data during the delay of calibration schedule. Either the maximum permissible error recommended by manufacturer or the error identified in the latest calibration report whichever is applied with the monitored data during the calibration gap.
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Data / Parameter:	EG_{y,exported}																				
Unit:	MWh/y																				
Description:	Amount of electricity to substitute grid electricity by the project in year y																				
Measured/ Calculated / Default:	Measured.																				
Source of data:	Plant records and PEA monthly invoice																				
Value(s) of monitored parameter:	<p>ID-24: Export to national grid</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Monitoring period</th> <th>Total value (Mwh)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>896</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>3,182</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>3,839</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>3,319</td> </tr> </tbody> </table> <p>ID-25: Supply to palm oil mill</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Monitoring period</th> <th>Total value (Mwh)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0</td> </tr> </tbody> </table>	Monitoring period	Total value (Mwh)	18/10/2011 – 31/12/2011	896	01/01/2012 – 31/12/2012	3,182	01/01/2013 – 31/12/2013	3,839	01/01/2014 – 31/07/2014	3,319	Monitoring period	Total value (Mwh)	18/10/2011 – 31/12/2011	0	01/01/2012 – 31/12/2012	0	01/01/2013 – 31/12/2013	0	01/01/2014 – 31/07/2014	0
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01/01/2014 – 31/07/2014	3,319																				
Monitoring period	Total value (Mwh)																				
18/10/2011 – 31/12/2011	0																				
01/01/2012 – 31/12/2012	0																				
01/01/2013 – 31/12/2013	0																				
01/01/2014 – 31/07/2014	0																				

Monitoring equipment:	<table border="1" data-bbox="528 219 1394 573"> <tr> <td>Tag no.</td> <td>ID-24 (export to grid)</td> </tr> <tr> <td>Equipment Type</td> <td>Power meter</td> </tr> <tr> <td>Manufacturer</td> <td>EDMI</td> </tr> <tr> <td>Model</td> <td>Mk6</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 0.5%</td> </tr> <tr> <td>Serial No.</td> <td>206500126</td> </tr> <tr> <td>Calibration Frequency</td> <td>As per PEA requirement</td> </tr> <tr> <td>Date of previous calibration</td> <td>N/A</td> </tr> <tr> <td>Date of latest calibration</td> <td>22/05/2014</td> </tr> <tr> <td>Validity</td> <td>As per PEA requirement</td> </tr> </table> <table border="1" data-bbox="528 640 1394 994"> <tr> <td>Tag no.</td> <td>ID-25 (supply to CPO mill)</td> </tr> <tr> <td>Equipment Type</td> <td>Power meter</td> </tr> <tr> <td>Manufacturer</td> <td>Schneider</td> </tr> <tr> <td>Model</td> <td>PM710</td> </tr> <tr> <td>Maximum permissible error</td> <td>+/- 1%</td> </tr> <tr> <td>Serial No.</td> <td>4A943A98</td> </tr> <tr> <td>Calibration Frequency</td> <td>Annually</td> </tr> <tr> <td>Date of previous calibration</td> <td>N/A</td> </tr> <tr> <td>Date of latest calibration</td> <td>N/A</td> </tr> <tr> <td>Validity</td> <td>N/A</td> </tr> </table>	Tag no.	ID-24 (export to grid)	Equipment Type	Power meter	Manufacturer	EDMI	Model	Mk6	Maximum permissible error	+/- 0.5%	Serial No.	206500126	Calibration Frequency	As per PEA requirement	Date of previous calibration	N/A	Date of latest calibration	22/05/2014	Validity	As per PEA requirement	Tag no.	ID-25 (supply to CPO mill)	Equipment Type	Power meter	Manufacturer	Schneider	Model	PM710	Maximum permissible error	+/- 1%	Serial No.	4A943A98	Calibration Frequency	Annually	Date of previous calibration	N/A	Date of latest calibration	N/A	Validity	N/A
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Date of latest calibration	N/A																																								
Validity	N/A																																								
Measuring/ Reading/ Recording frequency:	<p>The electricity supplied to the palm oil mill was continuously monitored by the internal power meter own by the project participant (ID-25). The electricity exported to the grid was continuously measured by using the energy meter that is under the ownership of PEA (ID-24).</p> <p>The monitored data of ID-25 are based on the hourly recorded into the log-sheet. In calculation of the emission reduction, the daily data were summarised and integrated into the spreadsheets monthly. The monitored data of ID-24 are referred to PEA power meter reading monthly report for emission reduction calculation.</p>																																								
Calculation method (if applicable):	n/a																																								
QA/QC procedures:	The internal power meter (ID-25) shall be calibrated at least once in a year. The calibration of power-exported meter (ID-24) is under the control of PEA.																																								
Purpose of data:	The calculation of baseline emissions.																																								

Additional comment:	<ul style="list-style-type: none"> At the monitoring point ID-24, for the export electricity to grid within the month of October 2011 the PEA report provides entire month export data whereas the monitoring period starts from 18/10/2011. Hence, for the period from 18/10/2011 to 31/10/2011 PP has estimated the export to grid electricity on a conservative approach considering minimum value of either monitored data or PEA monthly readings in the ER calculation sheet. At the monitoring point ID-25 power supplied to CPO, the data recording was not conducted properly. There was no monitoring data available during this period. Therefore, the baseline emission of this component is not claimed during this monitoring period. This is conservative to ER calculation.
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Data / Parameter:	D _{CH4}										
Unit:	Tonnes/m ³										
Description:	Density of methane at normal temperature and pressure (As per PDD, it was required to calculate from ID15 $f_{V_{CH4,RG,h}}$ and ID11 $W_{CH4,y}$. However, the biogas flow can be measured and reported as unit of Nm ³ /hour. The conversion of monitored unit to normal condition unit (Nm ³ /hour) was done by flow computing. Therefore, this parameter was referred to default value from CDM EB 28.)										
Measured/ Calculated / Default:	Default value										
Source of data:	CDM EB as per EB28 Meeting report (Annex 13)										
Value(s) of monitored parameter:	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Monitoring period</th> <th>Default value (tonnes/m³)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0.716</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0.716</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0.716</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0.716</td> </tr> </tbody> </table>	Monitoring period	Default value (tonnes/m ³)	18/10/2011 – 31/12/2011	0.716	01/01/2012 – 31/12/2012	0.716	01/01/2013 – 31/12/2013	0.716	01/01/2014 – 31/07/2014	0.716
Monitoring period	Default value (tonnes/m ³)										
18/10/2011 – 31/12/2011	0.716										
01/01/2012 – 31/12/2012	0.716										
01/01/2013 – 31/12/2013	0.716										
01/01/2014 – 31/07/2014	0.716										
Monitoring equipment:	Not applicable.										
Measuring/ Reading/ Recording frequency:	Not applicable.										
Calculation method (if applicable):	Not applicable.										
QA/QC procedures:	Not applicable.										
Purpose of data:	The calculation of baseline and project emissions.										
Additional comment:	This is default value referred to CDM EB28 Meeting report (Annex 13). The value is applied with the calculation of baseline emission for MD approach and the project emission from flaring activity.										

Data / Parameter:	$\eta_{flare-h}$
Unit:	%
Description:	Flare efficiency

Measured/ Calculated / Default:	Default value										
Source of data:	Tool to determine project emissions from flaring gases containing methane										
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Monitoring period</th> <th>Total value (%)</th> </tr> </thead> <tbody> <tr> <td>18/10/2011 – 31/12/2011</td> <td>0%</td> </tr> <tr> <td>01/01/2012 – 31/12/2012</td> <td>0%</td> </tr> <tr> <td>01/01/2013 – 31/12/2013</td> <td>0%</td> </tr> <tr> <td>01/01/2014 – 31/07/2014</td> <td>0%</td> </tr> </tbody> </table>	Monitoring period	Total value (%)	18/10/2011 – 31/12/2011	0%	01/01/2012 – 31/12/2012	0%	01/01/2013 – 31/12/2013	0%	01/01/2014 – 31/07/2014	0%
Monitoring period	Total value (%)										
18/10/2011 – 31/12/2011	0%										
01/01/2012 – 31/12/2012	0%										
01/01/2013 – 31/12/2013	0%										
01/01/2014 – 31/07/2014	0%										
Monitoring equipment:	n/a										
Measuring/ Reading/ Recording frequency:	<p>Default flare efficiency for enclosed flare is used as per step 6 “determination of the hourly flare efficiency” of the flaring tool:</p> <ul style="list-style-type: none"> • 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500°C for more than 20 minutes during the hour h. • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer’s specifications on proper operation of the flare are not met at any point in time during the hour h. • 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer’s specifications on proper operation of the flare are met continuously during the hour h. <p>Other flare specific parameters, which might be required to monitor whether the flare operates within the specified range of operating conditions shall be monitored according to the manufacturer’s specifications.</p>										
Calculation method (if applicable):	n/a										
QA/QC procedures:	Maintenance of the flare system was conducted periodically as per supplier’s specifications in order to ensure optimal operation.										
Purpose of data:	The calculation of project emissions.										
Additional comment:	The data recorded of temperature in the exhaust gas of the flare and time duration during flaring were not available during the monitoring period. The value of flare efficiency is assumed as zero % in order to calculate the project emission. This is conservative.										

D.3. Implementation of sampling plan

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This section is 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

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The emission reductions from the methane avoidance component of the project activity are calculated as per the guidance given in the methodology (version 15 of AMS.III.H). The emission reductions from thermal and electrical components are calculated as per the guidance given in the methodologies (version 16 of AMS.I.D). According to the registered PDD, the overall baseline calculation is determined as follows;

$$BE_y = BE_{CH_4,y} + BE_{power,y} \quad \text{Eq-1}$$

Where:

BE_y	Baseline emission in year y (tCO _{2e})
$BE_{CH_4,y}$	Baseline emission for methane avoidance component in year y (tCO _{2e})
$BE_{power,y}$	Baseline emission for electricity generation component in year y (tCO _{2e})

I-Baseline emission for methane avoidance component (AMS.III-H):

I.1 COD Approach

As per the registered PDD, baseline emission for methane avoidance component is given as:

$$BE_{CH_4,y} = BE_{ww,treatment,y} + BE_{ww,discharge,y} \quad \text{Eq-2}$$

Where:

$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment system affected by the project activity (tCO _{2e})
$BE_{ww,discharge,y}$	Baseline emissions of the wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into/lake/sea in year y (tCO _{2e})

I-1a Methane emissions from the baseline wastewater treatment affected by the project ($BE_{ww,treatment,y}$) are determined as following equation:

$$B_{ww,treatment,y} = \sum(Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment, BLi}) * B_{o,ww} * UF_{BL} * GWP_{CH_4} \quad \text{Eq-3}$$

Where:

$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system i in year y (m ³)
$COD_{removed,i,y}$	Chemical oxygen demand removed by baseline treatment system i in year y (tonnes/m ³) measured as the difference between inflow COD and the outflow COD in system i
$MCF_{ww,treatment, BLi}$	Methane correction factor for the baseline anaerobic wastewater treatment i (MCF values as per table III.H.1)
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH ₄ /kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89) ¹
GWP_{CH_4}	Global warming potential (value of 21 for 1 st commitment period and value of 25 for 2 nd commitment period)

As per the registered PDD, the determination of $COD_{removed,i,y}$ and $MCF_{ww,treatment, BLi}$ are considered according to the baseline situation prior the implementation of project activity. The functions of opened ponds in the baseline scenario were anaerobic/poor manage pond and aerobic/poor manage pond. Therefore, the calculations of baseline emission are determined from wastewater treatment types of anaerobic lagoon and aerobic treatment with poorly managed.

¹ Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

I-1b Methane emission on account of inefficiencies in the baseline wastewater treatment systems and the presence of degradable organic carbon in the treated wastewater discharge into river/lake/sea. $BE_{ww,discharge,y}$ is determined as following equation:

$$B_{ww,discharged,y} = \sum(Q_{ww,i,y} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge,y}) * B_{o,ww} * UF_{BL} * GWP_{CH4} \quad \text{Eq-4}$$

Where:

$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system i in year y (m^3)
$COD_{ww,discharge,BL,y}$	The chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in tonnes/ m^3
$MCF_{ww,discharge,BL}$	Methane correction factor based on discharge pathway in the baseline situation (MCF values as per table III.H.1 of 0.1)
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH_4 /kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89) ²
GWP_{CH4}	Global warming potential (value of 21 for 1 st commitment period and value of 25 for 2 nd commitment period)

Since the data monitoring of $Q_{ww,i,y}$ is not conducted properly during this monitoring period, the parameter of $BE_{ww,discharge,y}$ is reported as zero. This is conservative to emission reduction calculation.

1.2 MD Approach

As per the registered PDD, baseline emission for methane avoidance component based on methane captured and destroyed/gainfully used by the project activity is given as:

$$MD_y = BG_{burnt,y} * W_{CH4,y} * D_{CH4} * FE * GWP_{CH4} \quad \text{Eq-5}$$

Where:

MD_y	Methane captured and destroyed/gainfully used by the project activity in the year y (tCO_{2e}). In case of flaring/fuelling it shall be measured using the condition of the flaring process
$BG_{burnt,y}$	Biogas flared/combusted in year y (m^3)
$W_{CH4,y}$	Methane content in the biogas in year y (volume fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas In year y (tCO_{2e}/m^3)
FE	Flare efficiency in year y (fraction)

II-Baseline emission for electricity generation component (AMS-I.D)

As per the registered PDD, the baseline emissions for electricity generation component is determined as follow;

$$BE_{power,y} = EG_{BL,y} * EF_{CO2,grid,y} \quad \text{Eq-6}$$

Where:

$EG_{BL,y}$	The quantity of electricity exported to the grid by the project activity during the year y (MWh)
$EF_{CO2,grid,y}$	Thailand National Grid emission factor (tCO_{2e}/MWh)

² Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

Table of calculation of baseline emissions

Baseline emissions		2011	2012	2013	2014
		18/10 to 31/12	01/01 to 31/12	01/01 to 31/12	01/01 to 31/07
<i>AMS-III.H: Methane avoidance component</i>					
BE _{CH4}	tCO ₂	4,116	19,337	25,137	20,909
MD _y	tCO ₂	4,875	21,981	29,519	26,097
<i>AMS-I.D: Electricity Generation Component</i>					
BE _{elec,y}	tCO ₂	466	1,655	1,997	1,726

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

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According to the registered PDD, the overall project emissions are determined as following equation:

$$PE_{y,} = PE_{CH4} \quad \text{Eq-7}$$

Where:

PE_y Project activity emissions from methane avoidance component in the year y (tCO₂e)

PE_{CH4,y} Project activity emissions from methane avoidance component in the year y (tCO₂e)year y (MWh)

IV. Project activity emission for methane avoidance component (AMS-III.H)

The project activity emissions from the systems affected by the project activity are:

$$PE_{CH4,y,} = PE_{power,y} + PE_{ww,treatment,y} + PE_{ww,discharge,y} + PE_{fugitive,y} + PE_{flaring,y} \quad \text{Eq-8}$$

Where:

PE_{power,y} Emissions from electricity or fuel consumption in the year y (tCO₂e). These emissions shall be calculated as per paragraph 20, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use

PE_{ww,treatment,y} Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO₂e).

PE_{ww,discharge,y} Methane emissions on account of inefficiency of the project activity wastewater treatment system and presence of degradable organic carbon in treated wastewater in year y (tCO₂e).

PE_{fugitive,y} Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 28 (tCO₂e)

PE_{flaring,y} Methane emissions due to incomplete flaring in year y as per the "Tool to determine project emissions from flaring gases containing methane"(tCO₂e)

IV. (a) PE_{power,y} – Project emission from electricity consumption

As per the registered PDD, the generic approach is used to calculate the project emissions as follows:

$$PE_{power,y} = PE_{EC} = \sum EC_{P,J,y} * EF_{EL,y} \quad \text{Eq-9}$$

Where:

$PE_{power,y}$, PE_{EC}	Project emissions from grid electricity consumption in year y (tCO ₂)
$EC_{PJ,y}$	Quantity of grid electricity consumed by the project activity during the year y (MWh)
$EF_{EL,y}$	Emission factor of Thai national grid in year y (tCO ₂ /MWh)

IV. (b) $PE_{ww,treatment,y}$ – Project emission from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation.

As per the registered PDD, methane emissions from wastewater treatment systems affected by the project activity are calculated as per the equation 2 given in paragraph 21 of AMS III.H:

$$PE_{ww,treatment,y} = \sum(Q_{ww,k,y} * COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}) * B_{o,ww} * UF_{PJ} * GWP_{CH4} \quad Eq-10$$

Where:

$Q_{ww,k,y}$	Volume of wastewater treated in system affected by the project activity in year y (m ³)
$COD_{removed,PJ,k,y}$	Chemical oxygen demand removed by project wastewater treatment system k in year y (t/m ³), measured as the difference between inflow COD and the outflow COD in system k
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system k (MCF values as per Table III.H.1)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH ₄ /kg COD)
UF_{PJ}	Model correction factor to account for model uncertainties (0.89) ³
GWP_{CH4}	Global Warming Potential for methane (value of 21 for 1 st commitment period and value of 25 for 2 nd commitment period)

IV. (c) $PE_{ww, discharge,y}$ – Project emissions on account of inefficiency of the project activity wastewater treatment system and presence of degradable organic carbon in treated wastewater

As per the registered PDD, methane emissions from this parameter are calculated as following;

$$PE_{ww,discharge,y} = \sum(Q_{ww,k,y} * COD_{ww,discharge,PJ} * MCF_{ww,PJ,discharge}) * B_{o,ww} * UF_{PJ} * GWP_{CH4} \quad Eq-11$$

Where:

$Q_{ww,k,y}$	Volume of wastewater treated discharged in system affected by the project activity in year y (m ³)
$COD_{ww,discharge,PJ}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in tonnes/m ³
$MCF_{ww,PJ,discharge}$	Methane correction factor based on discharge pathway in the project situation (MCF values as per Table III.H.1)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH ₄ /kg COD)
UF_{PJ}	Model correction factor to account for model uncertainties (0.89) ⁴

³ Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

⁴ Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

GWP_{CH4} Global Warming Potential for methane (value of 21 for 1st commitment period and value of 25 for 2nd commitment period)

IV.(d) $PE_{fugitive,y}$ – Project emissions on account of inefficiencies in capture systems

As per the registered PDD, project activity emissions from methane release in capture systems are determined as per paragraph 28 of AMS III.H as follows:

$$PE_{fugitive,y} = PE_{fugitive,ww,y} \tag{Eq-12}$$

Where:

$PE_{fugitive,ww,y}$ Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment in the year y (tCO_{2e})

$PE_{fugitive,ww,y}$ is calculated as follows:

$$PE_{fugitive,ww,y} = (1 - CEF_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4} \tag{Eq-13}$$

Where:

CEF_{ww} Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a default value of 0.9 shall be used)

$MEP_{ww,treatment,y}$ Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y (t)

$MEP_{ww,treatment,y}$ is calculated as follows:

$$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k} \tag{Eq-14}$$

Where:

$Q_{ww,y}$ Volume of wastewater treated in system affected by the project activity in year y (m³)

$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH₄/kg COD)

UF_{PJ} Model correction factor to account for model uncertainties (1.12)

$COD_{removed,PJ,k,y}$ The chemical oxygen demand removed⁵ by the treatment system k of the project activity equipped with biogas recovery in the year y (t/m³)

$MCF_{ww,treatment,PJ,k}$ Methane correction factor for the project wastewater treatment system k equipped with biogas recovery equipment (MCF values as per Table III.H.1)

IV. (d) $PE_{flaring,y}$ – Methane emissions due to incomplete flaring

As per the registered PDD, project emissions from flaring are calculated as the sum of emissions from each hour h, based on the methane flow rate in the residual gas (TM_{RG,h}) and the flare efficiency during each hour h ($\eta_{flare,h}$), as follows:

$$PE_{flare,y} = \sum TM_{RG,h} * (1 - \eta_{flare-h}) * GWP_{PCH4} / 1000 \tag{Eq-15}$$

Where:

$TM_{RG,h}$ Mass flow rate of methane in the residual gas in the hour h (kg/h)

$\eta_{flare-h}$ Flare efficiency in hour h

GWP_{CH4} Global Warming Potential of methane valid for the commitment period

⁵ Difference between the inflow COD and the outflow COD.

(tCO₂e/tCH₄) (Value of 21 for 1st commitment period and value of 25 for 2nd commitment period)

However, the monitored data of temperature in the exhaust gas flared and time duration during flaring were not available during this monitoring period. To be conservativeness, the value of flare efficiency is assumed as zero percentage. The calculation of project emission due to flaring are considered the annual amount of biogas flared and the flare efficiency of zero %.

VI. Project emissions for electricity generation component (AMS-I.D):

As per AMS I. D., paragraph 19, for the most renewable energy project activity, PE_y = 0. The project emission under AMS I.D are considered zero.

Table of calculation of project emissions

Project emissions		2011	2012	2013	2014
		10/08 to 31/12	01/01 to 31/12	01/01 to 31/12	01/01 to 31/07
<i>AMS-III.H: Methane avoidance component</i>					
PE _{EC,y}	tCO ₂	2	24	21	9
PE _{ww, treatment, y}	tCO ₂	1,132	3,426	4,118	3,489
PE _{fugitive, y}	tCO ₂	410	2,012	2,661	2,235
PE _{ww, discharge, y}	tCO ₂	17	81	126	97
PE _{flaring, y}	tCO ₂	0	0	0	0

E.3. Calculation of leakage

>>

As per the registered PDD, leakage is assumed to be zero as no equipment is transferred from another activity.

Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	75,340	19,863	0	18,467	37,010	55,477

Note: ex-post emission reduction is calculated as given below:

$$ER_{y,ex\ post} = \min (BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power}, PE_{biomass,y} - LE_{y,ex\ post}) \quad \text{Eg-16}$$

E.4. 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 CO ₂ e)	52,506	55,477

E.5. Remarks on difference from estimated value in registered PDD

>>

The actual emission reduction achieved during this monitoring period is higher than the values estimated in ex-ante calculation of the registered PDD. Because the operation of biogas system performed well in 2013 and 2014, this can be seen from the removal efficiency of COD loading was more than 92%. In the registered PDD, the removal efficiency of the biogas system was determined as 90% by the technology provider. However, there was no change in the design of project activity. The biogas system was operated as per the registered PDD. In addition, the GWP_{CH₄} value of 25, effective on 01/01/2013, is applied in the ER calculation. The emission reduction calculation of the project activity is conducted with the conservative approach. Therefore, the increase in the actual GHG emission reduction achieved based on the applicable provision can be considered during this monitoring period.

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

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	United Palm Oil Industry PCL.
Street/P.O. Box	236 Moo 4, Bangpoo Industrial Estate, Sukhumvit Road, Phraeksa Sub-district, Muang District.
Building	-
City	Sumutprakarn
State/region	-
Postcode	10280
Country	Thailand
Telephone	+66 2 709-3610 Ext. 1802
Fax	+66 2 324-0638
E-mail	sawang@lamsoon.co.th
Website	-
Contact person	
Title	Plant manager
Salutation	Mr.
Last name	Lertthirasuntorn
Middle name	-
First name	Sawang
Department	-
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	sawang@lamsoon.co.th

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Swiss Carbon Assets Ltd.
Street/P.O. Box	Technoparkstrass 1
Building	-
City	Zürich
State/region	-
Postcode	8005
Country	Switzerland
Telephone	+41 43 501 3350
Fax	+41 43 501 3599
E-mail	registration@southpolecarbon.com
Website	http://www.southpolecarbon.com/
Contact person	Renat Heuberger
Title	Managing Partner
Salutation	Mr.
Last name	Heuberger
Middle name	-
First name	Renat
Department	-
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	-

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • 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 (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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		