VERIFICATION/CERTIFICATION REPORT

Final

"UPOIC Wastewater Treatment for Energy Generation, Krabi"
in
Thailand

Monitoring period: 18/10/2011 to 31/07/2014

Report N°2014-IQ-30-MD

Revision N°2.0 Aa

VERIFICATION/CERTIFICATION REPORT

Project Title:	Country:	Estimated CERs (tCO2e):
UPOIC Wastewater Treatment for Energy Generation, Krabi	Thailand	18,002 tCO_2e annual average
CDM Registration Reference N°:	**Monitoring period:**	**Certified CERs (tCO2e):**
4322	18/10/2011 to 31/07/2014	55,477 tCO_{2e}
Client:	**Client contact:**	
M/s Swiss Carbon Assets Ltd.	Mr. Santosh Kumar Singh	
Report No.:	**Revision:**	**Date of this report:**
2014-IQ-30-MD	2.0 Aa	09/10/2015
Approved by (Final Report – Authorized officer signing for the DOE):		**Date of approval:**
Laura SEVERINO		21/10/2015

Methodology

Number:	Version:	Title:	Scale	SS(s):
AMS-I.D	16 of 28/05/2010	Grid connected renewable electricity generation	Small	01 & 13
AMS-III.H	15 of 30/07/2010	Methane recovery in wastewater treatment		

RINA Services S.p.A. (RINA), commissioned by M/s Swiss Carbon Assets Ltd., has verified the greenhouse gas emission reductions reported for the project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi" in Thailand, CDM Registration Reference N° 4322, for the period 18/10/2011 to 31/07/2014, with regard to the relevant requirements for CDM activities. The verification shall ensure that reported emission reductions are complete and accurate in accordance with applicable CDM requirements in order to be certified.

The project was validated by TUV Sud (validation report N° 1233984 issued on 13/10/2011) and it was registered on 18/10/2011 under the CDM registration reference N° 4322.

The GHG emission reductions were calculated on the basis of the approved methodology AMS-I.D, version 16, 'Grid connected renewable electricity generation' of 28/05/2010, AMS-III.H, version 15, 'Methane recovery in wastewater treatment' of 30/07/2010 and the monitoring plan included in the registered Project Design Document, version 11 of 11/10/2011.

In conclusion, it is RINA's opinion that the project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi", in "Thailand", as described in the Monitoring Report version 5 of 06/10/2015, meets all relevant requirements for CDM activities and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AMS-I.D, version 16, 'Grid connected renewable electricity generation' of 28/05/2010 and AMS-III.H, version 15, 'Methane recovery in wastewater treatment' of 30/07/2010. Hence, RINA is able to certify that the emission reductions from the project during the monitoring period 18/10/2011 to 31/07/2014 amount to 55,477 tCO_2e, the emissions reductions during the period up to 31/12/2012 amount to 18,467 tCO_2e, and the emissions reductions during the period from 01/01/2013 to 31/07/2014 amount to 37,010 tCO_2e.

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Work verified by (Final Report)

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Keywords:

Climate Change, Kyoto Protocol, Clean Development Mechanism, Verification

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Abbreviations

BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification Request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reductions
ERDI	Energy Research and Development Institute
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MR	Monitoring Report
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document
PE	Project Emission
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services Spa
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
UPOIC	United Palm Oil Industry PCL
VVS	Validation and Verification Standard

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VERIFICATION/CERTIFICATION REPORT

1 INTRODUCTION

Swiss Carbon Assets Ltd. has commissioned RINA to carry out the verification and certification of emission reductions reported for the registered “UPOIC Wastewater Treatment for Energy Generation, Krabi” project in Thailand, CDM Registration Reference N° 4322, for the period 18/10/2011 to 31/07/2014.

This report summarizes the findings of the verification of the project, performed on the basis of UNFCCC criteria for CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting.

1.1 Objective

The objective of the verification is to have an independent review ex post determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period. Certification is the written assurance by the DOE that, during a specific time period, a proposed CDM project activity achieved the reductions in anthropogenic emissions by sources of GHGs as verified.

1.2 Scope

The verification scope is:

- to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan;
- to evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement;
- to verify that reported GHG emission data is sufficiently supported by evidence.

Verification shall ensure that reported emission reductions are complete and accurate in accordance with applicable UNFCCC criteria for CDM in order to be certified.

UNFCCC criteria for CDM refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, for SSC project add the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board.

Verification is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

2 METHODOLOGY

Verification was conducted using RINA procedures in line with the requirements specified in the CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques.

The verification consisted of the following three phases:

- Desk review;
- On-site assessment:
- The resolution of outstanding issues and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

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2.1 Desk Review

The monitoring report, version 05 of 06/10/2015 and previous version 04 of 27/05/2015 version 03 of 24/04/2015, version 02 of 27/02/2015, version 01 of 21/11/2014 /**01**/, the emission reduction calculations provided in the form of a spreadsheet (UPOIC_ER sheet_1stMR_v01_21112014_R.xlsx) version 01 of 21/11/2014, version 02 of 27/02/2015 and version 03 (UPOIC_expost_ER-Calculation_1stMR_v04_27052015_R.xlsx) of 27/05/2015 and version 04 (UPOIC_expost_ER-Calculation_1stMR_v04_12102015_R.xlsx) of 12/10/2015 /**02/**, were assessed as part of the verification. In addition the Project Design Document (PDD) /**03**/ in particular the baseline estimations and the monitoring plan and the validation report, revision 05 of 13/10/2011 /**04**/ for the project were reviewed.

The monitoring report version 01 of 21/11/2014 /**01**/ was made publicly available on the CDM UNFCCC website on 02/12/2014 /**05**/.

The following table lists the documentation that was reviewed during the verification.

/01/	Swiss Carbon Assets Ltd.: Monitoring report for project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi" in Thailand, version 1.0 of 21/11/2014, version 02 of 27/02/2015, version 03 of 24/04/2015, version 04 of 27/05/2015 and version 05 of 06/10/2015 related to the monitoring period 18/10/2011 to 31/07/2014.
/02/	Swiss Carbon Assets Ltd.: Emission reduction calculation spreadsheet (UPOIC_ER sheet_1stMR_v01_21112014_R.xlsx), version 1.0 of 21/11/2014, version 02 of 27/02/2015 and version 03 (UPOIC_expost_ER-Calculation_1stMR_v03_27052015_R.xlsx) of 27/05/2015 and version 04 (UPOIC_expost_ER-Calculation_1stMR_v04_12102015_R.xlsx) of 12/10/2015
/03/	United Palm Oil Industry PCL: CDM-SSC-PDD for project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi" in Thailand, version 11 of 11/10/2011
/04/	TUV Sud: CDM validation report of "UPOIC Wastewater Treatment for Energy Generation, Krabi",validation report N°1233984, version 05 of 1 3/10/2011
/05/	UNFCCC website Project 4322: UPOIC Wastewater Treatment for Energy Generation, Krabi, https://cdm.unfccc.int/Projects/DB/TUEV-SUED1293726368.8/view, in English language, retrieved on 07/01/2015 Monitoring Report published linkage on UNFCCC website Project 4322, https://cdm.unfccc.int/Projects/DB/TUEV-SUED1293726368.8/iProcess/RINA1417509121.06/view, English language, retrieved on 07/01/2015
/06/	CDM Executive Board: Instruction for filling out the monitoring report form, version 04.0 of 25/06/2014 and version 05.1 of 04/05/2015
/07/	CDM Executive Board: Monitoring Report Form (F-CDM-MR), version 04 of 25/06/2014 and version 05.1 of 04/05/2015
/08/	CDM Executive Board: Clean Development Mechanism Project Cycle Procedure, version 07.0 of 01/06/2014
/09/	CDM Executive Board: Clean Development Mechanism Project Standard, version 07.0 of 01/06/2014
/10/	CDM Executive Board: Clean Development Mechanism validation and verification standard", version 07 of 01/06/2014
/11/	CDM Executive Board: Baseline and monitoring methodology "AMS-III.H", "Methane recovery in wastewater treatment", version 15 of 30/07/2010
/12/	CDM Executive Board: Baseline and monitoring methodology "AMS-I.D", "Grid connected renewable electricity generation", version 16 of 28/05/2010
/13/	CDM Executive Board: Tool to determine project emissions from flaring gases containing methane, EB 28, Annex-13 dated 15/12/2006
/14/	CDM Executive Board: Tool to calculate emission factor for an electricity system, version 02.1.0, EB 60, Annex-8 dated 15/04/2011

/15/	CDM Executive Board: Standard for the application of the global warming potentials to clean development mechanism project activities and programme of activities for the second commitment period of the Kyoto Protocol, version 1, Annex 3 of EB 69 dated 13/09/2012
/16/	United Palm Oil Industry PCL: Log book records for daily wastewater flow in the project activity for the period from 18/10/2011 to 31/07/2014
/17/	United Palm Oil Industry PCL: Log book records for daily COD in wastewater before entering in digester, after leaving the digesters and at discharge for the project activity for the period from 18/10/2011 to 31/07/2014
/18/	United Palm Oil Industry PCL: Log book records for daily biogas flared and biogas fired in gas engines for the project activity for the period from 18/10/2011 to 31/07/2014.
/19/	United Palm Oil Industry PCL: Electricity generation from biomass fired power plant and consumption at the mill from January 2012 to December 2014
/20/	ERDI: Commissioning report for the biogas plant (digester capacity 12,000m^3) dated 01/10/2009
/21/	Guascor: Commissioning certificate for two 952 kW biogas generator (serial no.330491 and 330492) dated 24/10/2009
/22/	Calibration certificate for flow meter **A0792017 (used for monitoring flow of wastewater)** a) Calibration certificate (L1103-011) for flow meter A0792017, calibrated on 01/03/2011 by Miracle International Technology Co. Ltd. b) Calibration certificate (SMG-12-C007) for flow meter A0792017, calibrated on 07/03/2012 by Science Magic Grow Co. Ltd. c) Calibration certificate (SMG-13-B003) for flow meter A0792017, calibrated on 04/02/2013 by Science Magic Grow Co. Ltd.
/23/	United Palm Oil Industry PCL: Company record (F.M-BPP-015) replacing flow meter (sl.no. A0792017) with new meter serial number 1401123 dated 20/01/2014
/24/	ABB Engineering Co. Ltd.: Calibration certificate of flow meter with serial number 1401123 dated December 2013
/25/	List of Accredited Laboratories According to ISO/IEC 17025; webpage http://app.tisi.go.th/lab/calibrate/clas_e.html in English language retrieved on 20/05/2015
/26/	International Laboratory Accreditation Cooperation (ILAC): Guideline for the determination of calibration intervals of measuring instruments-ILAC-G24, Edition 2007 (E)
/27/	Calibration certificate for burette with serial number 399004802 **(used for monitoring COD)** a) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0765-11) for Mettler Toledo Burette with serial number 399004802 calibrated on 17/10/2011 b) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0771-12/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 27/09/2012 c) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0811-13/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 10/09/2013
/28/	Central Bureau of weights and measures, Govt. of Thailand: Calibration certificate of weighing scale serial number 5445595-5HP dated 05/04/2011, 29/06/2012, 24/04/2013, 13/02/2014 and 11/03/2014
/29/	Calibration certificate for flow meter (sl.no. 5843) and flow computing (sl.no. 8623676T) **(used for monitoring flow rate of biogas leaving the digester)** a) PTT Public Company Ltd.: Calibration certificate (GMCL 10/54) for flow meter with serial number 5843 calibrated on 01/03/2011 b) PTT Public Company Ltd.: Calibration certificate (GMCL 05/55) for flow meter with serial number 5843 calibrated on 06/03/2012 c) PTT Public Company Ltd.: Calibration certificate (GMCL 23/56) for flow meter with serial number 5843 calibrated on 12/12/2013 d) Thermology Co. Ltd.: Calibration certificate (11/0385) for flow computing with serial

	number 8623676T calibrated on 01/03/2011 e) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C014) for flow computing with serial number 8623676T calibrated on 06/03/2012 f) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L018) for flow computing with serial number 8623676T calibrated on 10/12/2013
/30/	Calibration certificate for continuous gas analyser (Sl. No. 28960 (available upto 20/04/2014) and sl. No. 2160913 (replaced on 21/04/2014)) **(used for monitoring methane content in the biogas at generator 1)** a) JE International Co. Ltd.: Calibration certificate for continuous gas analyser with serial number 28960 calibrated on 20/05/2012 b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number 28960 calibrated on 21/11/2013
/31/	Calibration certificate for continuous gas analyser (Sl. No. 29193 **(used for monitoring methane content in the biogas at generator 2)** a) Entech Associate Co. Ltd.: Calibration certificate (G/O 550188) for continuous gas analyser with serial number 29193 calibrated on 13/03/2012 b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number 29193 calibrated on 21/11/2013
/32/	Calibration certificate for continuous gas analyser Sl. No. BM11818109 (available upto 04/11/2014) and sl. No. BM502475 (replaced on 05/11/2014) **(used for monitoring methane content at digester outlet)** a) Entech Associate Co. Ltd.: Calibration certificate (G/O 550186) for continuous gas analyser with serial number BM11818109 calibrated on 13/03/2012 b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number BM11818109 calibrated on 21/11/2013
/33/	Webpage: http://www.ibex2005.com/ in English language retrieved on 25/05/2015 to check the company profile of Instrument best expert limited partnership.
/34/	Calibration certificate for temperature sensor (TWD-B9410213BY) **(used for monitoring temperature of biogas at the digester)** a) Thermology Co. Ltd.: Calibration certificate (11/0381) for temperature sensor TWD-B9410213BY calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C047) for temperature sensor TWD-B9410213BY calibrated on 06/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-B008) for temperature sensor TWD-B9410213BY calibrated on 10/12/2013
/35/	Calibration certificate for temperature sensor (TWD-B9410213TY) **(used for monitoring temperature of biogas at flaring)** a) Thermology Co. Ltd.: Calibration certificate (11/0384) for temperature sensor TWD-B9410213TY calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C035) for temperature sensor TWD-B9410213TY calibrated on 06/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L011) for temperature sensor TWD-B9410213TY calibrated on 10/12/2013
/36/	Calibration certificate for temperature sensor (TWD-B9410213BY) **(used for monitoring temperature of biogas at generator 1)** a) Thermology Co. Ltd.: Calibration certificate (11/0382) for temperature sensor TWD-B9410213BY calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C045) for temperature sensor TWD-B9410213BY calibrated on 06/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L010) for temperature

	sensor TWD-B9410213BY calibrated on 10/12/2013
/37/	Calibration certificate for temperature sensor (TWD-B9410213TY) **(used for monitoring temperature of biogas at generator 2)** a) Thermology Co. Ltd.: Calibration certificate (11/0383) for temperature sensor TWD-B9410213TY calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C046) for temperature sensor TWD-B9410213TY calibrated on 06/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L009) for temperature sensor TWD-B9410213TY calibrated on 10/12/2013
/38/	Calibration certificate for Pressure sensor (sl.no. 1006 800278800002) **(used for monitoring pressure of biogas at the generator)** a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030121) for pressure sensor with serial no. 1006 800278800002 calibrated on 02/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C034) for pressure sensor with serial no. 1006 800278800002 calibrated on 07/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L012) for pressure sensor with serial no. 1006 800278800002 calibrated on 10/12/2013
/39/	Calibration certificate for Pressure sensor (sl.no. 2600422) **(used for monitoring pressure of biogas at the flaring)** a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030122) for pressure sensor with serial no. 2600422 calibrated on 02/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-13-L013) for pressure sensor with serial no. 2600422 calibrated on 10/12/2013
/40/	Calibration certificate for Pressure sensor (sl.no. 2600502) **(used for monitoring pressure of biogas at generator 1)** a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030124) for pressure sensor with serial no. 2600502 calibrated on 02/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L015) for pressure sensor with serial no. 2600502 calibrated on 10/12/2013
/41/	Calibration certificate for Pressure sensor (sl.no. 260TZXA) **(used for monitoring pressure of biogas at generator 2)** a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030123) for pressure sensor with serial no. 260TZXA calibrated on 02/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L014) for pressure sensor with serial no. 260TZXA calibrated on 10/12/2013
/42/	Calibration certificate for flow meter (sl.no. 5594) **(used for monitoring flow of biogas at the flaring)** a) PTT Public Company Limited: Calibration certificate (GM-07/54) for flow meter with serial no. 5594 calibrated on 01/03/2011 b) PTT Public Company Limited: Calibration certificate (GMCL 07/55) for flow meter with serial no. 5594 calibrated on 06/03/2012 c) PTT Public Company Limited: Calibration certificate (GMCL 20/56) for flow meter with serial no. 5594 calibrated on 12/12/2013
/43/	Calibration certificate for flow computing (sl.no. 9422144T) **(used for monitoring flow of biogas at the flaring)** a) Thermology Co., Ltd.: Calibration certificate (11/0386) for flow meter with serial no. 9422144T calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C020) for flow meter with serial no. 9422144T calibrated on 06/03/2012 c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L016) for flow meter

	with serial no. 9422144T calibrated on 10/12/2013
/44/	Calibration certificate for continuous gas analyser (sl.no. 28958) **(used for monitoring methane fraction of biogas at the flaring)** a) JE International Co. Ltd.: Calibration certificate (2012/20-5) for analyser with serial number 28958 calibrated on 20/05/2012 b) JE International Co. Ltd.: Calibration certificate (2013/01-1) for analyser with serial number 28958 calibrated on 10/04/2013
/45/	WR&W Calibration Laboratory Co. Ltd.: Calibration certificate for thermocouple (25507001/02) dated 30/07/2012
/46/	Calibration certificate for flow meter (sl.no. 5592) **(used for monitoring flow rate of biogas used for power generation at generator 1)** PTT Public Company Limited: Calibration certificates, calibrated on 01/03/2011, on 06/03/2012 and on 12/12/2013
/47/	Calibration certificate for flow computing (sl.no. 8623677T) **(used for monitoring flow rate of biogas used for power generation at generator 1)** a) Thermology Co., Ltd.: Calibration certificate, calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate, calibrated on 06/03/2012 and on 10/12/2013
/48/	Calibration certificate for flow meter (sl.no. 5593) **(used for monitoring flow rate of biogas used for power generation at generator 2)** PTT Public Company Limited: Calibration certificates, calibrated on 01/03/2011, on 06/03/2012 and on 12/12/2013
/49/	Calibration certificate for flow computing (sl.no. 8623675T) **(used for monitoring flow rate of biogas used for power generation at generator 2)** a) Thermology Co., Ltd.: Calibration certificate, calibrated on 01/03/2011 b) Science Magic Grow Co. Ltd.: Calibration certificate, calibrated on 06/03/2012 and on 10/12/2013
/50/	Measurement Industrial Group Co. Ltd., Industrial calibration laboratory: Calibration certificate for energy meter (BI1290012101P) dated 24/12/2014 and energy meter (BI0980037101I) dated 24/12/2014 Webpage: http://mig.co.th in English language retrieved on 25/05/2015 to check profile of the company.
/51/	Measurement Industrial Group Co. Ltd., Industrial calibration laboratory: Calibration certificate for energy meter (0058033222) dated 24/12/2014 and energy meter (0058010741) dated 27/11/2014 Webpage: http://mig.co.th in English language retrieved on 25/05/2015 to check profile of the company.
/52/	PEA: Monthly electricity export report from the biogas project activity to grid for the period 18/10/2011 to 31/07/2014
/53/	United Palm Oil Industry PCL: Monthly invoices raised for the export electricity to grid from the project activity for the period 18/10/2011 to 31/07/2014.
/54/	PEA: Calibration certificate of energy meter Sl. No. 206500126 dated 22/05/2014
/55/	United Palm Oil Industry PCL: Daily recording of the fraction of methane content in the recovered biogas (w_{CH4}), for the monitoring period 18/10/2011 to 31/07/2014
/56/	United Palm Oil Industry PCL: Daily recording of the electricity consumed internally at the biogas plant and consumption from grid at the biogas plant for the monitoring period 18/10/2011 to 31/07/2014
/57/	United Palm Oil Industry PCL: Daily recording of the electricity exported to the mill from the biogas plant for the monitoring period 18/10/2011 to 31/07/2014
/58/	United Palm Oil Industry PCL: Purchaser order released to Instrument Best Expert Limited for

	procuring 'Transmitter IR-5000 wp methane 0-100%' dated 27/02/2014 with delivery date 18/04/2014
/59/	United Palm Oil Industry PCL: Internal document of installing gas analyzer (sl. No. 2160913) dated 21/04/2014
/60/	Geotech: Technical specifications of gas analyser; Website 'http://www.geotechuk.com/products/gases/ch4.aspx' in English retrieved on 12/10/2015.
/61/	JE International Co. Ltd.: Specifications of JE gas sensor (CH_4)
/62/	Calibration certificate for continuous gas analyser Sl. No. 2160913 (available from 21/04/2014) at generator 1 (ID 20.1) by Entech Associate Co. Ltd. (G/O 570836) calibrated on 17/12/2014
/63/	United Palm Oil Industry PCL: Daily recording of the fraction of methane content in the recovered biogas, biogas at generator (w_{CH4}), for the monitoring period 18/10/2011 to 31/07/2014

2.2 On-site assessment

On 12/01/2015 and 13/01/2015, RINA visited the project facility 'United Palm Oil Industry Public Company Limited factory' located 814 km south of Bangkok in Krabi Province, Thailand. There were no hindrances or barriers that were faced by the verification team while carrying out the site visits. During the on-site assessment of the project RINA assessed the implementation and operation of the proposed project activity, reviewed the information flows for generating, aggregating and reporting the monitoring parameters, interviewed key personnel of the plant to confirm the operational and data collection procedures, cross-checked between information provided in the monitoring report and data plant, checked the monitoring equipment including calibration performance, reviewed calculations and assumptions made in determining the GHG data and emission reductions, checked the quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

The key personnel interviewed and the main topics of the interviews are summarized in the table below.

	Date	Name and Role	Organization	Topic
/a/	12/01/2015 – 13/01/2015	Ladaporn Kat Khunikakorn (CDM- Project Manager)	Swiss Carbon Asset Ltd.	Project implementation and operation. Technical equipment, calibration and monitoring observation. Management of the electricity meter and data collection. Monitoring plan and monitoring parameters. Preparation of the Monitoring Report (MR), calculation of the ER.
/b/	12/01/2015 – 13/01/2015	Tawatchai Jaikliang (Project Coordinator)	UPOIC	Monitoring plan and monitoring parameters. Management of the meter devices. Technical equipment, calibration and monitoring observation. Information flows for generating, aggregating and reporting the monitoring parameters. Cross-check of information in the monitoring report and data source.
/c/	12/01/2015 – 13/01/2015	Surat Aramging (Plant Supervisor)	UPOIC	
/d/	12/01/2015 – 13/01/2015	Supathrapong Chanpanich (Factory Manager)	UPOIC	

2.3 Resolution of outstanding issues

The objective of this phase of the verification is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the monitoring report and emission reductions.

To guarantee transparency a verification protocol has been customized for the project. The protocol shows in a transparent manner the requirements, means of verification and the results from verifying the identified criteria.

The verification protocol consists of three tables; the different columns in these tables are described in the figure below (see Figure 1). The completed verification protocol is enclosed in Appendix A to this report.

A corrective action request (CAR) is raised if one of the following occurs:

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impair the estimate of emission reductions;
- Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during verification for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

CARs, CLs and FARs identified are included in the verification protocol in Appendix A of this report.

Figure 1 Verification protocol tables

Verification Protocol, Table 1 - Requirement checklist				
Checklist Question	Ref.	MoV	Comments	Conclusion
The checklist is organized in four different sections.	Makes reference to documents where the answer to the checklist question or item is found.	Explain how conformance with the checklist question is investigated. Examples are document review (DR), interview or any other follow-up actions (I), cross checking (CC) with available information relating to projects, (N/A) means not applicable.	The discussion on how the conclusion is arrived at and the conclusion on the compliance with checklist question so far.	For CAR, CL and FAR see the definitions above.OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements.

Verification Protocol, Table 2 - Resolution of Corrective Action Requests and Clarification			
Corrective action requests and/or clarification requests	Reference to Table 1	Response by project participants	Verification conclusion
The CAR and/or CLs raised in table 1 are repeated here.	Reference to the checklist question number in Table 1 where the CAR or CL is explained.	The responses given by the project participants to address the CARs and/or CLs.	The verification team's assessment and final conclusion of the CARs and/or CLs.

Verification Protocol, Table 3 - Forward Action Requests (if no FAR table 3 is deleted)		
Forward action request	Reference to Table 1	Response by project participants Verification conclusion
The FAR raised in table 1 is repeated here.	Reference to the checklist question number in Table 1 where the FAR is explained.	Response by the project participants on how forward action request will be addressed.

2.4 Internal quality control

All the revisions of the verification report before being to submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent RINA instructions.

The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for CDM validation and verification.

2.5 Verification team and the technical reviewer(s)

The verification team and the independent technical reviewer team have the collective competence necessary to perform the verification.

The verification team fulfills the following requirements:

- qualification for all technical area/s (TAs) related to the activity;
- technical experts who provides specific technical, methodological and sectoral knowledge and/or expertise and qualification for TAs can be involved;
- it includes one Team Leader that takes the responsibility to lead the team;
- it includes a Verifier;
- at least one member who performs the on-site visit is qualified for all TAs related to the activity;
- at least one member who performs the on-site visit is qualified as Team Leader, even if he/she does not cover this role for the specific activity;
- the same person can cover more than one roles.

The independent technical reviewer team fulfills the following requirements:

- qualification for the CDM scheme and attendance to specific training related to the independent technical reviewer activity;
- qualification for all technical area/s (TAs) related to the activity in case of Final Report;

The verification team members and the technical reviewers consist of the following personnel (refer to the relevant attachments to see the pertinent qualification certificates):

Role	Last Name	First Name	Site Visit (Yes/No)	Country
Team Leader	Menon	Rekha	No	India
Verifier and technical Expert TA 1.2 and 13.1	Buragohain	Champok	Yes	India
Technical Reviewer	Valoroso	Rita	No	Italy

(The verifier also qualified as Team Leader)

3 VERIFICATION FINDINGS

The findings of the verification related to the monitoring period from 18/10/2011 to 31/07/2014 as documented and described in the monitoring report version 01 of 21/11/2014, version 02 of 27/02/2015, version 03 of 24/04/2015, version 04 of 27/05/2015 and version 05 of 06/10/2015 /**01**/ are stated in the following sections.

The verification requirements, the means of verification and the results from verifying the identified criteria are documented in more detail in the verification protocol in Appendix A.

3.1 Description of the project activity

The main information of the project is summarized in the table below.

Project Participant(s)	United Palm Oil Industry PCL. (Thailand) Swiss Carbon Asset Ltd. (Switzerland)		
Project Title	UPOIC Wastewater Treatment for Energy Generation, Krabi		
Location of the project	United Palm Oil Industry Public Company Limited, Kalasae sub-district, Sikao Distrct, Trang province, Thailand - Latitude: 8°9' 2382" N - Longitude: 99°1' 4009" E		
Methodology(ies)	AMS-III.H", "Methane recovery in wastewater treatment", version 15 of 30/07/2010 /**11**/ AMS-I.D", "Grid connected renewable electricity generation", version 16 of 28/05/2010 /**12**/		
Sectoral Scope(s)	01 & 13	RINA's Technical Area(s)	1.2 and 13.1
Registered PDD	Revision 11 of 11/10/2011		
Date of registration	18/10/2011	CDM Registration Reference N°	4322
Starting date of the crediting period	18/10/2011		
Project's crediting period	18/10/2011 to 17/10/2021		
Monitoring period	18/10/2011 to 31/07/2014		
Project documentation link	https://cdm.unfccc.int/Projects/DB/TUEV-SUED1293726368.8/view /**05**/		
Purpose of the project activity	The purpose of the project activity is to extract methane (biogas) from the wastewater stream through the biogas reactors and use of biogas as fuel for electricity generation in a Crude Palm Oil (CPO) plant. The captured biogas is approximately 2,622,256 m^3/year piped through 2 sets of 952 kW-generator, to produce electricity which will be self-utilized in the palm oil factory and fed into the electricity grid. Any excess biogas will be flared /**03**/.		

3.2 Remaining issues (FARs) from previous validation or verification

Based on the review of validation report /**04**/, 1 FAR was raised during the validation. The FAR has been successfully closed as described below:

FAR 1 stated "The PP has provided the three year historical data of power consumption in the Palm oil by biomass power plant which is 4,022,173 KWh for 2006, 2,754,348 KWh for 2007 and 4,945,426 KWh for 2008. Average of last three years comes out to be 3,907,316 KWh and it needs to be cross checked with the consumption in the Palm oil plant from Biomass power plant during the crediting period to confirm that the power generation from project activity has not replaced power generation from Biomass power plant". It has been verified from log book records of electricity generation from biomass power plant and consumption at the mill since January 2012 to December 2014 and found

that average of 3 years consumption from the biomass plant is 6,276,634 kWh/year /**19**/ which is higher that the validated value historical value. Therefore, it is confirmed that biomass power generation in the plant is not replaced by the project power generation which is supplied to the mill. Further, PP is not claiming emission reduction for the electricity component sent to the mill which is conservative and hence the FAR is closed.

3.3 Monitoring Report

The Monitoring Report for the project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi", in "Thailand", version 01 of 21/11/2014, version 02 of 27/02/2015, version 03 of 24/04/2015, version 04 of 27/05/2015 and version 05 of 06/10/2015 /**01**/ submitted by Swiss Carbon Assets Ltd. have been the basis for the verification process.

RINA confirms that the above MR is based on the currently valid MR template /**07/** and is completed in accordance with the applicable guidance document **/06**/.

The main changes between the MR version 01 of 21/11/2014 published in the UNFCCC website on 02/12/2014 and the MR version 05 of 06/10/2015 submitted for registration are the following:

Section of the MR	Description and reason for changing the information in that section
All sections	The MR template version 05.1 is used in the final MR. This template is the last available tamplate at UNFCCC.
All sections	The emission reduction reported in the version 01 of the MR was 61,276 tCO_2 which is corrected to 55,477 tCO_2 for the monitoring period.
A.1	Commissioning details of the project have been corrected as per actual commissioning records.
D.2	Monitoring details of parameters are corrected as per actual site reocrds.
All sections	Version 05 of the MR is revised as per queries raised during Information and Reporting check.

3.4 Project implementation

Actual implementation of the registered project activity

During this site visit, RINA verified the actual implementation of the project and confirmed that the project is implemented and operated as described in the registered PDD version 11 dated 11/10/2011 /**03**/ and the monitoring report version 05 dated 06/10/2015 /**01**/. The project activity involves the installation of an anaerobic wastewater treatment facility with methane capture, based on the Completely Stirred Tank Reactor (CSTR) to treat wastewater from the existing crude palm oil extraction mill and also biogas utilization for electricity generation. RINA verified the commissioning certificate of biogas plant (digester capacity 12,000 m^3) from ERDI (the technology supplier) dated 01/10/2009 and confirm that the project technology is as per the registered PDD /**20**/. The captured biogas is sent to two biogas engine of 952 kW each (model: SFGLD 560 with serial number 330491 and 330492) /**21**/. Electricity generated in this project activity is used for project's own consumption (gas engine system, biogas system and control room) and thereafter the net electricity is exported to the mill and to the national grid of Thailand. Excess biogas is routed to a high temperature, open flare to destroy the biogas. The details on the anaerobic digester, palm oil mill effluent (POME) entering the digester and utilization of biogas are verified to be consistent with the details provided in the registered CDM PDD /**03/**.

The project activity was verified on-site to consume electricity from the grid for backup and start-up purposes. RINA was able to verify this during the physical inspection of the power generation facilities on-site. The volume of wastewater entering to the digester is monitored using a flow meter (ABB, FEP311.XXX.AIAI01, serial number 1401123), the COD of wastewater before entering the digester and after treatment is measured applying closed-reflux method. This is in line with the registered PDD /**03**/. The volume of biogas generated is monitored continuously using a flow meter (KOBOLD, DOG-

1120, serial number 5843), the biogas flared is monitored using a flow meter (KOBOLD, DOG-1120, serial number 5594) and volume of biogas used for power generation in two gas engines with separate flow meters (KOBOLD, DOG-1120, serial number 5592 in generator 1 and KOBOLD, DOG-1120, serial number 5593 in generator 2). The amount of electricity generated from both the gas engine (952 kW each) is monitored continuously using separate energy meter (Carlo Gavazzi, WM3-96, serial number BI1290012101P from generator 1 and Carlo Gavazzi, WM3-96, serial number BI0980037101I from generator 2) with accuracy class 0.2S, the auxiliary electricity consumption is monitored in a separate energy meter (Merlin Gerin, PM210, serial number 0058033222), the grid energy consumption is monitored in a separated energy meter (Merlin Gerin, PM210, serial number 0058010741). The electricity exported to grid is monitored using an energy meter (EDMI, Mk6, serial number 206500126) and the export to the CPO mill is monitored in an energy meter (Schneider, PM710, serial number 4A943A98). All the above monitoring arrangements are as per the registered PDD and were found in place.

During the site visit, no changes have been observed or identified which may impact the additionality as there was no change in the effective output capacity, no addition of component nor extension of technology, no addition nor removal of project sites since there is only one site of the project activity, no change of values of the actual operational parameter relevant to determination of emission reductions which are within the control of the PP; no change has been observed or identified that may impact the scale of the project activity or applicability of the monitoring methodology AMS-III.H version 15 /**11**/ and AMS-I.D version 16 /**12**/.

In conclusion, RINA is able to confirm that: the implementation and operation of the project during this monitoring period is consistent with the registered PDD /**03**/ and the information provided in the MR /**01**/ is also in accordance with the description of the registered PDD /**03**/.

Post registration changes

Temporary deviation from the registered monitoring plan is reported in this monitoring period for the parameter 'volume of wastewater discharged in year y' ($Q_{ww,discharge,y\ (outlet)}$). PP could not produce evidence of this monitoring as per registered PDD; however, in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire monitoring period to account project emission. Since, volume of wastewater entering digester (Qww,y) is higher compared to volume of discharged wastewater after treatment ($Q_{ww,discharge,y\ (outlet)}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.

3.5 Methodology for determining Emission Reductions.

According to the applied methodology "AMS-III.H", "Methane recovery in wastewater treatment" version 15 of 30/07/2010 /**11**/, "AMS-I.D", "Grid connected renewable electricity generation" version 16 of 28/05/2010 /**12**/, the emission reductions have been calculated based on the following formula:

1. Baseline Emission

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

$BE_{CH4,y} = BE_{ww,treatment,y} + BE_{ww,discharge,y}$

Where:

BE_y	Baseline emissions in year y (tCO_2e)
$BE_{power,y}$	Baseline emissions due to electrciity of fossil fuel used in year y (tCO_2e)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (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})

$B_{ww,treatment,y} = \sum(Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment,BLi}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$

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.
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems i (MCF values of 0.8 (for anaerobic pond) and 0.3 (for aerobic, poorly managed pond) is used as per as per table III.H.1 /**11**/)
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.25 kg CH_4/kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89) /**03**/
GWP_{CH4}	Global Warming Potential for methane (value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period) /**15**/

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

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) /**03/, /11**/
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) /**03/**
UF_{BL}	Model correction factor to account for model uncertainties (0.89) /**03/**
GWP_{CH4}	Global warming potential (value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period) /**15**/

Baseline methane avoidance emissions as per MDy approach is calculated as per below formula:

$MDy = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$

Where:

MDy	Methane captured and destroyed/gainfully used by the project activity in the year y (tCO_2e)
$BG_{burnt,y}$	Biogas flared/combusted in year y (m^3)
$w_{CH4,y}$	Methane content in the biogas in the year y (volume fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year y (tones/m^3). This is considered 0.716 kg/m^3 as per flaring tool /**13**/.
FE	Flare efficiency in year y (fraction)
GWP_{CH4}	Global Warming Potential for methane (value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period) /**15**/

$BE_{power,y} = EG_{BL,y} * EF_{CO2,\ grid,y}$

Where:

$BE_{power,y}$	Baseline emissions from electricity generated utilizing the recovered methane from anaerobic reactors in the project activity and exported to the grid (tCO_2e).
$EG_{BL,y}$	Amount of electricity generated utilizing the recovered methane from anaerobic reactors in the project activity and exported to the grid (MWh).
EF_{CO2}	Carbon emission factor for the displaced electricity source in the project scenario (tCO_2e/MWh). In this case, it is Thailand National Grid emission factor (tCO_{2e}/MWh) fixed ex-ante to be 0.52 tCO_2e/MWh /**03/**.

2. Project Emission

$$PE_y = PE_{CH4,y,} = PE_{power,y} + PE_{ww,treatment,y} + PE_{ww,discharge,y} + PE_{fugitive,y} + PE_{flaring,y}$$

Where:

$PE_{power,y}$	Emissions from electricity or fuel consumption in the year *y* (tCO_2e). 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* (tCO_2e).
$PE_{ww,discharge,y}$	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* (tCO_2e).
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year *y*, calculated as per paragraph 28 (tCO_2e) of AMS-III.H /11/
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y* as per the "Tool to determine project emissions from flaring gases containing methane"(tCO_2e)

$PE_{power,y} = \Sigma EC_{PJ,y} * FE_{EL,y}$

Where:

$EC_{PJ,y}$	Quantity of grid electricity consumed in the year y (MWh).
EF_{CO2}	Emission factor of grid. In this case, it is Thailand National Grid emission factor (tCO_{2e}/MWh) fixed ex-ante to be 0.52 tCO_2e/MWh /**03/.**

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

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 of 0.3 (for aerobic, poorly managed pond) is used as per as per table III.H.1 /**11**/))
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD) /**03/**.
UF_{PJ}	Model correction factor to account for model uncertainties (0.89)/**03**/.
GWP_{CH4}	Global Warming Potential for methane (value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period) /**15**/

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

Where,

$Q_{ww,k,y}$	Volume of wastewater treated 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 value of 0.1 as per Table III.H.1 is considered) /**03/, /11/**.
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD) /**03/**.
UF_{PJ}	Model correction factor to account for model uncertainties (0.89) /**03/**.
GWP_{CH4}	Global Warming Potential for methane (value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period) /**15**/

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$

Where:

$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiency in the anaerobic wastewater treatment in the year "y" (tCO_2e)
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiency in the anaerobic sludge treatment in the year "y" (tCO_2e).

No sludge generation is reported during this monitoring to account $PE_{fugitive,s,y}$. Thus, $PE_{fugitive,s,y}$ is not applicable during this monitoring period.

$$PE_{fugitive,ww,y} = (1\text{-}CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$$

Where:

CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (0.9) /**03/**.
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y (tonnes)

$$MEP_{ww,treatment,y} = Q_{ww,y} * \Sigma COD_{removed,PJ,k,y} * B_{o,ww} * UF_{PJ} * MCF_{ww,treatment,PJ,k}$$

Where:

$Q_{ww,y}$	Volume of treated wastewater discharged in year y (m^3)

$B_{o,WW}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD) /**03/**.
UF_{PJ}	Model correction factor to account for model uncertainties (1.12) /**03**/
$\Sigma COD_{removed,PJ,k,y}$	The chemical oxygen demand removed by the treatment system k of the project activity equipped with biogas recovery in the year y (tonnes/m^3)
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the wastewater treatment system k equipped with biogas recovery equipment (MCF value is used as 0.8 as per table III.H.1) /**03/, /11**/

$$PE_{flare,\ y} = \sum TM_{RG,h} * (1 - \eta_{flare\text{-}h}) * GW_{PCH4} / 1000$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h (kg/h)
$\eta_{flare\text{-}h}$	Flare efficiency in hour h
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4). Value of 21 for the first commitment period (upto 31/12/2012) and 25 for the second commitment period /**15**/.

3. Leakage

As per the registered PDD /03/, all the equipments are newly manufactured and installed. There is no equipment transferred from another activity. Therefore, there is no leakage due to the proposed project activity.

$LE_{y,ex\ post}=0$

4. Emission Reductions

$$ER_{y,ex\ post} = \min((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - LE_{y,ex\ post}))$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated as per equation above in the registered PDD /03/
$PE_{y,ex\ post}$	Project emissions calculated as per equation above in the registered PDD /03/
MD_y	Methane captured and destroyed/gainfully used by the project activity in the year y (tCO_2e) as per equation in the registered PDD /03/

3.5.1 Compliance of the monitoring plan with the monitoring methodology and applicable methodological tools

During this monitoring period, the validated and registered monitoring plan was found to be in accordance with the applied methodologies, AMS-III.H, version 15 and AMD-I.D, version 16 /**11**/, /**12**/ except for the parameter 'volume of wastewater discharged in year y' ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$) PP could not produce evidence of this monitoring as per registered PDD; however, in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire monitoring period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative. Other monitoring parameters, monitoring and calibration procedures follow the methodology requirements. No recommendation was made during this verification.

3.5.2 Compliance of monitoring with monitoring plan

During this monitoring period, the registered monitoring plan and the applied monitoring methodology have been properly implemented and followed by the project participant as explained in above section 3.5.1.

The parameters have been monitored in accordance with the monitoring plan in the registered PDD **/03**/ and the monitoring report **/01**/.

3.5.2.1 Data and parameters fixed ex-ante or at renewal crediting period

DATA/PARAMETER Unit	Source of data	Reported value for the project period	Assessment/Observation
Quantity of FFB processed per annum (Q_{FFB})	Data based on registered PDD /03/ and validation report /04/	Approximately 175,200 ton FFB/y	The value is as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Volume of wastewater from the mill to the lagoons per annum in project baseline (Q_{ww})	Data based on registered PDD /03/ and validation report /04/	102,730	The value is as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Chemical Oxygen Demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline ($COD_{untreated}$)	Data based on registered PDD /03/ and validation report /04/	0.0646 tons/m^3	The value is ex-ante fixed for 10 years crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Global Warming Potential of methane (GWP_{CH4})	Data based on registered PDD /03/ and validation report /04/	21 tCO_{2e}/tCH_4 for first commitment period upto 31/12/2012 and 25 from 01/01/2013 onwards.	The value is ex-ante fixed for 10 years crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Methane generation capacity of COD in waste water ($B_{o,ww}$)	Data based on registered PDD /03/ and validation report /04/	0.25 kg CH_4/kg COD	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.

Model correction factor to account of model uncertainties (UF_{BL})	Data based on registered PDD /03/ and validation report /04/	0.89	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Model correction factor to account of model uncertainties (UF_{PJ})	Data based on registered PDD /03/ and validation report /04/	1.12	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Methane correction factor for the baseline anaerobic wastewater treatment systems ($MCF_{WW,treatment,BL}$)	Data based on registered PDD /03/ and validation report /04/	0.8 for anaerobic deep lagoon and 0.3 for aerobic poor managed.	The value is ex-ante fixed for the fixed 10 years crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
The chemical oxygen demand removed by the anaerobic wastewater treatment system in the project baseline ($COD_{removal,y}$)	Data based on registered PDD /03/ and validation report /04/	0.0622 from anaerobic pond and 0.00048 from aerobic, poor managed pond.	The value is ex-ante fixed for the fixed 10 years crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Methane correction factor based on discharge pathway in the baseline situation / Methane correction factor based on discharge pathway in the project situation ($MCF_{WW,BL,discharge}/MCF_{ww,PJ,discharge}$)	Data based on registered PDD /03/ and validation report /04/	0.1	The value is ex-ante fixed for the fixed 10 years crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Methane correction factor for project wastewater treatment system equipped with biogas recovery and combustion ($MCF_{WW,treatment,PJ}$)	Data based on registered PDD /03/ and validation report /04/	0.8	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Capture efficiency of the biogas	Data based	0.9	The value is ex-ante fixed

recovery equipment in the wastewater treatment (CFE_{WW})	on registered PDD /03/ and validation report /04/		for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Grid emission factor of Thailand ($EF_{y,grid}/EF_{y,consumed}$)	Data based on registered PDD /03/ and validation report /04/	0.52 tCO_2/MWh	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.
Density of methane at normal conditions (ρ_{CH4})	Data based on registered PDD /03/ and validation report /04	0.716 kg/m^3	The value is ex-ante fixed for 10 years fixed crediting period as per the registered PDD, which has been justified and validated by validation DOE to follow the applied methodology and tool and already approved by EB /03/, /04/.

3.5.2.2 Data and parameters monitored ex-post

<table>
<tr><th>Data/Parameter</th><th>$Q_{ww,y}$</th></tr>
<tr><td>Data Unit</td><td>m^3/y</td></tr>
<tr><td>Description</td><td>Volume of wastewater treated in year y entering the cooling pond and entering the digester</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per flow meter measurement</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Total value (m^3)</th></tr>
<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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is flow meter located at the inlet of anaerobic reactor, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Wastewater Flow meter</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td></tr>
<tr><td>Model</td><td>MID-2C1FA0AA00L</td></tr>
<tr><td>SN</td><td>A0792017 (until 19/01/2014)</td></tr>
<tr><td>Accuracy</td><td>±0.30%</td></tr>
</table>
<table>
<tr><td>Meter</td><td>Wastewater 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>SN</td><td>1401123 (Since 20/01/2014)</td></tr>
<tr><td>Accuracy</td><td>±0.40%</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the meters is ±0.30% for the old flow meter and ±0.40% for the new meter as per manufacturer specifications and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly recorded and summarized daily. This is in accordance with the methodology AMS-III.H version 15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The flow meter was calibrated on 01/03/2011 (with validity until 29/02/2012), on 07/03/2012 (with validity until 06/03/2013), on 04/02/2013 (with validity until 03/02/2014) /22/. The flow meter was replaced with a new meter (sl.no.1401123) on 20/01/2014 which was calibrated on December 2013 /24/. Therefore calibration due date would be 30/11/2014.
During calibration on 01/03/2011 the error identified to be 0.48% and during calibration on 07/03/2012 the error identified to be</td></tr>
</table>

<table>
<tr><td></td><td>1.66% compared to permissible error of 0.30% of the meter. Hence, PP has applied 1.66% error with the measured value from 18/10/2011 to 07/03/2012 and considered the minimum value on conservative side. This is in line with paragraph 283 of VVS, version 07 /10/.

Hence, the calibration of flow meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td><table>
<tr><td>Meter no.</td><td>Calibration details</td></tr>
<tr><td>A0792017</td><td>a) Calibration certificate (L1103-011) for flow meter A0792017, calibrated on 01/03/2011 by Miracle International Technology Co. Ltd. /22/
b) Calibration certificate (SMG-12-C007) for flow meter A0792017, calibrated on 07/03/2012 by Science Magic Grow Co. Ltd. /22/
c) Calibration certificate (SMG-13-B003) for flow meter A0792017, calibrated on 04/02/2013 by Science Magic Grow Co. Ltd./22/</td></tr>
<tr><td>1401123</td><td>By ABB Engineering Co. Ltd. on December 2013 /24/.</td></tr>
</table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>Miracle International Technology Co. Ltd. and Scientific Magic Glow Company Limited has been accredited calibration laboratory for flow measurement in accordance with ISO/IEC17025 No. 0147 issued by the Thai Industrial Standards Institute (TISI) /25/. ABB Engineering Co. Ltd. is the manufacturer of flow meter (1401123). Hence, calibration is done by accredited agency.</td></tr>
</table>

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<table>
<tr><th>Data/Parameter</th><th>$COD_{ww,untreated,y}$</th></tr>
<tr><td>Data Unit</td><td>tCOD/m^3</td></tr>
<tr><td>Description</td><td>Chemical oxygen demand of wastewater before the treatment system k</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per on-site laboratory test reports</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>At the cooling pond for aerobic poor managed system
<table>
<tr><th>Monitoring period</th><th>Average value (tCOD/m^3)</th></tr>
<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>
</table>
At the digester for anaerobic treatment system
<table>
<tr><th>Monitoring period</th><th>Average value (tCOD/m^3)</th></tr>
<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>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>The COD content was analysed in comply with closed-reflux method which is international standard method. The measurement shall ensure a 90/10-confidence level. Detailed information of the Burette are listed in the following table:
<table>
<tr><td>Equipment</td><td>Burette</td></tr>
<tr><td>Manufacturer</td><td>Mettler Toledo</td></tr>
<tr><td>SN</td><td>399004802</td></tr>
<tr><td>Maximum permissible error</td><td>+/- 0.20 %</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The maximum permissible error of the burette is ±0.20%.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is measured and recorded daily and reported weekly basis in ER sheet. This is in accordance with the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>The calibration interval of COD monitoring equipment was according to the calibration plan for laboratory equipments based on “Guideline for the determination of calibration intervals of measuring instruments” of the “International Laboratory Accreditation Cooperation” (ILAC) /26/ and is planned annually. This is as per the registered monitoring plan /03/. Further, monthly samples are analyzed in accredited independant laboratory to cross cehck the results and apply the conservative values /02/.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The Mettler Toledo Burette was calibrated on 17/10/2011 (with validity until 16/10/2012), on 27/09/2012 (with validity until 26/09/2013), on 10/09/2013 (with validity until 09/10/2014) /27/.
During calibration on 10/09/2013 the error identified to be 1.65% compared to permissible error of 0.20%. Hence, PP has applied 1.65% error with the measured value from 27/09/2012 to</td></tr>
</table>

<table>
<tr><td></td><td>10/09/2013 and considered the lower value in the 90/10 confidence level on conservative side. This is in line with paragraph 283 of VVS, version 07 /10/.

Hence, the calibration covers the monitoring period. The calibration frequency of the Burette has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td><table>
<tr><td>Burette</td><td>Calibration details</td></tr>
<tr><td>399004802</td><td>a) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0765-11) for Mettler Toledo Burette with serial number 399004802 calibrated on 17/10/2011 /27/
b) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0771-12/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 27/09/2012 /27/
c) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0811-13/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 10/09/2013 /27/</td></tr>
</table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>Mettler-Toledo (Thailand) Limited is the manufacturer of the equipment and hence credible to calibrate the equipment /27/</td></tr>
</table>

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<table>
<tr><th>Data/Parameter</th><th>$COD_{ww,treated,y}$</th></tr>
<tr><td>Data Unit</td><td>tCOD/m^3</td></tr>
<tr><td>Description</td><td>Chemical oxygen demand of wastewater after the treatment system k</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per on-site laboratory test reports</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>Average value of two monitoring points after the digester
<table>
<tr><th>Monitoring period</th><th>Average value (tCOD/m^3)</th></tr>
<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>
</table>
Monitored value at the combination point of wastewater leaving the digester
<table>
<tr><th>Monitoring period</th><th>Average value (tCOD/m^3)</th></tr>
<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>
</table>
Monitored value at the sampling point before facultative pond 1-2, oxidation pond and polish pond in the post treatment system
<table>
<tr><th>Monitoring period</th><th>Average value (tCOD/m^3)</th></tr>
<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>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>The COD content was analysed in comply with closed-reflux method which is international standard method. The measurement shall ensure a 90/10-confidence level. Detailed information of the Burette are listed in the following table:
<table>
<tr><td>Equipment</td><td>Burette</td></tr>
<tr><td>Manufacturer</td><td>Mettler Toledo</td></tr>
<tr><td>SN</td><td>399004802</td></tr>
<tr><td>Maximum permissible error</td><td>+/- 0.20 %</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The maximum permissible error of the burette is ±0.20%.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is measured and recorded daily and reported weekly basis in ER sheet. This is in accordance with the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable.</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>The calibration interval of COD monitoring equipment was according to the calibration plan for laboratory equipments based on “Guideline for the determination of calibration intervals of measuring instruments” of the “International Laboratory Accreditation Cooperation” (ILAC) /26/ and is planned annually. This is as per the registered monitoring plan /03/. Further, monthly samples are analyzed in accredited independant laboratory to</td></tr>
</table>

<table>
<tr><td></td><td>cross cehck the results and apply the conservative values /02/.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The Mettler Toledo Burette was calibrated on 17/10/2011 (with validity until 16/10/2012), on 27/09/2012 (with validity until 26/09/2013), on 10/09/2013 (with validity until 09/10/2014) /27/.
During calibration on 10/09/2013 the error identified to be 1.65% compared to permissible error of 0.20%. Hence, PP has applied 1.65% error with the measured value from 27/09/2012 to 10/09/2013 on conservative side. This is in line with paragraph 283 of VVS, version 07 /10/.
Hence, the calibration covers the monitoring period. The calibration frequency of the Burette has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td><table><tr><td>Burette</td><td>Calibration details</td></tr><tr><td>399004802</td><td>a) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0765-11) for Mettler Toledo Burette with serial number 399004802 calibrated on 17/10/2011 /27/
b) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0771-12/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 27/09/2012 /27/
c) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0811-13/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 10/09/2013 /27/</td></tr></table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>Mettler-Toledo (Thailand) Limited is the manufacturer of the equipment and hence credible to calibrate the equipment /27/</td></tr>
</table>

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<table>
<tr><th>Data/Parameter</th><th>$COD_{ww,discharged,PJ,y}$</th></tr>
<tr><td>Data Unit</td><td>$tCOD/m^3$</td></tr>
<tr><td>Description</td><td>Chemical oxygen demand of the final treated wastewater discharged into the plantation area in the project activity</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per on-site laboratory test reports</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Average value ($tCOD/m^3$)</th></tr>
<tr><td>18/10/2011 – 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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The COD content was analysed in comply with closed-reflux method which is international standard method. The measurement shall ensure a 90/10-confidence level. Detailed information of the Burette are listed in the following table:
<table>
<tr><td>Equipment</td><td>Burette</td></tr>
<tr><td>Manufacturer</td><td>Mettler Toledo</td></tr>
<tr><td>SN</td><td>399004802</td></tr>
<tr><td>Maximum permissible error</td><td>+/- 0.20 %</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The maximum permissible error the burette is ±0.20%.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is measured and recorded daily and reported weekly basis in ER sheet. This is in accordance with the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable.</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>The calibration interval of COD monitoring equipment was according to the calibration plan for laboratory equipments based on “Guideline for the determination of calibration intervals of measuring instruments” of the “International Laboratory Accreditation Cooperation” (ILAC) /26/ and is planned annually. This is as per the registered monitoring plan /03/. Further, monthly samples are analyzed in accredited independant laboratory to cross cehck the results and apply the conservative values /02/.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The Mettler Toledo Burette was calibrated on 17/10/2011 (with validity until 16/10/2012), on 27/09/2012 (with validity until 26/09/2013), on 10/09/2013 (with validity until 09/10/2014) /27/.
During calibration on 10/09/2013 the error identified to be 1.65% compared to permissible error of 0.20%. Hence, PP has applied 1.65% error with the measured value from 27/09/2012 to 10/09/2013 on conservative side. This is in line with paragraph 283 of VVS, version 07 /10/.
Hence, the calibration covers the monitoring period. The calibration frequency of the Burette has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
</table>

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<table>
<tr>
<td>Calibration certificates</td>
<td>
<table>
<tr><th>Burette</th><th>Calibration details</th></tr>
<tr><td>399004802</td><td>a) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0765-11) for Mettler Toledo Burette with serial number 399004802 calibrated on 17/10/2011 /27/
b) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0771-12/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 27/09/2012 /27/
c) Mettler-Toledo (Thailand) Limited: Calibration certificate (CCB-0811-13/C) for Mettler Toledo Burette with serial number 399004802 calibrated on 10/09/2013 /27/</td></tr>
</table>
</td>
</tr>
<tr>
<td>Does the calibration of metershave be done by an accredited person or institution?</td>
<td>Mettler-Toledo (Thailand) Limited is the manufacturer of the equipment and hence credible to calibrate the equipment /27/</td>
</tr>
</table>

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Data/Parameter	$Q_{ww,discharge,y\ (outlet)}$
Data Unit	m^3/year
Description	Volume of wastewater discharged in year y
Source of data to be used	Plant record as per flow meter measurement. However, in this case, project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Value of monitored parameter for the monitoring period	As explained above, on conservative side the monitored value of $Q_{ww,y}$ is provided below for project emission calculation.

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

Monitoring equipment	Project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Accuracy of the monitoring equipment	Project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Measuring/Reading/Recording frequency	Project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Calcualtion method (if	Not applicable

applicable)	
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PDD?	Project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	Project participant could not produce evidence of this monitoring and therefore in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,y}$) for the entire period to account project emission. Since, volume of wastewater entering digester ($Q_{ww,y}$) is higher compared to volume of discharged wastewater after treatment ($\mathbf{Q_{ww,discharge,y\ (outlet)}}$), consideration of $Q_{ww,y}$ under this parameter accounts higher project emission and hence conservative.
Calibration certificates	Not applicable.
Does the calibration of metershave be done by an accredited person or institution?	Not applocable.

<table>
<tr><th>Data/Parameter</th><th>$S_{final,PJ,y}$</th></tr>
<tr><td>Data Unit</td><td>tonnes/year</td></tr>
<tr><td>Description</td><td>End use of treated sludge generated in year y</td></tr>
<tr><td>Source of data to be used</td><td>Plant records</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>0 (No excess sludge generation is reported during the monitoring period)</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is a weigh bridge to measure the amount of sludge generated and sent for end use; detailed information of the weigh bridge are listed in the following table:
<table>
<tr><td>Equipment</td><td>Weigh Bridge</td></tr>
<tr><td>Manufacturer</td><td>Matter tolede</td></tr>
<tr><td>Model</td><td>8530</td></tr>
<tr><td>SN</td><td>5445595-5HP</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>Accuracy of the weighing scale is not identified. Since during the monitoring period no end use of sludge generation is reported, hence accuracy is not relevant during this monitoring period.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is monitored and recorded when sludge is sent for end use. This is in accordance with the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is not defined, however as per calibration records PP has followed calibration at least once in a year.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The weighing scale was calibrated on 05/04/2011 (valid until 04/04/2012), on 29/06/2012 (valid until 28/06/2013), on 24/04/2013 (valid until 23/04/2014), on 13/02/2014 (valid until 12/02/2015) and on 11/03/2014 (valid until 10/03/2015) /28/. There was a delay in calibration from 04/04/2012 to 29/06/2012, however since the parameter is not used in emission reduction calculation, the delay is accepted. Hence, the calibration of weigh bridge covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected. Further, no data has been recorded during this monitoring period, hence these is no uncertainty for the parameter.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><td>Weigh Bridge</td><td>Calibration details</td></tr>
<tr><td>5445595-5HP</td><td>By Central Bureau of weights and measures, Govt. of Thailand dated 05/04/2011, 29/06/2012, 24/04/2013, 13/02/2014 and 11/03/2014 /28/</td></tr>
</table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>The calibrating agency is government agency accredited for calibration /28/</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$FV_{digester,y}$</th></tr>
<tr><td>Data Unit</td><td>Nm^3 in year y</td></tr>
<tr><td>Description</td><td>Volumetric flow rate of biogas on dry basis leaving the digester in year y ($BG_{burnt,y}$)</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per flow meter measurement. However, during the monitoring period recording of total biogas leaving the digester was not adequate and hence PP has considered total biogas utilized in gas engine and flaring for this parameter which is in line with the methodology. Since, emission reduction is claimed based on biogas utilization, this approach is accepted.</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Total value (Nm^3)</th></tr>
<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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is a flow meter and a flow computing located at biogas generation point, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Flow meter</td><td>Flow computing</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Fuji Electric</td></tr>
<tr><td>Model</td><td>DOG-1120</td><td>PXH9A211-5V000</td></tr>
<tr><td>SN</td><td>5843</td><td>8623676T</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td><td>±0.1%</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the flow meters is ±1.5% and of the flow computing ±0.1% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly recorded s. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification from a certified testing agency but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The flow meter was calibrated on 01/03/2011 (with validity until 29/02/2012), on 06/03/2012 (with validity until 05/03/2013), on 12/12/2013 (with validity until 11/12/2014 /29/. Also the flow computing was calibrated on 01/03/2011 (with validity until 29/02/2012), on 06/03/2012 (with validity until 05/03/2013), on 10/12/2013 (with validity until 09/12/2014 /29/.
There has been a delay in calibration from 29/02/2012 to 06/03/2012 and from 05/03/2013 to 12/12/2013 (for the flow meter) and from 29/02/2012 to 06/03/2012 and from 05/03/2013 to 10/12/2013 for the flow computing. However, since monitored values from these equipments are not used and PP has considered</td></tr>
</table>

<table>
<tr><td></td><td>total biogas utilized in gas engine and flaring for this parameter hence calibration delay is neglected. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><td>Meter no.</td><td>Calibration details</td></tr>
<tr><td>5843</td><td>a) PTT Public Company Ltd.: Calibration certificate (GMCL 10/54) for flow meter with serial number 5843 calibrated on 01/03/2011 /29/
b) PTT Public Company Ltd.: Calibration certificate (GMCL 05/55) for flow meter with serial number 5843 calibrated on 06/03/2012 /29/
c) PTT Public Company Ltd.: Calibration certificate (GMCL 23/56) for flow meter with serial number 5843 calibrated on 12/12/2013 /29/</td></tr>
<tr><td>8623676T</td><td>a) Thermology Co. Ltd.: Calibration certificate (11/0385) for flow computing with serial number 8623676T calibrated on 01/03/2011 /29/
b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C014) for flow computing with serial number 8623676T calibrated on 06/03/2012 /29/
c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L018) for flow computing with serial number 8623676T calibrated on 10/12/2013 /29/</td></tr>
</table>
</td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>PTT Public Company Ltd., Thermology Co. Ltd. and Scientific Magic Glow Company Limited has been accredited calibration laboratory for flow measurement in accordance with ISO/IEC17025 by the Thai Industrial Standards Institute (TISI) /25/</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$W_{CH4,y}$</th></tr>
<tr><td>Data Unit</td><td>Fraction (kg CH_4/m^3 biogas)</td></tr>
<tr><td>Description</td><td>Methane content in the biogas in the year y (volume fraction)</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per flow meter measurement</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>The reported value is average of monitoring values at biogas generation and combustion at two generators (ID 11, 20.1 and 20.2).
Upper Value
<table>
<tr><th>Monitoring period</th><th>Average value (%)</th></tr>
<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>
</table>
Lower value
<table>
<tr><th>Monitoring period</th><th>Average value (%)</th></tr>
<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>
</table>
Lower value is used in case of baseline emission calculation and higher value used in case of project emissions calculation.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment used for this parameter is a gas analyser installed at two points (generator and digester); detailed information of the equipment are listed in the following table:
<table>
<tr><td>Gas analyser</td><td>Continuous gas analyser at Generator 1</td><td>Continuous gas analyser at Generator 2</td><td>Portable gas analyser at digester outlet (biogas generation)</td></tr>
<tr><td>Manufacturer</td><td>JE gas sensor</td><td>JE gas sensor</td><td>Geotechnical</td></tr>
<tr><td>Model</td><td>MJE</td><td>MJE</td><td>MJE</td></tr>
<tr><td>SN</td><td>28960 (available upto 20/04/2014)
2160913 (new sensor; replaced on 21/04/2014)</td><td>29193</td><td>BM11818109 (available upto 04/11/2014)
BM502475 (new sensor; replaced on 05/11/2014)</td></tr>
<tr><td>Accuracy</td><td>±2%</td><td>±2%</td><td>±0.5%</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>Registered PDD does not specify accuracy class of gas analyser /03/. The accuracy of continuous gas analyser as per manufacturer specifications /60/, /61/.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored and daily recorded. The measurement of this parameter ensures 90/10 confidence/precision level. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if</td><td>Not applicable</td></tr>
</table>

<table>
<tr><td>applicable)</td><td></td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014.
<table>
<tr><td>Continuous gas analyser at Generator 1</td><td>Continuous gas analyser at Generator 2</td><td>Portable gas analyser at digester outlet (biogas generation)</td></tr>
<tr><td>28960 available upto 20/04/2014)
2160913 (new sensor, replaced on 21/04/2014)</td><td>29193</td><td>BM11818109 (available upto 04/11/2014)
BM502475 (new sensor; replaced on 05/11/2014)</td></tr>
<tr><td>20/05/2012 (valid until 19/05/2013) /30/</td><td>13/03/2012 (valid until 12/03/2013) /31/</td><td>13/03/2012 (valid until 12/03/2013) /32/</td></tr>
<tr><td>21/11/2013 (valid until 20/11/2014) /30/</td><td rowspan="2">21/11/2013 (valid until 20/11/2014) /31/</td><td>21/11/2013 (valid until 20/11/2014) /32/</td></tr>
<tr><td>2160913 (new sensor, replaced on 21/04/2014) calibrated on 17/12/2014 valid until 16/12/2015</td><td>BM502475 (new sensor; replaced on 05/11/2014)</td></tr>
</table>
There has been delay in calibration from start date of monitoring period 18/10/2011 to 20/05/2012 and from 19/05/2013 to 21/11/2013 for the Continuous gas analyser (28960) at Generator 1, from start date of monitoring period 18/10/2011 to 13/03/2012 and from 12/03/2013 to 21/11/2013 (for Continuous gas analyser (29193) at Generator 2), from start date of monitoring period (18/10/2011) to 13/03/2012 and from 12/03/2013 to 21/11/2013 (Continuous gas analyser at digester outlet (biogas generation)).
Since, the reported value is average of monitoring points at biogas generation (ID 11) and combustion at two generators (20.1 and 20.2) the calibration gap has been applied from 18/10/2011 to 20/05/2012 and from 12/03/2013 to 21/11/2013 considering the maximum error of any of the three instruments to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /10/. Further, the new gas analyser (serial no. 2160913) was procured newly as verified from the purchaser order /58/ and installed on 21/04/2014 /59/. Since the latest calibration report is dated 17/12/2014, PP has applied maximum permissible error with the measured value from 21/04/2014 to 31/07/2014 on a conservative side as per paragraph 283 of VVS, version 07 /10/. Hence, the calibration covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records</td></tr>
</table>

<table>
<tr><td></td><td>and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><th>Gas analyser</th><th>Calibration details</th></tr>
<tr><td>28960</td><td>a) JE International Co. Ltd.: Calibration certificate for continuous gas analyser with serial number 28960 calibrated on 20/05/2012 /30/
b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number 28960 calibrated on 21/11/2013 /30/</td></tr>
<tr><td>29193</td><td>a) Entech Associate Co. Ltd.: Calibration certificate (G/O 550188) for continuous gas analyser with serial number 29193 calibrated on 13/03/2012 /31/
b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number 29193 calibrated on 21/11/2013 /31/</td></tr>
<tr><td>BM11818109</td><td>a) Entech Associate Co. Ltd.: Calibration certificate (G/O 550186) for continuous gas analyser with serial number BM11818109 calibrated on 13/03/2012 /32/
b) Instrument Best Expert Limited Partnership: Calibration certificate for continuous gas analyser with serial number BM11818109 calibrated on 21/11/2013 /32/</td></tr>
<tr><td>2160913</td><td>By Entech Associate Co. Ltd. (G/O 570836) calibrated on 17/12/2014</td></tr>
</table>
</td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>Entech Associate Co. Ltd. Is Accredited Laboratories According to ISO/IEC 17025 /25/. Instrument best expert limited partnership is also accredited to carry out calibration as veriifed from the company webpage /33/ and calibration reports /32/</td></tr>
</table>

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<table>
<tr><th>Data/Parameter</th><th>T_{biogas} and P_{biogas}</th></tr>
<tr><td>Data Unit</td><td>^{0}C and bar</td></tr>
<tr><td>Description</td><td>Temperature and pressure of produced biogas</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>Temperature:
<table>
<tr><th>Monitoring period</th><th>At the digester</th><th>At the flaring system</th><th>At the generator 1</th><th>At the generator 2</th></tr>
<tr><td>18/10/2011 – 31/12/2011</td><td>39.13</td><td>0</td><td>44.53</td><td>43.93</td></tr>
<tr><td>01/01/2012 – 31/12/2012</td><td>39.60</td><td>0</td><td>45.22</td><td>46.87</td></tr>
<tr><td>01/01/2013 – 31/12/2013</td><td>38.63</td><td>0</td><td>51.17</td><td>52.38</td></tr>
<tr><td>01/01/2014 – 31/07/2014</td><td>39.75</td><td>0</td><td>55.71</td><td>53.99</td></tr>
</table>
Pressure:
<table>
<tr><th>Monitoring period</th><th>At the digester</th><th>At the flaring system</th><th>At the generator 1</th><th>At the generator 2</th></tr>
<tr><td>18/10/2011 – 31/12/2011</td><td>-2.71</td><td>0</td><td>149.1</td><td>152.4</td></tr>
<tr><td>01/01/2012 – 31/12/2012</td><td>-2.97</td><td>0</td><td>159.8</td><td>166.7</td></tr>
<tr><td>01/01/2013 – 31/12/2013</td><td>-8.72</td><td>0</td><td>153.2</td><td>167.8</td></tr>
<tr><td>01/01/2014 – 31/07/2014</td><td>-7.52</td><td>0</td><td>152.4</td><td>168.3</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>For measuring temperature and pressure of biogas, temperature and pressure sensor is installed at digester, at flaring system and at the generator. Detailed information of the sensors are listed in the following table:
<table>
<tr><td></td><td>at the digester</td><td>at the flaring system</td><td>at the generator 1</td><td>at the generator 2</td></tr>
<tr><td colspan="5">Temperature sensor</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Kobold</td><td>Kobold</td><td>Kobold</td></tr>
<tr><td>Identification</td><td>TWD-B9410213BY</td><td>TWD-B9410213TY</td><td>TWD-B9410213BY</td><td>TWD-B9410213TY</td></tr>
<tr><td>Maximum permissible error</td><td>±0.11%</td><td>+/- 1.36%</td><td>+/- 0.53%</td><td>+/- 0.24%</td></tr>
<tr><td colspan="5">Pressure sensor</td></tr>
<tr><td>Manufacturer</td><td>Honeywell</td><td>Kobold</td><td>Kobold</td><td>Kobold</td></tr>
<tr><td>SN</td><td>1006 8002788000 02</td><td>260 0 422</td><td>260 0 502</td><td>260TZXA</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>Maximum permissible error</td><td>+/- 1.0%</td><td>+/- 1.0 %</td><td>+/- 1.0 %</td><td>+/- 1.0 %</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>Registered PDD does not mention any accuracy for pressure and temperature sensor /03/. The temperature and pressure is measured with the volume of biogas and provides the output in normalized flow (Nm3) by the flow computing. Therefore, values of temperature and pressure is not used directly in the ER calculation.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly recorded and summarized for daily reporting. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/. The temperature and pressure sensors are installed at the biogas delivery piping system and integrated into the flow meters which provides biogas output in normalized flow (Nm^3). Pressure and temperature values are not directly used in ER calculation.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The calibration detail of temperature sensor and pressure sensor is given below:
<table>
<tr><td colspan="4">Temperature Sensor</td></tr>
<tr><td>at the digester (TWD-B9410213BY)</td><td>at the flaring system (TWD-B9410213TY)</td><td>at the generator 1 (TWD-B9410213BY)</td><td>at the generator 2 (TWD-B9410213TY)</td></tr>
<tr><td>01/03/2011 (valid until 29/02/2012) /34/</td><td>01/03/2011(valid until 29/02/2012) /35/</td><td>01/03/2011(valid until 29/02/2012) /36/</td><td>01/03/2011(valid until 29/02/2012) /37/</td></tr>
<tr><td>06/03/2012 (valid until 05/03/2013) /34/</td><td>06/03/2012 (valid until 05/03/2013) /35/</td><td>06/03/2012 (valid until 05/03/2013) /36/</td><td>06/03/2012 (valid until 05/03/2013) /37/</td></tr>
<tr><td>10/12/2013 (valid until 09/12/2014) /34/</td><td>10/12/2013 (valid until 09/12/2014) /35/</td><td>10/12/2013 (valid until 09/12/2014) /36/</td><td>10/12/2013 (valid until 09/12/2014) /37/</td></tr>
</table>
<table>
<tr><td colspan="4">Pressure Sensor</td></tr>
<tr><td>at the digester (1006 800278800002)</td><td>at the flaring system (2600422)</td><td>at the generator 1 (2600502)</td><td>at the generator 2 (260TZXA)</td></tr>
<tr><td>02/03/2011 (valid until 01/03/2012)</td><td>02/03/2011 (valid until 01/03/2012)</td><td>02/03/2011(valid until 01/02/2012) /40/</td><td>02/03/2011(valid until 01/02/2012) /41/</td></tr>
</table>
</td></tr>
</table>

/38/	**/39/**		
07/03/2012 (valid until 06/03/2013) **/38/** 10/12/2013 (valid until 09/12/2014) **/38/**	10/12/2013 (valid until 09/12/2014) **/39/**	10/12/2013 (valid until 09/12/2014) **/40/**	10/12/2013 (valid until 09/12/2014) **/41/**

The pressure and temperature sensor is integrated with the flow computing which is calibrated and also adjusted with permissible error in case of delayed calibration; therefore, the delay calibration of pressure and temperature sensor is considered not relevant to consider. As explained above, these values are not used directly in ER calculation. .

Calibration certificates

Temperature Sensor	Calibration details
TWD-B9410213BY	a) Thermology Co. Ltd.: Calibration certificate (11/0381) for temperature sensor TWD-B9410213BY calibrated on 01/03/2011 **/34/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C047) for temperature sensor TWD-B9410213BY calibrated on 06/03/2012 **/34/** c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-B008) for temperature sensor TWD-B9410213BY calibrated on 10/12/2013 **/34/**
TWD-B9410213TY	a) Thermology Co. Ltd.: Calibration certificate (11/0384) for temperature sensor TWD-B9410213TY calibrated on 01/03/2011 **/35/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C035) for temperature sensor TWD-B9410213TY calibrated on 06/03/2012 **/35/** c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L011) for temperature sensor TWD-B9410213TY calibrated on 10/12/2013 **/35/**
TWD-B9410213BY	a) Thermology Co. Ltd.: Calibration certificate (11/0382) for temperature sensor TWD-B9410213BY calibrated on 01/03/2011 **/36/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C045) for temperature sensor TWD-B9410213BY calibrated on 06/03/2012 **/36/** c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L010) for temperature sensor TWD-B9410213BY calibrated on 10/12/2013 **/36/**
TWD-B9410213TY	a) Thermology Co. Ltd.: Calibration certificate (11/0383) for temperature sensor TWD-

	B9410213TY calibrated on 01/03/2011 **/37/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C046) for temperature sensor TWD-B9410213TY calibrated on 06/03/2012 **/37/** c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L009) for temperature sensor TWD-B9410213TY calibrated on 10/12/2013 **/37/**

Pressure Sensor	Calibration details
1006 800278800002	a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030121) for pressure sensor with serial no. 1006 800278800002 calibrated on 02/03/2011 **/38/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C034) for pressure sensor with serial no. 1006 800278800002 calibrated on 07/03/2012 **/38/** c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L012) for pressure sensor with serial no. 1006 800278800002 calibrated on 10/12/2013 **/38/**
2600422	a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030122) for pressure sensor with serial no. 2600422 calibrated on 02/03/2011 **/39/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-13-L013) for pressure sensor with serial no. 2600422 calibrated on 10/12/2013 **/39/**
2600502	a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030124) for pressure sensor with serial no. 2600502 calibrated on 02/03/2011 **/40/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L015) for pressure sensor with serial no. 2600502 calibrated on 10/12/2013 **/40/**
260TZXA	a) PVN Testing and calibration standard laboratory: Calibration certificate (CP11030123) for pressure sensor with serial no. 260TZXA calibrated on 02/03/2011 **/41/** b) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L014) for pressure sensor with serial no. 260TZXA calibrated on 10/12/2013 **/41/**

Does the calibration of	Thermology Co. Ltd., Science Magic Grow Company and PVN Testing

metershave be done by an accredited person or institution?	and calibration standard laboratory are accredited Laboratories According to ISO/IEC 17025 /**25**/.

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<table>
<tr><th>Data/Parameter</th><th>$FV_{RG,h}$</th></tr>
<tr><td>Data Unit</td><td>m^3/hr (Converted and reported in Nm^3/year)</td></tr>
<tr><td>Description</td><td>Volumetric flow rate of the biogas to the flare in dry basis at normal condition in hour h ($BG_{flare,y}$)</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per flow meter measurement</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Total value (Nm^3)</th></tr>
<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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is a flow meter and a flow computing located at the flaring point, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Flow meter</td><td>Flow computing</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Fuji Electric</td></tr>
<tr><td>Model</td><td>DOG-1120</td><td>PXH9A211-5V000</td></tr>
<tr><td>SN</td><td>5594</td><td>9422144T</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td><td>±0.1%</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the flow meters is ±1.5% and of the flow computing ±0.1% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly recorded and summarized daily. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification from a certified testing agency but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
<table>
<tr><td>Flow Meter
(5594)</td><td>Flow Computing
(9422144T)</td></tr>
<tr><td>01/03/2011 (valid until 29/02/2012) /42/</td><td>01/03/2011(valid until 29/02/2012) /43/</td></tr>
<tr><td>06/03/2012 (valid until 05/03/2013) /42/</td><td>06/03/2012 (valid until 05/03/2013) /43/</td></tr>
<tr><td>12/12/2013 (valid until 11/12/2014) /42/</td><td>10/12/2013 (valid until 09/12/2014) /43/</td></tr>
</table>
There has been delay in calibration and to cover that PP has applied error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /10/. However, there was no flaring during the monitoring period and PP has taken zero value for this parameter. The calibration frequency</td></tr>
</table>

<table>
<tr><td></td><td>of the meter has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><th>Meter no.</th><th>Calibration details</th></tr>
<tr><td>5594</td><td>a) PTT Public Company Limited: Calibration certificate (GM-07/54) for flow meter with serial no. 5594 calibrated on 01/03/2011 /42/
b) PTT Public Company Limited: Calibration certificate (GMCL 07/55) for flow meter with serial no. 5594 calibrated on 06/03/2012 /42/
c) PTT Public Company Limited: Calibration certificate (GMCL 20/56) for flow meter with serial no. 5594 calibrated on 12/12/2013 /42/</td></tr>
<tr><td>9422144T</td><td>a) Thermology Co., Ltd.: Calibration certificate (11/0386) for flow meter with serial no. 9422144T calibrated on 01/03/2011/43/
b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C020) for flow meter with serial no. 9422144T calibrated on 06/03/2012 /43/
c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L016) for flow meter with serial no. 9422144T calibrated on 10/12/2013 /43/</td></tr>
</table>
</td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>PTT Public Company Ltd., Thermology Co. Ltd. and Science Magic Grow Company Limited has been accredited calibration laboratory for flow measurement in accordance with ISO/IEC17025 by the Thai Industrial Standards Institute (TISI) /25/</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$fv_{CH4,RG,h}$</th></tr>
<tr><td>Data Unit</td><td>Fraction (volumetric basis)</td></tr>
<tr><td>Description</td><td>Volumetric fraction of component i in the residual gas in the hour h where i=CH_4 and N_2 of the residual gas in dry basis at normal conditions in the hour h</td></tr>
<tr><td>Source of data to be used</td><td>Plant record as per flow meter measurement</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>During the monitoring period, although the monitoring equipment was in place, PP was unable to produce data for this parameter. However, PP has taken upper value of methane fraction as recorded at the generator inlet which is the closest location (in absence of the monitoring device closest to flaring flow meter to comply the requirement of the applied methodology /11/. Further, PP has taken flare efficiency as 0% on a conservative approach since flare efficiency was not monitored. Therefore, this is considered conservative to estimate project emission from flaring and as per Appendix 1 of project standard version 07, prior approval from Board is not required /09/. Values used in emission reduction calculation as recorded at the generator inlet is given below although no flaring was recorded during the monitoring period:
Upper value
<table>
<tr><th>Monitoring period</th><th>Average value (%)</th></tr>
<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>
</table>
Lower value
<table>
<tr><th>Monitoring period</th><th>Average value (%)</th></tr>
<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>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment used for this parameter is a continuous gas analyser, detailed information are listed in the following table:
<table>
<tr><td>Equipment</td><td>Continuous gas analyser</td></tr>
<tr><td>Manufacturer</td><td>JE gas sensor</td></tr>
<tr><td>Model</td><td>MJE</td></tr>
<tr><td>SN</td><td>28958</td></tr>
<tr><td>Maximum permissible error</td><td>±0.1845%</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>No accuracy class was defined in the registered monitoring plan /03/. The permissible error (±0.1845%) of the continuous gas analyser as per latest calibration report /44/.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly measured and daily recorded. The measurement of this parameter ensures 90/10 confidence/precision level. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
</table>

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<table>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer's specification but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The continuous gas anasyer was calibrated on 20/05/2012 (with validity until 19/05/2013), on 10/04/2013 (with validity until 09/04/2014) /44/.
There has been calibration gap from 18/10/2011 to 20/05/2012 and from 09/04/2014 to 31/07/2014. However, there is no flaring during the monitoring period and hence there is no impact in ER estimation due to this delay. Hence, the delay is accepted.
The calibration frequency of the meter has been checked with calibrations records /44/.</td></tr>
<tr><td>Calibration certificates</td><td><table><tr><td>Gas analyser</td><td>Calibration details</td></tr><tr><td>28958</td><td>a) JE International Co. Ltd.: Calibration certificate (2012/20-5) for analyser with serial number 28958 calibrated on 20/05/2012 /44/
b) JE International Co. Ltd.: Calibration certificate (2013/01-1) for analyser with serial number 28958 calibrated on 10/04/2013 /44/</td></tr></table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>JE International Co. Ltd. is the supplier of the instrument and hence cridible to calibrate the analyser /44/.</td></tr>
</table>

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<table>
<tr><th>Data/Parameter</th><th>T_{flare}</th></tr>
<tr><td>Data Unit</td><td>^0C</td></tr>
<tr><td>Description</td><td>Temperature of methane flare used for flame detection</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>During the monitoring period data recording was not found consistent. Hence, PP has considered zero value for the monitoring period. This value is relevant for flare efficiency and since PP has assumed zero efficiency for flare hence it is conservative.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment used for this parameter is a thermocouple, detailed information are listed in the following table:
<table>
<tr><td colspan="2">Thermocouple</td></tr>
<tr><td>Manufacturer</td><td>WRW</td></tr>
<tr><td>Model</td><td>Type N</td></tr>
<tr><td>SN</td><td>25507001/02</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>No accuracy class was defined in the registered monitoring plan /03/. The temperature range tested between 500-800 ^0C. Further, zero value has been considered for this parameter during the monitoring period. Hence, there is no impact on the ER calculation.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>As per PDD, the parameter is continuously monitored and data will be logged digitally and stored (1 min aggregated average value) in an easily accessible and transparent format. However, during the monitoring period no recording was done. Therefore, PP has taken zero value for this parameter and accordingly considered zero flare efficiency. This is conservative approach to consider zero flare efficiency.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification but at least once per year /03/. During this monitoring period it has been delayed from the annual calibration plan. However, since PP has taken zero value for this parameter and accordingly considered zero flare efficiency. This is conservative approach and hence calibration delay accepted.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. The thermocouple was calibrated on 30/07/2012 (with validity until 29/07/2013).
There has been gap from 18/10/2011 to 30/07/2012 and from 29/07/2013 to 31/07/2014 for calibration. However, since PP has considered zero value for this parameter this gas is considered irrelevant.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><td>Thermocouple</td><td>Calibration details</td></tr>
<tr><td>25507001/02</td><td>By WR&W Calibration Laboratory Co. Ltd. dated 30/07/2012</td></tr>
</table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>The manufacturer’s calibration laboratory WR&W Calibration Laboratory Co., Ltd. has performed the calibration /45/.</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$T_{flare\ operation}$</th></tr>
<tr><td>Data Unit</td><td>hours</td></tr>
<tr><td>Description</td><td>Operation time of the flare per year y</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>During the monitoring period data recording was not found consistent. Hence, PP has considered zero value for the monitoring period. This value is relevant for flare efficiency and since PP has assumed zero efficiency for flare hence it is conservative.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is a flow meter and a flow computing located at the flaring point, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Flow meter</td><td>Flow computing</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Fuji Electric</td></tr>
<tr><td>Model</td><td>DOG-1120</td><td>PXH9A211-5V000</td></tr>
<tr><td>SN</td><td>5594</td><td>9422144T</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td><td>±0.1%</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the flow meters is ±1.5% and of the flow computing ±0.1% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>As per PDD, the parameter is continuously monitored. However, during the monitoring period no recording was done. Therefore, PP has taken zero value for this parameter and accordingly considered zero flare efficiency. This is conservative approach to consider zero flare efficiency.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
<table>
<tr><td>Flow Meter
(5594)</td><td>Flow Computing
(9422144T)</td></tr>
<tr><td>01/03/2011 (valid until 29/02/2012) /42/</td><td>01/03/2011(valid until 29/02/2012) /43/</td></tr>
<tr><td>06/03/2012 (valid until 05/03/2013) /42/</td><td>06/03/2012 (valid until 05/03/2013) /43/</td></tr>
<tr><td>12/12/2013 (valid until 11/12/2014) /42/</td><td>10/12/2013 (valid until 09/12/2014) /43/</td></tr>
</table>
There has been delay in calibration and to cover that PP has applied error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /10/. However, there was no flaring during the monitoring period and PP has taken zero value for this parameter. The calibration frequency of the meter has been checked with calibrations records and found</td></tr>
</table>

<table>
<tr><td></td><td>that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><th>Meter no.</th><th>Calibration details</th></tr>
<tr><td>5594</td><td>a) PTT Public Company Limited: Calibration certificate (GM-07/54) for flow meter with serial no. 5594 calibrated on 01/03/2011 /42/
b) PTT Public Company Limited: Calibration certificate (GMCL 07/55) for flow meter with serial no. 5594 calibrated on 06/03/2012 /42/
c) PTT Public Company Limited: Calibration certificate (GMCL 20/56) for flow meter with serial no. 5594 calibrated on 12/12/2013 /42/</td></tr>
<tr><td>9422144T</td><td>a) Thermology Co., Ltd.: Calibration certificate (11/0386) for flow meter with serial no. 9422144T calibrated on 01/03/2011/43/
b) Science Magic Grow Co. Ltd.: Calibration certificate (SMG-12-C020) for flow meter with serial no. 9422144T calibrated on 06/03/2012 /43/
c) Science Magic Grow Co. Ltd.: Calibration certificate (SMN-13-L016) for flow meter with serial no. 9422144T calibrated on 10/12/2013 /43/</td></tr>
</table>
</td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>PTT Public Company Ltd., Thermology Co. Ltd. and Science Magic Grow Company Limited has been accredited calibration laboratory for flow measurement in accordance with ISO/IEC17025 by the Thai Industrial Standards Institute (TISI) /25/</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$FV_{electricity,y}$</th></tr>
<tr><td>Data Unit</td><td>Nm^3/year</td></tr>
<tr><td>Description</td><td>Volumetric flow rate of biogas on dry basis entering for power generation ($BG_{electricity,y}$)</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Total value (Nm^3)</th></tr>
<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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is a flow meter and a flow computing located at the generator point, detailed information of the meter are listed in the following table:
Generator 1
<table>
<tr><td>Meter</td><td>Flow meter</td><td>Flow computing</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Fuji Electric</td></tr>
<tr><td>Model</td><td>DOG-1120</td><td>PXH9A211-5V000</td></tr>
<tr><td>SN</td><td>5592</td><td>8623677T</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td><td>±0.1%</td></tr>
</table>
Generator 2
<table>
<tr><td>Meter</td><td>Flow meter</td><td>Flow computing</td></tr>
<tr><td>Manufacturer</td><td>Kobold</td><td>Fuji Electric</td></tr>
<tr><td>Model</td><td>DOG-1120</td><td>PXH9A211-5V000</td></tr>
<tr><td>SN</td><td>5593</td><td>8623675T</td></tr>
<tr><td>Accuracy</td><td>±1.5%</td><td>±0.1%</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the flow meters is ±1.5% and of the flow computing ±0.1% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored, hourly measured and daily recorded. This is in accordance with the methodology AMS-III.H version15 /11/ and the registered PDD /03/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is as per manufacturer’s specification but at least once per year /03/. During this monitoring period PP has followed annual calibration which complies to the registered monitoring plan.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
Generator 1
<table>
<tr><td>Flow Meter
(5592)</td><td>Flow Computing
(8623677T)</td></tr>
<tr><td>01/03/2011 (valid until 29/02/2012) /46/</td><td>01/03/2011(valid until 29/02/2012) /47/</td></tr>
<tr><td>06/03/2012 (valid until</td><td>06/03/2012 (valid until</td></tr>
</table>
</td></tr>
</table>

	05/03/2013) **/46/** | 05/03/2013) **/47/** 12/12/2013 (valid until 11/12/2014) **/46/** | 10/12/2013 (valid until 09/12/2014) **/47/** There has been delay in calibration from 29/02/2012 to 06/03/2012 and from 05/03/2013 to 12/12/2013 (for the flow meter) and from 29/02/2012 to 06/03/2012 and 05/03/2013 to 10/12/2013 for the flow computing, and to cover that PP has applied error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /**10**/. Hence, the calibration of flow meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected. Generator 2 Flow Meter (5593) | Flow Computing (8623675T) 01/03/2011 (valid until 29/02/2012) **/48/** | 01/03/2011(valid until 29/02/2012) **/49/** 06/03/2012 (valid until 05/03/2013) **/48/** | 06/03/2012 (valid until 05/03/2013) **/49/** 12/12/2013 (valid until 11/12/2014) **/48/** | 10/12/2013 (valid until 09/12/2014) **/49/** There has been delay in calibration from 29/02/2012 to 06/03/2012 and from 05/03/2013 to 12/12/2013 (for the flow meter) and from 29/02/2012 to 06/03/2012 and 05/03/2013 to 10/12/2013 for the flow computing, and to cover that PP has applied error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /**10**/. Hence, the calibration of flow meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.
Calibration certificates	Meter no. | Calibration details 5592 | PTT Public Company Limited: Calibration certificates, calibrated on 01/03/2011, on 06/03/2012 and on 12/12/2013 /**46/** 8623677T | a) Thermology Co., Ltd.: Calibration certificate, calibrated on 01/03/2011 **/47/** b) Science Magic Grow Co. Ltd.: Calibration certificate, calibrated on 06/03/2012 and on 10/12/2013 **/47/** 5593 | PTT Public Company Limited: Calibration certificates, calibrated on 01/03/2011, on 06/03/2012 and on 12/12/2013 /**48/** 8623675T | a) Thermology Co., Ltd.: Calibration certificate, calibrated on 01/03/2011 **/49/** b) Science Magic Grow Co. Ltd.: Calibration certificate, calibrated on 06/03/2012 and on 10/12/2013 **/49/**

Does the calibration of metershave be done by an accredited person or institution?	PTT Public Company Ltd., Thermology Co. Ltd. and Science Magic Grow Company Limited has been accredited calibration laboratory for flow measurement in accordance with ISO/IEC17025 by the Thai Industrial Standards Institute (TISI) /**25**/

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<table>
<tr><th>Data/Parameter</th><th>$EG_{total,y}$</th></tr>
<tr><td>Data Unit</td><td>MWh/year</td></tr>
<tr><td>Description</td><td>Total annual electricity generated from the project in year y</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>
<table>
<tr><th>Monitoring period</th><th>Total value (MWh)</th></tr>
<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>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is energy meter located at the biogas power generation points, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Energy meter (generator 1)</td><td>Energy meter (Generator 2)</td></tr>
<tr><td>Manufacturer</td><td>Carlo Gavazzi</td><td>Carlo Gavazzi</td></tr>
<tr><td>Model</td><td>WM3-96</td><td>WM3-96</td></tr>
<tr><td>SN</td><td>BI1290012101P</td><td>BI0980037101I</td></tr>
<tr><td>Accuracy</td><td>+/- 0.20%</td><td>+/- 0.20%</td></tr>
</table>
</td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the energy meter is ±0.2% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored and recorded daily. This is in line with the registered PDD and applied methodology /03/, /11/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is not defined /03/. During this monitoring period PP has followed annual calibration.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
<table>
<tr><td>Energy Meter (BI1290012101P)</td><td>Energy Meter (BI0980037101I)</td></tr>
<tr><td>24/12/2014 (valid until 23/12/2015) /50/</td><td>24/12/2014 (valid until 23/12/2015) /50/</td></tr>
</table>
There has been delay in calibration from 18/10/2011 to 24/12/2014. However, this parameter is not directly used for emission reduction estimation. PP monitors electricity exported and consumed internally in separate calibrated energy meter and hence this parameter is only for reference purpose and not used for emission reduction calculation. Hence, calibration delay is accepted.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><td>Meter no.</td><td>Calibration details</td></tr>
<tr><td>BI1290012101P</td><td>By Measurement Industrial Group Co. Ltd., Industrial calibration laboratory dated 24/12/2014 /50/</td></tr>
</table>
</td></tr>
</table>

	BI0980037101I	By Measurement Industrial Group Co. Ltd., Industrial calibration laboratory dated 24/12/2014 **/50/**
Does the calibration of metershave be done by an accredited person or institution?	Measurement Industrial Group Co. Ltd., Industrial calibration laboratory is accredited laboratory for calibration /**50**/.	

<table>
<tr><th>Data/Parameter</th><th>$EG_{y,consumed}$</th></tr>
<tr><td>Data Unit</td><td>MWh/year</td></tr>
<tr><td>Description</td><td>Annual electricity to operate the facilities or power auxiliary equipment</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>Internal Consumption
<table>
<tr><th>Monitoring period</th><th>Total value (MWh)</th></tr>
<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>
</table>
Grid consumption
<table>
<tr><th>Monitoring period</th><th>Total value (MWh)</th></tr>
<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>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is an energy meter located for grid electricity consumption at the project and auxiliary electricity consumption from project electricity generation, detailed information of the meter are listed in the following table:
<table>
<tr><td>Meter</td><td>Energy meter (Internal consumption)</td><td>Energy Meter (grid electricity consumption)</td></tr>
<tr><td>Manufacturer</td><td>Merlin Gerin</td><td>Merlin Gerin</td></tr>
<tr><td>Model</td><td>PM210</td><td>PM210</td></tr>
<tr><td>SN</td><td>0058033222</td><td>0058010741</td></tr>
<tr><td>Accuracy</td><td>+/- 1%</td><td>+/- 1%</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the energy meter is +/- 1% and in compliance with the registered PDD /03/</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored and recorded daily. This is in line with the registered PDD and applied methodology /03/, /11/.</td></tr>
<tr><td>Calcualtion method (if applicable)</td><td>Not applicable</td></tr>
<tr><th colspan="2">Calibration</th></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is not defined /03/. During this monitoring period PP has followed annual calibration which is in line with UNFCCC guideline.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
<table>
<tr><td>Energy Meter (0058033222)</td><td>Energy Meter (0058010741)</td></tr>
<tr><td>24/12/2014 (valid until 23/12/2015) /51/</td><td>27/11/2014 (valid until 26/11/2015) /51/</td></tr>
</table>
There has been a delay in calibration from 18/10/2011 to 24/12/2014 for energy meter (0058033222)-internal consumption</td></tr>
</table>

<table>
<tr><td></td><td>and from 18/10/2011 to 27/11/2014 for energy meter (0058010741)-grid consumption. To cover the delay, PP has applied maximum error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration as per paragraph 283 of VVS, version 07 /10/. Hence, the calibration of energy meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.</td></tr>
<tr><td>Calibration certificates</td><td><table>
<tr><td>Meter no.</td><td>Calibration details</td></tr>
<tr><td>0058033222</td><td>By Measurement Industrial Group Co. Ltd., Industrial calibration laboratory dated 24/12/2014 valid until 23/12/2015 /51/</td></tr>
<tr><td>0058010741</td><td>By Measurement Industrial Group Co. Ltd., Industrial calibration laboratory dated 27/11/2014 valid until 26/11/2015 /51/</td></tr>
</table></td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>Measurement Industrial Group Co. Ltd., Industrial calibration laboratory is accredited laboratory for calibration /51/.</td></tr>
</table>

<table>
<tr><th>Data/Parameter</th><th>$EG_{exported,y}$</th></tr>
<tr><td>Data Unit</td><td>MWh/year</td></tr>
<tr><td>Description</td><td>Amount of electricity to substitute grid electricity by the project in year y</td></tr>
<tr><td>Source of data to be used</td><td>Plant record</td></tr>
<tr><td>Value of monitored parameter for the monitoring period</td><td>Export to Grid
<table>
<tr><th>Monitoring period</th><th>Total value (MWh)</th></tr>
<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>
</table>
Supply to palm oil mill
<table>
<tr><th>Monitoring period</th><th>Total value (Mwh)</th></tr>
<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>
</table>
Although the export to mill electricity from project was monitored during the monitoring period, PP is not claiming any emission reduction for the quantity of export to the mill PP on a conservative side as explained in section 3.2 of this report. Therefore, the monitored value is presented as zero.
For the export to grid quantity PP has taken the values as per PEA monthly report since the energy meter is not under the control of PP. PEA issue monthly reading report for the export to grid electricity quantity from the biogas plant and the same value is used in the ER estimation /52/. However, for the month of October 2011 the PEA record provided entire month reading whereas the monitoring starts from 18/10/2011, PP has taken a conservative approach to estimate electricity export to grid for the period 18/10/2011 to 31/10/2011 considering minimum of either monitored data or PEA monthly readings in the ER sheet. This is conservative approach and hence accepted.</td></tr>
<tr><td>Monitoring equipment</td><td>The monitoring equipment is an energy meter, detailed information of the meters are listed in the following table:
<table>
<tr><td>Meter</td><td>Energy meter (supply to mill)</td><td>Energy Meter (supply to grid)</td></tr>
<tr><td>Manufacturer</td><td>Schneider</td><td>EDMI</td></tr>
<tr><td>Model</td><td>PM710</td><td>Mk6</td></tr>
<tr><td>SN</td><td>4A943A98</td><td>206500126</td></tr>
<tr><td>Accuracy</td><td>+/- 1%</td><td>+/- 0.5%</td></tr>
</table></td></tr>
<tr><td>Accuracy of the monitoring equipment</td><td>The accuracy of the energy meter is +/- 1% and in compliance with the registered PDD /03/. Export to grid meter is under PEA control and hence accuracy of the meter is as per PEA requirements.</td></tr>
<tr><td>Measuring/Reading/Recording frequency</td><td>The parameter is continuously monitored and recorded daily. This is in line with the registered PDD and applied methodology /03/, /11/.</td></tr>
<tr><td>Calcualtion method (if</td><td>Not applicable</td></tr>
</table>

<table>
<tr><td>applicable)</td><td></td></tr>
<tr><td colspan="2">Calibration</td></tr>
<tr><td>Calibration frequency/interval
Is the calibration interval in line with the monitoring plan of the PDD?</td><td>As per registered PDD, calibration frequency is not defined /03/. The PEA meter (export to grid) is under the control of PEA and hence calibration is under the control of PEA. The monitored value is as per monthly PEA report based on which PP raises invoice /52/, /53/.
The calibration of the energy meter used to montor export to mill is under PP’s control; however calibration frequency was not maintained during the monitoring period. Since, PP is not claiming emission reduction for the export to mill component, the calibration gap is accepted.</td></tr>
<tr><td>Does the calibration cover the monitoring period?
Has the calibration frequency been respected?</td><td>The monitoring period is from 18/10/2011 to 31/07/2014. Calibration details are given below:
<table>
<tr><td>Energy Meter (4A943A98)</td><td>Energy Meter (206500126)</td></tr>
<tr><td>Not calibrated during the monitoring period. Since PP is not claiming any emission reduction for this component, hence calibration gap is accepted.</td><td>22/05/2014; validity as per PEA requirement /54/.</td></tr>
</table>
Energy Meter (4A943A98) was not calibrated during the monitoring period; however since the electricity component monitored through that meter is not used for emission reduction calculation, the gap is accepted.
The energy meter (206500126) which records export to grid is not under the control of PP and strictly under the control of PEA, therefore, values are taken as per monthly meter reading reports from PEA /52/ and cross checked from monthly invoices /53/.</td></tr>
<tr><td>Calibration certificates</td><td>
<table>
<tr><td>Meter no.</td><td>Calibration details</td></tr>
<tr><td>4A943A98</td><td>Not calibrated.</td></tr>
<tr><td>206500126</td><td>By PEA on 22/05/2014 and valid until PEA requirement /54/</td></tr>
</table>
</td></tr>
<tr><td>Does the calibration of metershave be done by an accredited person or institution?</td><td>PEA is the Thai electricity authority /54/.</td></tr>
</table>

Data/Parameter	D_{CH4}
Data Unit	Tonnes/m^3
Description	Density of methane at the temperature and pressure of the biogas in the year y
Source of data to be used	As per PDD, it is calculated considering monitored temperature and pressure of biogas. However, as per the methodology, if the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Since, PP has installed flow computing which provides outputs the normalised flow of biogas, calculation of density of methane not required /**11**/. PP has taken default value as per 'Tool to determine project emissions from flaring gases containing methane' /**13/**.
Value of monitored parameter for the monitoring period	0.716
Monitoring equipment	Not applicable
Accuracy of the monitoring equipment	Not applicable
Measuring/Reading/Recording frequency	Default value as per 'Tool to determine project emissions from flaring gases containing methane' /**13/**
Calcualtion method (if applicable)	Not applicable
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PDD?	Not applicable
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	Not applicable
Calibration certificates	Not applicable
Does the calibration of metershave be done by an accredited person or institution?	Not applicable

Data/Parameter	FE
Data Unit	%
Description	Flare efficiency in year y
Source of data to be used	Default value as per “Tool to determine project emissions from flaring gases containing methane” /**13**/
Value of monitored parameter for the monitoring period	0% (the temperature in the exhaust gas of the flare was not monitored properly during the monitoring period and hence, PP has considered 0% flare efficiency; This is conservative approach and hence accepted)
Monitoring equipment	Not applicable
Accuracy of the monitoring equipment	Not applicable
Measuring/Reading/Recording frequency	Not applicable
Calcualtion method (if applicable)	Not applicable
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PDD?	Not applicable
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	Not applicable
Calibration certificates	Not applicable
Does the calibration of metershave be done by an accredited person or institution?	Not applicable

3.5.3 Assessment of data and calculation of emission reductions

Availability of the data:

The data for all the monitoring parameters have been correctly measured, recorded according to the applied monitoring methodology AMS-III.H version 15 /**11**/, AMS-I.D version 16 /**12**/ and the registered PDD /**03**/. However, for the parameter 'volume of wastewater discharged in year y' (Qww,discharge,y (outlet)). PP could not produce evidence of this monitoring as per registered PDD; however, in line with Appendix 1 of project standard version 07, PP has considered this under temporary deviation and accordingly considered volume of wastewater treated in year y entering the cooling pond and entering the digester (Qww,y) for the entire monitoring period to account project emission. Since, volume of wastewater entering digester (Qww,y) is higher compared to volume of discharged wastewater after treatment (Qww,discharge,y (outlet)), consideration of Qww,y under this parameter accounts higher project emission and hence conservative. All other data were made available for this monitoring period.

Cross-check reported data:

As stated in the section 3.5, the emission reductions ERy by the project activity during the monitoring period is the lower value of the following:

$ER_{y,ex\ post} = \min((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - LE_{y,ex\ post}))$

Baseline emission ($BE_{y,ex\ post}$) for AMS III.H:

The baseline emissions using ex-post monitored value involve only the component of baseline emissions of the wastewater treatment system as described in the PDD /**03**/ and is calculated as:

$BE_{y,ex\ post} = BE_{CH4,y} = BE_{ww,treatment,y} + BE_{ww,discharge,y}$

Where,

$BE_{ww,treatment,y} = \Sigma Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment,BL,i} * B_{o,ww} * UF_{BL} * GWP_{CH4}$

Flow of wastewater treated in the year y ($Q_{ww,y}$): The reported value during the monitoring period is 285,622 m^3. RINA has verified the values in the monitoring report /**01**/ against the daily recording of volume of the wastewater treated digesters/**16**/, which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/. Daily wastewater flow to digester is recorded in log books as per readings in flow meter totalizer (difference of previous days reading and the reporting day) /**16**/. When the mill does not operate the reported value is kept as zero and the emission reduction worksheet represents the same /**02**/. Hence, RINA was able to determine that all data applied in the emission reduction calculation spread sheet /**02/** and monitoring report /**01**/ were correct and from the original data.

$COD_{removed,y}$: In line with the methodology and registered PDD, $COD_{removed,y}$ for anaerobic deep lagoon is estimated considering *ex-post* monitored value of $COD_{ww,untreated,y}$ and COD removal efficiency of 85.7% determined *ex-ante* considering COD campaign data and 0.89 uncertainty range and for poorly managed aerobic lagoon considering 19.80% baseline removal efficiency and 0.89 uncertainty range. This is as per registered PDD and applied methodology /**02**/,**/03/,/11**/. $COD_{ww,untreated,y}$ is analyzed daily (closed reflux Tirtrimetric method) in in-house laboratory from sample of wastewater entering digesters and average weekly value is reported in ER sheet. Further, external laboratory analysis was done on monthly basis and conservative value is applied in ER calculation /**02**/. This is in line with the registered PDD. RINA has verified the values in the monitoring report /**01**/ against the Original test reports of the $COD_{ww,untreated,y,}$ /**17**/ which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/.

Methane correction factor for baseline wastewater treatment system i ($MCF_{ww,treatment,BL,i}$) has been fixed ex-ante as 0.8 for anaerobic deep lagoon and 0.3 for aerobic poor managed lagoon**/03/**. Methane producing capacity of the wastewater ($B_{o,ww}$) has been fixed ex-ante as 0.25 kg CH4/kg COD /**03**/. Model correction factor to account for model uncertainties (UF_{BL}) is fixed ex-ante to be 0.89 /**03**/.

Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC /**03**/, **/15/**.

Therefore, $BE_{ww,treatment,y}$ for the monitoring period is 69,500.74 tCO_{2e}.

Similarly, $BE_{ww,discharge,y}$ is calculated as follows:

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

During the monitoring period the monitored data for volume of wastewater discharged ($Q_{ww,discharged,y,(outlet)}$) was not available and therefore in line with appendix 1 of project standard PP has considered this value as zero and hence, $BE_{ww,discharge,y}$ for the monitoring period is reported zero on conservative side.

In summary, $BE_{y,ex\ post}$ for the monitoring period is 69,500.74 $tCO_{2e.}$

Baseline emissions for the electricity displaced by the project activity ($BE_{power,y}$) are calculated based on AMS-I.D version 16 /**12/**, /03/ as follows:

$BE_{power,y} = EG_{BL,y} * EF_{CO2,\ grid,y}$

$EG_{BL,y}$ is the net electricity generated from the biogas collected in the anaerobic treatment facility and sent to the grid is monitored using an energy meter under the control of PEA and monthly report is generated by PEA as per readings. The values in the ER sheet is taken against the monthly PEA reports /**52**/. However, for the month of October 2011, PEA report covers entire month export data whereas, the monitoring period starts from 18/10/2011 and therefore PP has taken a conservative approach to estimate export for the period 18/10/2011 to 31/10/2011 considering minimum of either monitored data or PEA monthly readings in the ER sheet. This is conservative approach and hence accepted /**02**/. RINA checked the reported values against the PEA monthly reports /**52**/, cross checked against the monthly invoices raised /**53/** and confirm the values to be correct. The EG_y for the current monitoring period is 11,237 MWh. Grid emission factor (EF_{CO2}) is fixed ex-ante to be 0.52 tCO_2/MWh as per registered PDD /**03**/. Therefore, $BE_{power,y}$ for the current monitoring period is 5,843 tCO_{2e} /**02**/.

The calculation of $BE_{y,ex\text{-}post}$ and $BE_{power,y}$ is reflected in the monitoring report /01/, and CER spreadsheet /02/.

Project Emissions:

As explained in above section 3.5, project emissions are calculated as:

$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{ww,discharge,y} + PE_{fugitive,y} + PE_{flaring,y}$

Emissions from electricity or fossil fuel consumption in the year y ($PE_{power,y}$) is calculated as follows:

$PE_{power,y}=\Sigma EC_{PJ,y} * FE_{EL,y}$

Electricity consumed by biogas system from grid ($EC_{PJ,y}$) is monitored to be 108 MWh during the monitoring period as per daily energy meter readings /**56**/,/**02**/,/**03/**. Electricity consumption from biogas plant is neglected since this is from the project itself and hence do not result to project emissions. Therefore considering $FE_{EL,y}/EF_{CO2}$ 0.52 tCO_{2e}/MWh (Fixed *ex-ante*), $PE_{power,y}$ is estimated to be 56 tCO_{2e} for the current monitoring period.

Emissions in wastewater not equipped with biogas recovery system and are calculated as per AMS-III.H and as follows:

$$PE_{ww,treatment,y} = \sum Q_{ww,k,y} \times COD_{removed,PJ,ky} \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ} \times GWP_{CH4}$$

Flow of wastewater treated in the year y ($Q_{ww,y}$): The reported value during the monitoring period is 285,622 m^3. RINA has verified the values in the monitoring report /**01**/ against the daily recording of volume of the wastewater treated digesters/**16**/, which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/. Daily wastewater flow to digester is recorded in log books as per readings in flow meter totalizer (difference of previous days reading and the reporting day) /**16**/. When the mill does not operate the reported value is kept as zero and the emission reduction worksheet represents the same /**02**/. Hence, RINA

was able to determine that all data applied in the emission reduction calculation spread sheet /**02/** and monitoring report /**01**/ were correct and from the original data.

$COD_{removed,PJ,k,y}$: In line with the methodology $COD_{removed,PJ,k,y}$ is calculated as difference between COD_{in} and COD_{out}. COD_{in} before cooling pond, COD_{out} after cooling pond, COD_{in} after the reactors and before post treatment ponds and COD_{out} after post treatment ponds are analyzed daily (closed reflux Tirtrimetric method) from sample of wastewaters and average weekly value is reported in ER sheet. RINA has verified the values in the monitoring report /**01**/ against the Original test reports /**17**/ which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/. Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC **/03/, /15/**. Methane producing capacity of the wastewater ($B_{o,ww}$) is fixed ex-ante to be 0.25 kg CH_4/kg COD as per IPCC **/03/**. Model correction for uncertainties (UF_{PJ}) is fixed ex-ante to be 1.12 as per registered PDD **/03/** and applied methodology **/11/**. Methane correction factor for project wastewater treatment system k without biogas recovery ($MCF_{ww,treatment,PJ,k}$) is fixed ex-ante to be 0.3 as per registered PDD **/03/**. $PE_{ww,treatment,y}$ for the monitoring period is 12,163.62 tCO_{2e}.

Project emissions on account of inefficiency of the project activity wastewater treatment system and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$) is calculated as below:

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

Flow of wastewater treated in the year y ($Q_{ww,y}$) during the monitoring period is 285,622 m^3 as explained in above. $COD_{discharge,PJ}$ after post treatment ponds is analyzed daily (closed reflux Tirtrimetric method) from sample of wastewaters and average weekly value is reported in ER sheet. RINA has verified the values in the monitoring report /**01**/ against the Original test reports /**17**/ which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/. Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC **/03/, /15/**. Methane producing capacity of the wastewater ($B_{o,ww}$) is fixed ex-ante to be 0.25 kg CH_4/kg COD as per IPCC **/03/**. Model correction for uncertainties (UF_{PJ}) is fixed ex-ante to be 1.12 as per registered PDD **/03/** and applied methodology **/11/**. Methane correction factor for project wastewater treatment system k without biogas recovery ($MCF_{ww,PJ,discharge}$) is fixed ex-ante to be 0.1 as per registered PDD **/03/**. $PE_{ww,discharge,y}$ for the monitoring period is 319 tCO_{2e}.

Methane fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$) are determined as per AMS-III.H and as follows:

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$

Excess sludge was not found generated during the monitoring period. Hence, $PE_{fugitive,s,y}$ is considered zero in this monitoring period.

Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y ($PE_{fugitive,ww,y}$) is estimated as follows:

$PE_{fugitive,ww,y} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$

Capture efficiency of the biogas recovery equipment in the wastewater treatment (CFE_{ww}) is fixed ex-ante to be 0.9 as per registered PDD /**03**/. Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC /**03/,/15**/.

Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y ($MEP_{ww,treatment,y}$) is calculated as follows:

$$MEP_{ww,treatment,y} = Q_{ww,y} \times B_{o,ww} \times UF_{PJ} \times \sum_{k} COD_{removed,PJ,k,y} \times MCF_{ww,treatment,PJ,k}$$

Flow of wastewater treated in the year y ($Q_{ww,y}$) during the monitoring period is 285,622 m^3 as explained in above.

Methane producing capacity of the wastewater ($B_{o,ww}$) is fixed ex-ante to be 0.25 kg CH_4/kg COD /**03**/. Model correction factor to account for model uncertainties (UF_{PJ}) is fixed ex-ante to be 1.12 /**03**/.

Methane correction factor for wastewater treatment system k equipped with biogas recovery ($MCF_{ww,treatment,PJ,k}$) is fixed ex-ante to be 0.8 as per registered PDD /**03**/.

$COD_{removed,PJ,k,y}$ is calculated as the difference between $COD_{ww,untreated,y}$ and $COD_{ww,treated,y}$ **/03/**. $COD_{ww,untreated,y}$ and $COD_{ww,treated,y}$ is analyzed daily (closed reflux Tirtrimetric method) from sample of wastewater entering digesters and leaving the digester and weekly average value is reported in ER sheet /02/. RINA has verified the values in the monitoring report /**01**/ against the Original test reports /**17**/ which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11**/. $MEP_{ww,treatment,y}$ for the monitoring period is 3111 tonnes and $PE_{fugitive,ww,y}$ for the monitoring period is 7,316 tCO_{2e} /**02**/.

Project Emissions from flaring in year y ($PE_{flare,y}$) is calculated as per the "Tool to determine project emissions from flaring gases containing methane" version 01 /**13**/ and as follows:

$$PE_{flare,y} = \sum TM_{RG,h} \times (1 - \eta_{flare,h}) \times GWP_{CH4} / 1000$$

Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC **/03/, /15/.** Flare efficiency in hour 'h' ($\eta_{flare,h}$) as per the registered PDD is 90% default for enclosed flare in line with the 'Tool to determine project emissions from flaring gases containing methane' /**03**/, /**13**/. However, during the monitoring period the monitoring was not recorded as per defined monitoring procedure and hence efficiency is considered 0% for the current monitoring period in line with the tool /**13**/.This is considered conservative approach to estimate project emission from flaring and as per Appendix 1 of project standard version 07 prior approval is not required /**09/.**

Mass flow rate of methane in the residual gas in hour 'h' ($TM_{RG,h}$) is calculated as per the 'Tool to determine project emissions from flaring gases containing methane' as follows:

$TM_{RG,h} = FV_{RG,h} * fv_{CH4,RG,h} * \rho_{CH4,n,h}$

Density of methane at normal condition ($\rho_{CH4,n,h}$) is fixed ex-ante to be 0.716 kg/m^3 as per the 'Tool to determine project emissions from flaring gases containing methane' /**13**/.

Biogas sent to flare ($FV_{RG,h}$/ $BG_{Flare,y}$) is recorded zero for the period 18/10/2011 and 31/07/2014. Hence, $PE_{flaring,y}$ for the monitoring period is 0 tCO_{2e} /**02**/.

Leakage Emissions:

As described in section 3.5 above leakage emission is considered zero.

Emission Reductions:

The emission reduction (ER) is the sum of the ER from type I component ($BE_{power,y}$) and the ER achieved from the type III component of the project activity ($ER_{y,ex\ post}$). ER from the type I component ($BE_{power,y}$) for this monitoring period is 5,843 tCO_{2e}.

As described in section 3.5 of this report and according to the applied methodologies AMS-III.H version 15 /**11**/, the emission reductions achieved from type III component ($ER_{y,ex\ post}$) in any year are the lowest value of the following:

$ER_{y,ex\ post} = \min((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - LE_{y,ex\ post}))$

For the current monitoring period the achieved $BE_{y,ex\ post}$ is 69,500.74 tCO_{2e}, achieved $PE_{y,ex\text{-}post}$ is 19,863 tCO_{2e} and $LE_{y,ex\text{-}post}$ is zero as explained in above.

As per equation 16 of AMS-III.H, version 15, in case of flaring/combustion MDy will be measured using the conditions of the flaring process:

$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$

The $BG_{burnt,y}$ is the sum of total biogas fired in generator ($FV_{electricity,y}$) and biogas flared ($FV_{RG,h}$). RINA has verified the values in the monitoring report /**01**/ against the daily recording of the amount of biogas flared ($FV_{RG,h}$) and biogas fired in generator ($FV_{electricity,y}$) /**18**/, which is in line with the requirements of the registered monitoring plan /**03**/ and the applied monitoring methodology AMS-III.H version 15 /**11/**. Density of methane at normal condition (D_{CH4}) is fixed ex-ante to be 0.716 kg/m^3 as per the 'Tool to

determine project emissions from flaring gases containing methane' /**13**/. Global Warming Potential for methane (GWP_{CH4}) is fixed 21 for the period up-to 31/12/2012 and 25 from 01/01/2013 onwards as per IPCC **/03/, /15/.** Flare efficiency in hour 'h' ($\eta_{flare,h}$) as per the registered PDD is 90% default for enclosed flare in line with the 'Tool to determine project emissions from flaring gases containing methane' /**03**/, /13/. However, during the monitoring period the monitoring was not recorded as per defined monitoring procedure and hence efficiency is considered 0% for the current monitoring period in line with the tool /**13**/.This is considered conservative approach. Methane fraction (W_{CH4}) is as per continuous measurement and daily records /**63**/. Methane fraction is measured near the biogas flow meter (generator inlet) and hence complies the methodology requirements. The reported value ensure lower value in 90/10 confidence level for conservative estimation.

Therefore, MDy achieved during 18/10/2011 to 31/07/2014 amounts to 82,473.94 tonnes of CO_2 equivalent /**02**/.

Therefore, $ER_{y,ex\ post}$ has been calculated following the two formulae respectively year wise and minimum of the two has been considered as emission reduction for the monitoring period /**02/**.

Accordingly, emission reduction achieved during the monitoring period is 55,477 $tCO_{2e.}$

RINA is able to certify that the emission reductions for the project activity during the period 18/10/2011 to 31/12/2012 amount to 18,467 tonnes of CO_2 equivalent and from 01/01/2013 to 31/07/2014 amount to 37,010 tonnes of CO_2 equivalent. Sufficient evidence was presented for the reported parameters. As outlined above, the input data for calculating the emission reductions, the calculating process and the result are complete and transparent. Therefore, RINA is able to confirm the accuracy of the emission reductions.

RINA assessed all input data and calculations contained in the monitoring report version 05 of 06/10/2015 /**01**/ and CER spread sheet /**02**/.

Furthermore, the parameters determined ex-ante in the PDD was correctly applied in the ER spread sheet /**02**/. It is confirmed that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed. In addition, the assumptions, emission factors and default values that were applied in the calculations have been justified and were found to be appropriate.

3.5.4 Accuracy of emission reduction calculations

The emission reduction calculations provided in the spreadsheet /**02**/ have been verified to be correct and in line with the registered PDD /**03**/.

The emission reductions from the project for the monitoring period as reported in the monitoring report version 05 of 06/10/2015 /**01**/ is equivalent to 55,477 tCO_{2e}. The reported emission reductions are 5.66% higher than the estimated emission reduction of 52,506 tCO_{2e} for the period as per the registered PDD /**03**/. The higher emission reduction is due to higher COD removal efficiency during the monitoring period and higher GWP of methane (25) for the second commitment period.

The data presented in the monitoring report version 05 /**01**/ was assessed by reviewing in detail project documentation, collection of monitored data, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. Sufficient evidence was presented and verified by RINA for the reported emission reductions as listed in the above Section 3.5.3.

3.5.5 Management system and quality control

The project owner has set up an organization structure for the monitoring of the parameters, contains the plant manager, quality manager, supervisors and technicians as described in the MR /**01**/.
A plant manager has been established for the overall responsibility of monitoring and the verification process and the plant director acting as the focal contact for the UNFCCC; Biogas system supervisor, technicians and lab technicians fully coordinate and assist the plant manager in managing and reviewing the monitoring data; operators will be in charge of data monitoring, reading, recording, archiving as well as the maintenance and inspection of the monitoring equipment. All the monitoring data will be aggregated daily at least and archived by the operators, and then reported to the quality manager and plant manager for checking. Internal audits are practiced by the top management in order to mitigate any error encountered in reporting and archiving. All monitoring equipment are

maintained and calibrated in line with monitoring plan or national standards to ensure that the equipment operates at the stated level of accuracy.
The monitoring and reporting of electricity data is in accordance with well-established operational procedures. The site visit confirmed that the management system for the CDM project is in place and can be traced, such as the organizational structure with responsibilities, data collection procedure and competence criteria of CDM personnel involved in the CDM project.

4 VERIFICATION AND CERTIFICATION OPINION

RINA Service SpA (RINA) has performed verification of the emission reductions reported for the project activity "UPOIC Wastewater Treatment for Energy Generation, Krabi" in Thailand, CDM Registration Reference N° 4322, for the period 18/1 0/2011 to 31/07/2014, with regard to the relevant requirements for CDM activities.

The project participants of the "UPOIC Wastewater Treatment for Energy Generation, Krabi" project are responsible for:

- the preparation of greenhouses gas emissions data and the reported greenhouse gas emission reductions from the project on the basis set out in the monitoring plan contained in the registered project design document version 11 of 11/10/2011.
- the development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of greenhouse gas emission reductions of the project

It is the responsibility of RINA to express an independent verification opinion about the project's conformity with the requirements of paragraph 62 of the CDM modalities and procedures and on the reported greenhouse gas emission reductions from the project.

Based on documented evidence and corroborated by an on-site assessment RINA can confirm that:

- the project has been implemented and operated as per the registered PDD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable CDM requirements;
- the monitoring is in place as per the applied baseline and monitoring methodology;
- the monitoring complies with the monitoring plan in the registered PDD;
- the monitoring plan in the registered PDD is as per the applied baseline and monitoring methodology.

It is RINA's opinion that the GHG emission reduction stated in the monitoring report version 5 of 06/10/2015 for the "UPOIC Wastewater Treatment for Energy Generation, Krabi" project in Thailand for the period 18/10/2011 to 31/07/2014 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology "AMS-III.H", "Methane recovery in wastewater treatment", version 15 of 30/07/2010 and "AMS-I.D", "Grid connected renewable electricity generation", version 16 of 28/05/2010 and the monitoring plan contained in the registered PDD.

Hence RINA is able to certify that the emission reductions from the project during the monitoring period 18/10/2011 to 31/07/2014 amount to 55,477 tCO_{2e}; the emissions reductions during the period up to 31/12/2012 amount to 18,467 tCO_2e, and the emissions reductions during the period from 01/01/2013 to 31/07/2014 amount to 37,010 tCO_2e.

Genova, 21/10/2015

Laura Severino
Authorized officer signing for the DOE
RINA Services S.p.A.

APPENDIX A

VERIFICATION PROTOCOL

TABLE 1 REQUIREMENTS CHECK LIST

Checklist Question		Reference	MoV[1]	Comments	Conclusion
A	**Monitoring Report**				
A.1	Does the used project title clearly enable the reader to identify the unique CDM activity? Is there an indication of a revision number, the date of the revision and the monitoring period?	/01/, /03/, /04/, /05/	DR	Yes, the project title is "UPOIC Wastewater Treatment for Energy Generation, Krabi", which clearly identifies the unique CDM activity. The monitoring report, version 1.0 of 21/11/2014 covers the monitoring period from 18/10/2011 to 31/07/2014.	**OK**
A.2	Does the project comply with the applicable requirements for completing the Monitoring Reports (latest version available)?	/01/, /06/	DR	Yes, the project complies with the applicable requirements in "Guidelines for completing the monitoring report form", 04.0 of 25/06/2014.	**OK**
A.3	Does the MR comply with the template available (latest version)?	/01/, /07/	DR	Yes, the MR version 1.0 complies with the template "Monitoring Report Form (F-CDM-MR)" version 04 of 25/06/2014.	**OK**
B	**Description of Project Activity**				
B.1	Is the actual implementation and operation of the proposed project activity in accordance with the project activity in the registered PDD?	/01/, /03/, /04/, /11/, /12/	DR	RINA has performed a site visit to verify the real implementation of the project against the description in its registered PDD and found that the project implementation is in accordance with the registered PDD. The project is commissioned prior to the registration of the project activity under UNFCCC. The anaerobic wastewater treatment facility, based on a "Completely Stirred Tank Reactor" (CSTR) system equipped with two gas engine of capacity 952kW$_{el}$ has been implemented as per the registered PDD which are found to be correct during the site visit. The wastewater flow and COD removal is monitored so as to estimate the methane avoidance. The generated power after internal consumption is exported to grid. Biogas consumption in both the gas engines are monitored	**~~CL 1~~, OK**

[1] MoV: DR document review, I interview, CC cross checking

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				continuously in separate mass flow meter. The surplus electricity after internal consumption is exported to grid which is continuously monitored with a energy meter. All the arrangements are in line with the registered PDD. During the site visit, no changes have been observed or identified which may impact the additionality as there was no change in the effective output capacity, no addition of component nor extension of technology, no addition nor removal of project sites since there is only one site of the project activity, no change of values of the actual operational parameter relevant to determination of emission reductions which are within the control of the PP; no change has been observed or identified that may impact the scale of the project activity or applicability of baseline and monitoring methodologies. However, PP is requested to provide the following: 1. Commissioning certificate of the project activity. 2. Commissioning certificate of the gas engines	
B.2	In case of deviation between the registered project and the actual implementation/operation, do they comply with the requirements of the Project Standards?	/01/, /03/ /04/	DR, I, CC	Not applicable since the actual implementation of the project activity is in line with the registered PDD during this monitoring period.	**OK**
B.3	For project activity that consist of more than one site: - describe the status of the implementation and starting date of opearation of each site; For project activity with phased implementation: - describe the progress of the proposed project activity achieved in each phase number; - if the phased implementaion is delayed, described the reasons and the expected implenetation dates.	/01/, /03/ /04/	DR, I	Not applicable since there is only one site of the project activity and the project activity does not involve any phased implementation as confirmed through the onsite visit.	**OK**
B.4	Methodology and methodological tool applied for the registered project activity	/01/, /03/ /04/, /05/,	DR, I	The approved methodologies are: AMS-I.D, “Grid connected renewable electricity	**OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
		/11/, /12/, /13/, /14/		generation" version 16 of 28/05/2010 AMS-III.H, "Methane recovery in wastewater treatment" version 15 of 30/07/2010 and the methodological Tools are: "Tool to calculate the emission factor for an electricity system" version 02.1.0 "Tool to determine project emissions from flaring These are as per the registered PDD.	
C Compliance of the monitoring activities with the registered monitoring plan / Compliance of the monitoring plan with the monitoring methodology and methodological tool					
C.1 Monitoring plan					
C.1.1	Does the monitoring plan included in the registered CDM project activity comply with the applied methodology?	/01/, /03/ /04/, /11/, /12/	DR	Yes, the monitoring plan in the registered CDM-SSC-PDD complies with the applied methodologies, AMS-I.D, version 16 of 11/06/2010 and AMS-III.H, version 15 of 130/07/2010. However, the MR in the title page refers to version 14 of AMS-III.H whereas the project was registered under version 15 of the methodology.	**~~CAR 1~~, OK**
C.1.2	Does the monitoring comply with the monitoring plan in the registered PDD?	/01/, /03/	DR, I, CC	Yes, the monitoring during this monitoring period complies with the registered PDD.	**OK**
C.2 Data and parameters fixed ex-ante or at renewal crediting period					
C.2.1	Which parameters were available at validation and how were they verified?	/01/, /03/ /04/, /13/, /15/	DR, CC	**GWP_{CH4}:** Global Warming Potential of methane. The value for this parameter is 21 tCO_{2e}/tCH_4 which is available and fixed as per the registered PDD based on the IPCC default value. However, the current monitoring period also falls under second commitment period as defined by UNFCCC and hence PP has applied 25 for the duration which falls under the second commitment period. **$B_{o,ww}$:** Methane producing capacity of the wastewater has been fixed ex-ante as 0.25 kg CH_4/kg COD as per the registered PDD. However, description of the parameter is not correct in the MR. **UF_{BL}:** Model correction factor to account for model uncertainties for the baseline system is fixed ex-	**~~CAR 2~~, OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				ante to be 0.89 as per the registered PDD. **UF_{PJ}**: Model correction factor to account for model uncertainties for the project system is fixed ex-ante to be 1.12 as per the registered PDD in line with the applied methodology. **$MCF_{ww,BL,discharge}$/$MCF_{ww,PJ,discharge}$**: Methane correction factor based on discharge pathway in the baseline situation / Methane correction factor based on discharge pathway in the project situation is fixed ex-ante as 0.1 as per the registered PDD in line with the applied methodology. **$MCF_{ww,treatment,BL,i}$**: Methane correction factor for baseline wastewater treatment system is fixed ex-ante as 0.8 anaerobic deep lagoon and 0.3 for aerobic poor managed as per the registered PDD in line with the applied methodology. **$MCF_{ww,treatment,PJ,k}$**: Methane correction factor for project wastewater treatment system that is equipped with methane recovery and combustion is fixed ex-ante to be 0.8 as per registered PDD in line with the applied methodology. **$COD_{removal,y}$**: COD removed by the anaerobic wastewater treatment system in the project baseline is fixed ex-ante to be 0.0622 tonnes/m^3 from anaerobic pond and 0.00048 tonnes/m^3 as per registered PDD in line with the applied methodology **CFE_{ww}**: Capture efficiency of the biogas recovery equipment in the wastewater treatment is fixed ex-ante to be 0.9 as per registered PDD. **DE_{CH4}**: Density of CH_4 at normal condition is fixed ex-ante to be 0.716 kg/m^3 as per the flaring tool, in line with the registered PDD. **EF_{CO2}**: Grid emission factor of Thailand is fixed ex-ante to be 0.52 tCO_2/MWh (calculated as per tool to	

<table>
<tr><th colspan="2">Checklist Question</th><th>Reference</th><th>MoV[1]</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td></td><td></td><td></td><td></td><td>calculate emission factor for an electricity system) as per registered PDD.

The value of the above parameters are derived from the registered PDD and is consistent with the value in the validation report, the value of the parameter will be fixed during the whole fixed crediting period. However, Quantity of FFB processed per annum (Q_{FFB}), volume of wastewater from the mill to the lagoons per annum in project baseline (Q_{ww}) and Chemical Oxygen Demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline ($COD_{untreated}$) were also available during validation as per registered PDD. The same are not included in the MR. The description of Bo,ww is not correct in the MR.</td><td></td></tr>
<tr><td>C.2.2</td><td>What default data were selected and applied?</td><td>/01/, /03/ /04/, /12/, /14/</td><td>DR</td><td>Please refer to section C.2.1 above.</td><td><s>CAR 2</s>, OK</td></tr>
<tr><td>C.3</td><td colspan="5">Data and parameters monitored ex-post</td></tr>
<tr><td>C.3.1</td><td>Which parameter have been monitored during the monitoring period?
(Data/Parameter monitored / Data unit / Description / Source of data to be used / Value data for the monitoring period)</td><td>/01/, /02/, /03/, /04/, /11/, /12/</td><td>DR/ CC</td><td>The following parameters are being monitored during the current monitoring period which is in line with the registered PDD:

<table>
<tr><td>Data/Parameter:</td><td>$Q_{ww,i,y}$</td></tr>
<tr><td>Data unit:</td><td>m^3/y</td></tr>
<tr><td>Description:</td><td>Volume of wastewater treated in year ‘y’ entering the cooling pond and the digester.</td></tr>
<tr><td>Source of data:</td><td>Measured and recorded in log books.</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>284,728 m^3 for the period 18/10/2011 to 31/07/2014. However, the value is not consistent with MR.</td></tr>
</table></td><td><s>CAR 3</s>, OK</td></tr>
</table>

Checklist Question	Reference	MoV[1]	Comments	Conclusion

Data/Parameter:	$COD_{ww,untreated,y}$
Data unit:	$tCOD/m^3$
Description:	COD of the wastewater before the treatment system
Source of data:	Measured and recorded in log books.
Value(s) of monitored parameter:	0.06605 $tCOD/m^3$ (average) at the cooling pond and 0.0531 $tCOD/m^3$ (Average) for the period 18/10/2011 to 31/07/2014

Data/Parameter:	$COD_{ww,treated,y}$
Data unit:	$tCOD/m^3$
Description:	COD of wastewater after the treatment system
Source of data:	Measured and recorded in log book.
Value(s) of monitored parameter:	0.0058 $tCOD/m^3$ (average value of two monitoring points after the digesters) for the period 18/10/2011 to 31/07/2014 0.0059 $tCOD/m^3$ (average value of combination point of wastewater leaving the digesters) for the period 18/10/2011 to 31/07/2014 0.0042 $tCOD/m^3$ (average value of combination point of wastewater leaving the

Checklist Question	Reference	MoV[1]	Comments	Conclusion

	digesters) for the period 18/10/2011 to 31/07/2014
Data/Parameter:	$Q_{discharge,y,outlet}$
Data unit:	m^3/y
Description:	Volume of wastewater discharged in year 'y'.
Source of data:	Measured and recorded in log books.
Value(s) of monitored parameter:	284,728 m^3 for the period 18/10/2011 to 31/07/2014. However, the value is not consistent with MR.

Data/Parameter:	$FV_{RG,h}$
Data unit:	Nm^3
Description:	Volumetric flow rate of biogas to the flare in dry basis at normal conditions in the hour h
Source of data:	Measured and recorded in log books.
Value(s) of monitored parameter:	0 (no flaring recorded during the monitoring period)

Data/Parameter:	$EC_{consumed,y}$
Data unit:	MWh
Description:	Annual electricity to operate the facilities or power auxiliary equipment
Source of data:	Measured continuously in energy meter and recorded in log books.

Checklist Question	Reference	MoV[1]	Comments	Conclusion

Value(s) of monitored parameter:	571.70 MWh from biogas power generation and 108 MWh from grid for the current monitoring period.

Data/Parameter:	$EC_{exported,y}$
Data unit:	MWh
Description:	Amount of electricity to substitute grid electricity by the project in year y.
Source of data:	Measured continuously in energy meter and recorded in log books.
Value(s) of monitored parameter:	No supply to the palm oil and 11,624 MWh exported to grid during this monitoring period.

Data/Parameter:	$\eta_{flare-h}$
Data unit:	%
Description:	Flare efficiency
Source of data:	As per tool to determine project emissions from flaring gases containing methane, EB28, Annex 13
Value(s) of monitored parameter:	The data of temperature in the exhaust gas of the flare was not available during the monitoring period. Hence, 0% efficiency is considered in line with the tool.

Please address the followings:

Checklist Question	Reference	MoV[1]	Comments	Conclusion
			1. *The notation used for volume of wastewater treated in year 'y' entering the cooling pond and the digester is not consistent with registered PDD.* 2. *The flow meter (sl. No. 1401123) used for monitoring wastewater flow before digester is installed newly replacing old flow meter (sl. No. A0792017). Kindly provide the documentary evidence for date of installation.* 3. *For $Q_{ww,y}$ 'the measurement is conducted hourly' as per MR which is not correct with the registered PDD. Further, the value in MR is not consistent with ER sheet.* 4. *ID-3 is repeated twice; one in $COD_{ww,untreated,y}$ and in $COD_{ww,treated,y}$. Kindly explain. The difference between ID6 and ID8 is not transparent from the description in MR.* 5. *For $COD_{ww,discharged,PJ,y}$ the values included in MR is not consistent with the ER sheet*. 6. *The monitoring equipment details for parameter '$S_{final,PJ,y}$' is not included in the MR.* 7. *The flow meter and flow computing for '$FV_{digester,y}$' monitoring is different at site when cross checked with MR. Kindly provide details of the actual meter in place with details of replacement and provided documentary evidence.* 8. *Thermocouple for monitoring temperature of methane flare used for flame detection (T_{flare}) and flow meter for operation time of the flare per year ($T_{flare\ operation}$) is not installed. PP is requested to justify the compliance of registered PDD and methodology applied.* 9. *For values mentioned in MR for 'Volumetric*	

<table>
<tr><th colspan="2">Checklist Question</th><th>Reference</th><th>MoV[1]</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td></td><td></td><td></td><td></td><td>flow of biogas on dry basis leaving the digesters in year y ($FV_{digester,y}$) not consistent with ER sheet.
10. The value for 'Methane content in biogas in the year y ($W_{CH4,y}$)' is not consistent in MR and in ER sheet.
11. The monitored value for T_{biogas} and P_{biogas} is not provided for all monitoring points.
12. The values for Volumetric flow of biogas on dry basis entering for power generation ($FV_{electricity,y}$) is not consistent in MR and ER sheet.
13. The values for The quantity of electricity exported by the project activity ($EG_{total,y}$) is not consistent in MR and ER sheet.</td><td></td></tr>
<tr><td>C.3.2</td><td>Is the measurement equipment described? Is the accuracy of the measurement equipment addressed and deemed appropriate?</td><td>/01/, /03/, /04/</td><td>DR/ CC</td><td>The measurement equipments are electricity meters and flow meters. Detailed information of all the electricity meters are listed in the following table:

<table>
<tr><td>Flow meter</td><td>Volume of wastewater treated in year y entering the cooling pond and entering the digester ($Q_{ww,i,y}$/$Q_{discharged,y}$)</td></tr>
<tr><td>Make</td><td>ABB</td></tr>
<tr><td>Accuracy</td><td>±0.40%</td></tr>
<tr><td>SN.</td><td>1401123</td></tr>
</table>

<table>
<tr><td>Colorimeter</td><td>COD of the wastewater before the treatment system ($COD_{ww,untreated,y}$)</td></tr>
<tr><td>Make</td><td>Mettler Toledo</td></tr>
<tr><td>Accuracy</td><td>±0.20%</td></tr>
<tr><td>SN.</td><td>399004802</td></tr>
</table>

<table>
<tr><td>Colorimeter</td><td>COD of wastewater after</td></tr>
</table></td><td><s>CAR 3</s>, <s>CAR</s> 4, OK</td></tr>
</table>

Checklist Question	Reference	MoV[1]	Comments	Conclusion

	the treatment system ($COD_{ww,treated,y}$)
Make	Mettler Toledo
Accuracy	±0.20%
SN.	399004802

Colorimeter	COD of final treated wastewater discharged into plantation area ($COD_{ww,discharged,PJ,y}$)
Make	Mettler Toledo
Accuracy	±0.20%
SN.	399004802

Pressure sensor	Pressure transmitter at the digester
Make	Honeywell
Accuracy	±1%
SN.	1006800278800002

Pressure sensor	Pressure transmitter at the flaring system
Make	Kobold
Accuracy	±1%
SN.	2600422

Pressure sensor	Pressure transmitter at the generator 1
Make	Kobold
Accuracy	±1%
SN.	2600502

Pressure sensor	Pressure transmitter at the generator 2
Make	Kobold
Accuracy	±1%

Checklist Question	Reference	MoV[1]	Comments	Conclusion

SN.	260TZXA

Flow meter	Quantity of biogas to the flare in dry basis at normal condition ($FV_{RG,h}$)
Make	Kobold
Accuracy	±1.5%
SN.	5594

Flow computing	Quantity of biogas sent to flaring.
Make	Fuji Electric
Accuracy	±0.1%
SN.	9422144T

Flow meter	Quantity of biogas entering for power generation ($FV_{electricity,y}/BG_{electricity,y}$)
	Generator-1
Make	Kobold
Accuracy	±1.5%
SN.	5592
	Generator-2
Make	Kobold
Accuracy	±1.5%
SN.	5593

Flow computing	Quantity of biogas entering for power generation ($FV_{electricity,y}/BG_{electricity,y}$)
	Generator-1
Make	Fuji Electric
Accuracy	±0.1%
SN.	8623677T
	Generator-2
Make	Fuji Electric

Checklist Question	Reference	MoV[1]	Comments	Conclusion

Accuracy	±0.1%
SN.	8623675T

Energy meter	The quantity of electricity generated by the project activity ($EG_{total,y}$)
	Generator-1
Make	Carlo Gavazzi
Accuracy	±0.20%
SN.	BI1290012101P
	Generator-2
Make	Carlo Gavazzi
Accuracy	±0.20%
SN.	BI0980037101I

Energy meter	Quantity of auxiliary power consumed in the project activity during the year y ($EC_{consumed,y}$)
	Consumed from the project power generation
Make	Merlin Gerin
Accuracy	±1%
SN.	0058033222
	Import from Grid
Make	Merlin Gerin
Accuracy	±1%
SN.	0058010741

Energy meter	Amount of electricity exported by the project activity ($EG_{exported,y}$).
	Export to the palm oil mill
Make	Schneider
Accuracy	+/- 1%

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				<table><tr><td>SN.</td><td>4A943A98</td></tr><tr><td></td><td>**Export to Grid**</td></tr><tr><td>Make</td><td>EDMI</td></tr><tr><td>Accuracy</td><td>+/-0.5%</td></tr><tr><td>SN.</td><td>206500126</td></tr></table> *Kindly clarify the followings:* 1. The period of availability for continuous gas analyser (sl. No. 28960 and sl. No. 2160913) for generator 1 is not transparent in the MR. 2. The details of temperature sensor (ID-12, ID-13, ID-18.1, ID-18.2) are not provided in MR. 3. The monitoring equipment details for Volumetric fraction of component i residual gas in hour ($fv_{CH4,y}$) is not provided in the MR. 4. The energy meter (SN. 4A943A98)-ID-24 is monitoring electricity supplied to the palm oil from grid as well as from the biogas plant. In that case how the power supplied to the mill by the biogas plant shall be apportioned from the recorded data. 5. The accuracy class of energy meter (SN. 206500126)-ID-25 is not correct in the MR. In addition, please refer to section C.3.1 above.	
C.3.3	Is the measuring/reading/recording frequency adequate for all monitoring parameters? Is it in line with the registered monitoring plan?	/01/, /03/, /04/	DR	The measuring and recording frequency for the monitoring parameters are as follows: $Q_{ww,i,y}/Q_{discharge,y}$ (Flow of wastewater treated in year *y* entering the cooling pond and entering the digester): As per registered PDD, this parameter requires continuous monitoring. The same is being followed using a flow meter with hourly recording is maintained. This is in line with the requirements.	**~~CAR 3~~, ~~CAR~~ 4, OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				$COD_{ww,untreated,y}$ (COD of the wastewater before the treatment system): As per registered PDD, wastewater influent of the treatment system is sampled and analyzed for COD at UPOIC laboratory weekly according to specifications of test equipments and national or international standard method i.e. the 'Standard Method of the Examination of Water and Wastewater, American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment. During the monitoring period, this parameter is measured applying closed-reflux method in the on-site laboratory weekly and results are recorded in log book. The method is as per international standard and hence, this is in line with the registered PDD. Results are cross checked with third party accredited laboratory on monthly basis. $COD_{ww,treated,y}$ (COD of wastewater after the treatment system): As per registered PDD, wastewater influent of the treatment system is sampled and analyzed for COD at UPOIC laboratory weekly according to specifications of test equipments and national or international standard method i.e. the 'Standard Method of the Examination of Water and Wastewater, American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment. During the monitoring period, this parameter is measured applying closed-reflux method in the on-site laboratory weekly and results are recorded in log book. The method is as per international standard and hence, this is in line with the registered PDD. Results are cross checked with third party accredited laboratory on monthly basis. $COD_{discharged,y}$ (COD of final treated wastewater discharged into the plantation area): As per	

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				registered PDD, wastewater influent of the treatment system is sampled and analyzed for COD at UPOIC laboratory weekly according to specifications of test equipments and national or international standard method i.e. the 'Standard Method of the Examination of Water and Wastewater, American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment. During the monitoring period, this parameter is measured applying closed-reflux method in the on-site laboratory weekly and results are recorded in log book. The method is as per international standard and hence, this is in line with the registered PDD. Results are cross checked with third party accredited laboratory on monthly basis. $S_{final,PJ,y}$ (Amount of dry matter in final sludge generated by the project wastewater treatment in the year y): As per registered PDD, sludge disposal to be documented and supported by additional evidence such as picture. The generated sludge is to be weighed in a weigh bridge whenever it is being generated and records to be maintained. $FV_{digester,y}/BG_{burnt,y}$ (Quantity of biogas leaving the digesters): Continuously using flow meters and recorded hourly basis. This is in line with the registered PDD. W_{CH4} (Methane content in biogas in the year y-volume fraction): As per registered PDD, CH_4 content will be periodical measured through portable analyzer and the measurement will be carried out once a day over the period of one week per year. During this monitoring period, continuous gas analyser is used to measure the parameter and recorded on hourly basis. Hence, it meets the	

Checklist Question	Reference	MoV[1]	Comments	Conclusion
			requirement. T_{biogas} and P_{biogas} (Temperature and pressure of biogas): As per registered PDD, continuous measurement. During this monitoring period, pressure and temperature sensor are installed and continuous measurement and hourly recording is maintained. Hence, requirements are met. $FV_{RG,h}/BG_{Flared,y}$ (Total quantity of biogas flared): This parameter is monitored using a gas flow meter on continuous basis and recorded hourly. This is in line with the registered PDD. $fv_{CH4,RG,h}$ (Volumetric fraction of component methane in the residual gas in the hour *h*): Volumetric fraction of methane needs to be averaged hourly or at a shorter time interval by using continuous gas analyzer installed in the individual delivery pipeline to the flaring system. During this monitoring period the data recording was not consistent and hence PP has applied upper value of methane fraction of biogas sent for power generation which is conservative and accepted by the verification team. $FV_{electricity,y}/BG_{electricity,y}$ (Quantity of biogas used for power generation): Continuously using flow meters and recorded hourly basis. This is in line with the registered PDD. $EG_{total,y}$ (Total quantity of electricity generated by the project activity during the year y): This parameter is monitored continuous basis with energy meters from individual generators and recorded hourly. This is in line with the registered PDD. $EC_{consumed,y}$ (Quantity electricity used for auxiliary consumption during the year y): This parameter is monitored continuous basis with energy meters	

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				(Internal consumption and grid consumption) and recorded hourly. This is in line with the registered PDD. $EG_{exported,y}$(Amount of electricity exported by the project activity): This parameter is monitored continuous basis with energy meters (Supply to mill and export to grid) and recorded hourly. However, the energy meter for export to mill is also recording power from grid to the mill. PP is requested to explain how the apportioning to be done for only export to mill from the biogas power plant. $\eta_{flare-h}$ (Flare efficiency): 90% default if the flame temperature is above 500^0C recorded for more than 40 minutes during an hour (ex-ante estimation). However, flame temperature was not monitored during the monitoring period and hence 0% efficiency has been considered in line with the applicable tool. In addition, please refer to section C.3.2 and C.3.1 above.	
C.4	**Calibration requirements**				
C.4.1	Are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate?	/01/, /02/, /04/	DR/ CC	PP is requested to provided calibration certificates covering the entire monitoring period for the following equipments: - Flow meter used to monitor volume of wastewater treated in the project treatment system ($Q_{ww,i,y}$)-1b - The burette to monitor COD untreated, treated and discharged. - Weighbridge used to weigh sludge - Flow meter and computing to monitor total quantity of biogas generated ($FV_{digester,y}$) - Continuous gas analysers and portable gas analyser - Temperature sensor and pressure sensor - Flow meter and flow computing for biogas	~~**CL 2**~~**, OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				used for flaring (ID-13 and ID-9) - Flow meter and flow computing for biogas used in two generators (ID-19.1, ID-19.1 (FC), ID-19.2 and ID-19.2 (FC)) - Energy meter for electricity generation from two generators (ID-21.1 and ID-21.2) - Energy meter for auxiliary power consumption-ID-22 and ID-23 - Energy meter for electricity exported (ID-24 and ID-25)	
C.4.2	Does the calibration cover the monitoring period?	/01/, /02/, /04/	DR/ CC	Please refer to section C.4.1 above.	~~**CL 2**~~**, OK**
C.4.3	Has the calibration frequency been respected?	/01/, /02/, /04/	DR/CC	Please refer to section C.4.2 and C.4.1 above.	~~**CL 2**~~**, OK**
C.4.4	Does the calibration of meters have be done by an accredited person or institution?	/01/, /03/, /04/	DR/CC	PP is requested to clarify whether calibration is done by accredited agency in line with the registered PDD.	~~**CL 2**~~**, OK**
C.4.5	In case of delay, describe the applied maximum permissible error	/01/, /03/, /04/	DR/CC	Please refer to section C.4.2 and C.4.1 above.	~~**CL 2**~~**, OK**
C.5	**Monitoring of the sustainable indicators**				
C.5.1	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host Country?	/01/, /03/, /04/	DR	Not applicable.	**OK**
C.6	**Management system and quality control**				
C.6.1	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/01/, /03/, /04/	DR/I	On the date of the site visit, RINA can confirm that the monitoring arrangements described in the monitoring plan are feasible within the project design which follows the methodology requirements.	**OK**
C.6.2	Are procedures identified for day-to-day record handling (including what records to keep, storage area of records and how to process performance documentation)? Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/01/, /02/, /03/	DR	Data to be used for emission reductions calculation is recorded on a daily basis and aggregated, summarized and calculated on a monthly basis. All monitored data required for verification and issuance will be kept for at least two years after the end of the crediting period.	**OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
C.6.3	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/01/, /03/	DR	Please refer to section C.4.1 above.	**~~CL 2~~, OK**
C.6.4	Are the responsabilities and authorities for monitoring and reporting in accordance with the responsabilities and authorities stated in the monitoring plan?	/01/, /03/	DR	Yes, the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan as confirmed through the onsite visit and interview with related staff.	**OK**
C.6.5	Does data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions?	/01/, /02/, /03/, /17/, /18/	DR/ CC/I	As confirmed during on-site visit, the operational and management structure set up by the project developer can ensure the correct transfer of data and ER reporting. For this implemented project, the wastewater flow data has been cross checked from the daily log book records. COD in wastewater before and after treatment is also cross checked from daily log book records. Total biogas generation, biogas flared and combusted in gas engine are also cross checked from daily log book records. Electricity exported to grid and imported from grid (for internal consumption) is recorded in log books hourly basis and invoice is generated for export quantity on monthly basis based on monthly readings. Methane content in biogas cross checked from the daily log book records. However, following discrepancies are observed: 1. For export electricity to grid the data is as per monthly report from PEA. However, the monitoring period starts from 18/10/2011 and hence, requested to clarify how the monthly PEA report can be referred for that particular month. 2. The Electricity generation from biomass power plant (3.2 MW) and consumption in mill oil from the biomass power plant for the monitoring period is not provided to justify	**~~CAR 5~~, OK**

Checklist Question		Reference	MoV[1]	Comments	Conclusion
				the FAR raised during validation. 3. The GWP of methane is not transparent in the MR specific to the commitment period. 4. The MD approach for emission reduction is not explained in the MR in line with the registered PDD.	
D.1	**Assessment of data and calculation of emission reductions/Accuracy of emision reduction calculations**				
D.1.2	How were the values in the monitoring report verified and cross-checked?	/01/, /02/, /03/, /17/, /18/	DR/ CC	Please refer to section C.6.5 above.	**~~CAR 5~~, OK**
D.1.3	If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	/01/, /02/, /03/	DR/ CC	Please refer to section C.6.5 above.	**~~CAR 5~~, OK**
D.1.4	Emission reductions reported	/01/, /02/	DR/ CC	The emission reductions generated during this monitoring period as reported in the MR version 01, is 61,276 tCO_2e. However, please refer to section C.6.5 above.	**~~CAR 5~~, OK**
D.1.5	Difference between the emission reductions estimated in the registered PDD and the emission reductions reported for the monitoring period.	/01/, /02/, /03/	DR/ CC	The estimated CERs for the monitoring period as per registered PDD is 52,506 tCO_2e, whereas, the reported ER is 61,276 tCO_2e which is 14% higher. However, please refer to section C.6.5 above.	**~~CAR 5~~, OK**

TABLE 2 RESOLUTION OF CORRECTIVE ACTION REQUESTS AND CLARIFICATION REQUESTS

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
CAR 1: the MR in the title page refers to version 14 of AMS-III.H whereas the project was registered under version 15 of the methodology.	C.1.1	1st Response 27/02/2015 According to the final validation report, the project was validated under AMS-III.H version 15. The clarification request will be submitted to EB soon. 2nd Response 24/04/2015 The clarification request submitted to UNFCCC is ongoing.	1st Review: The MR mention applied methodology AMS-III.H, version 14, whereas the registered PDD and validation report refers to version 15. Kinldy clarify. CAR is open. 2nd Review: As per UNFCCC current project view page the details are correcetd and consistent with registered PDD and validation report. Hence, **CAR is closed**.
CAR 2: Quantity of FFB processed per annum (Q_{FFB}), volume of wastewater from the mill to the lagoons per annum in project baseline (Q_{ww}) and Chemical Oxygen Demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline ($COD_{untreated}$) were also available during validation as per registered PDD. The same are not included in the MR. The description of $B_{o,ww}$ is not correct in the MR..	C.2.1, C.2.2	1st Response 27/02/2015 Quantity of FFB processed per annum (Q_{FFB}), volume of wastewater from the mill to the lagoons per annum in project baseline (Q_{ww}) and Chemical Oxygen Demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline ($COD_{untreated}$), which were available during vlidation, are included in the revised MR. Accordingly, the desciption of $B_{o,ww}$ is revised in the revised MR.	1st Review: Quantity of FFB processed per annum (Q_{FFB}), volume of wastewater from the mill to the lagoons per annum in project baseline (Q_{ww}) and Chemical Oxygen Demand (COD) level of the untreated wastewater entering anaerobic lagoons in project baseline ($COD_{untreated}$), which were available during vlidation, are included in the revised MR. Also the description of $B_{o,ww}$ is corrected in the revsied MR. The information is consistent with registered PDD and hence **CAR is closed**.
CAR 3: Please address the followings: 1. The notation used for volume of wastewater treated in year 'y' entering the cooling pond and the digester is not consistent with registered PDD. 2. The flow meter (sl. No. 1401123) used for monitoring wastewater flow before digester is installed newly replacing old flow meter (sl. No. A0792017). Kindly	C.3.1, C.3.2, C.3.3	1st Response 27/02/2015 1. The notation used for volume of wastewater treated in year 'y' entering the colling pond and the digester is updated and consistent with registered PDD. 2. The new flow meter (S/N 1401123) was delivered on 15	1st Review: 1. The notation used for volume of wastewater treated in year 'y' entering the colling pond and the digester is updated and consistent with registered PDD. 2. Kindly provide evidence of installation date of the new meter. 3. The measurement procedure is

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
provide the documentary evidence for date of installation. 3. For $Q_{ww,y}$ 'the measurement is conducted hourly' as per MR which is not correct with the registered PDD. Further, the value in MR is not consistent with ER sheet 4. ID-3 is repeated twice; one in $COD_{ww,untreated,y}$ and in $COD_{ww,treated,y}$. Kindly explain. The difference between ID6 and ID8 is not transparent from the description in MR. 5. For $COD_{ww,discharged,PJ,y}$ the values included in MR is not consistent with the ER sheet. 6. The monitoring equipment details for parameter '$S_{final,PJ,y}$' is not included in the MR. 7. The flow meter and flow computing for '$FV_{digester,y}$' monitoring is different at site when cross checked with MR. Kindly provide details of the actual meter in place with details of replacement and provided documentary evidence. 8. Thermocouple for monitoring temperature of methane flare used for flame detection (T_{flare}) and flow meter for operation time of the flare per year ($T_{flare\ operation}$) is not installed. PP is requested to justify the compliance of registered PDD and methodology applied. 9. For values mentioned in MR for 'Volumetric flow of biogas on dry basis leaving the digesters in year y ($FV_{digester,y}$) not consistent with ER sheet. 10. The value for 'Methane content in biogas in the year y ($W_{CH4,y}$)' is not consistent in MR and in ER sheet. 11. The monitored value for T_{biogas} and P_{biogas} is not provided for all monitoring points.		January 2014 as Att-1.1. It has been installed on 20 January 2014. The insallation date evidence will be provided to DOE soon. 3. The Qww,y parameter was measured continuesly by flow meter. The data was recorded houly into memery card of the recorder and the log-sheets during this monitoring period. The data in the logsheet were applied for emission reduction calculation. The MR is revised and consistent with the registered PDD. 4. ID-3 mentioned in the monitoring parameter $COD_{ww,\ treated,y}$ was deleted. The parameter of $COD_{ww,\ treated,y}$ is based on the COD value of the watewater treated after the biogas system which monitoring points are referred as following four points; 4.1 ID4 at the sampling point after digester no.1, 4.2 ID5 at the sampling point after digester no.2; 4.3 ID6 at the combining point of wastewater treated leaving digester system; 4.4 ID8 at the sampling point before facultative pond 1-2. The decription is revised in the MR. 5. The value of $COD_{ww,discharged,\ PJ,y}$ in MR is revised and consistent with	corrected in the revised MR and is now consistent with actual practice and registered PDD. Further, the monitored data is corrected in the revised MR in line with the ER sheet. 4. Necessary corrections are done and the MR is updated as per actual practice at site. The same is as per registered PDD. 5. The MR is corrected for the monitored value of $COD_{ww,discharged,PJ,y}$ and now consistent with ER sheet. 6. The weigh bridge details for monitoring $S_{final,PJ,y}$' is included in the revised MR. The dtails are cross checked with calibration certificate issued by Central Bureau of Weights and Measures and found to be correct. 7. The details of flow meter and flow computing device cross checked with last calibration report and found to be correct. Further, no data was recorded at site. Since, no falring was recorded during the monitoring period, the amount of biogas recorded for power generation is considered for this parameter. Since, all monitorinh devices were calibrated this is considered acceptable by the verification team. 8. Details of the thermocoule is not yet provided in the MR. 9. The monitored value of volumetric flow of biogas on dry basis

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
12. The values for Volumetric flow of biogas on dry basis entering for power generation ($FV_{electricity,y}$) is not consistent in MR and ER sheet. *13.* The values for The quantity of electricity exported by the project activity ($EG_{total,y}$) is not consistent in MR and ER sheet.		ER calculation. 6. The monitoring equipment details of $S_{final,PJ,y}$ is provided in the revised MR. The supportive document as Att-1.2. 7. The details of flow meter and flow computing for $FV_{digester,y}$ are matched with the MR. The evidences are referred to the calibration report as Att-1.4. 8. Detail of thermocouple will be conveyed to DOE soon. The monitoring details for operation time of flame per year ($T_{flare,operation}$) is revised in the MR. The recording of time period during flaring is based on data logger software which can display relevant parameters during operation. 9. The value of $FV_{digester,y}$ mentioned in the MR is revised and consistent with ER sheet. 10. The value of Methane content in biogas in the year y ($W_{CH4,y}$)' is revised in the MR and consistent in ER sheet. 11. The monitored value for T_{biogas} and P_{biogas} is now provided into the revised MR. 12. The values for Volumetric flow of biogas on dry basis entering for power generation ($FV_{electricity,y}$) is revised and consistent in MR and ER sheet. 13. The values for The quantity of electricity exported by the project activity ($EG_{total,y}$) is revised and	leaving the digesters in year y ($FV_{digester,y}$) is now consistent with the ER sheet. 10. Methane content in biogas in the year y ($W_{CH4,y}$)' is found to be consistent in the MR and ER sheet. 11. The monitored value for T_{biogas} and P_{biogas} as recorded has been provided in the revised MR. However, PP is requested to privide the monitored data in the ER sheet also. 12. The monitored values for Volumetric flow of biogas on dry basis entering for power generation ($FV_{electricity,y}$) is found to be consistent in MR and ER sheet. 13. The values for the quantity of electricity exported by the project activity ($EG_{total,y}$) is found to be consistent in MR and ER sheet. PP is requested to respond to the open queries. CAR is open. 2nd Review: The new flow meter (1401123) replacing old flow meter (A0792017) was recorded in UPOIC dated 20/01/2014. Hence, response is accepted. The details of thermocouple provided in the final MR and the verified from calibration records. Temperature and pressure of biogas as monitored and recorded in log books are provided in MR and ER sheet. Although

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
		consistent in MR and ER sheet. 2nd Response: 24/04/2015 1. (for 1st-2) evidence of installation of the new meter (flow meter A0792017) as Att-2.1 and Att-2.8. Date of installation was 20/01/2014. 2. (for 1st-8) The detail of thermocouple is included in the ER sheet. The supportive evidences as Att-2.7. 3. (for 1st-11) Temperature and pressure details are included in the ER calculation sheet.	these values has no impact or relation with ER calculation, PP has provided the same in MR as per records. In summary, **CAR is closed**.
CAR 4: *Kindly clarify the followings:* a) The period of availability for continuous gas analyser (sl. No. 28960 and sl. No. 2160913) for generator 1 is not transparent in the MR. b) The details of temperature sensor (ID-12, ID-13, ID-18.1, ID-18.2) are not provided in MR. c) The monitoring equipment details for Volumetric fraction of component i residual gas in hour ($fv_{CH4,y}$) is not provided in the MR. d) The energy meter (SN. 4A943A98)-ID-24 is monitoring electricity supplied to the palm oil from grid as well as from the biogas plant. In that case how the power supplied to the mill by the biogas plant shall be apportioned from the recorded data. e) The accuracy class of energy meter (SN. 206500126)-ID-25 is not correct in the MR	C.3.2, C.3.3	1st Response 27/02/2015 1. The period of availability for continuous gas analyser (S/N. No. 28960 and S/N 2160913 for generator 1 is revised in the MR. 2. The details of temperature sensor (ID-12, ID-13, ID-18.1, ID-18.2) are provided in MR. The suportive evidence of calibration report as Att-1.12, 1.12, 1.14 and 1.15 respectively. 3. The detail of monitoring equipment for $fv_{CH4,y}$ is provided in the revised MR. 4. The electricity supplied to CPO mill by the project was not monitored properly. The power meter ID-24 is installed but no data recorded available. The baseline emission is not claimed during this monitoring period.	1st Review: a) The continuous gas analyser for generator 1 with Sl. No. 28960 was available from 18/10/2011 to 20/04/2014 and the same was replaced with new analyser with Sl. No. 2160913 from 21/04/2014. This is made transparent in the revised MR. b) The details of temperature sensor (ID-12, ID-13, ID-18.1, ID-18.2) are provided in the MR which has been cross check with calibration certificates and found to be correct. c) The continuous gas analyser detail for monitoring $fv_{CH4,y}$ is now provided in the MR. The same is found to be correct whcn cross checked with calibration certificate.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
		This is conservative to the calculation of emission reduciton. 5. The accuaracy class of energy meter (S/N. 206500126) of 0.5% is corrected in the revised MR.	d) The electricity exported to CPO mill by the project is not recorded during the monitoring period and the same is considered zero in the ER calculation. This is conservative and hence accepted. e) The accuracy class of energy meter (SN. 206500126)-ID-25 is corrected in the revised MR. In summary, responses are accepted and **CAR is closed**.
CAR 5: Following discrepancies are observed: 1. For export electricity to grid the data is as per monthly report from PEA. However, the monitoring period starts from 18/10/2011 and hence, requested to clarify how the monthly PEA report can be referred for that particular month. 2. The Electricity generation from biomass power plant (3.2 MW) and consumption in mill oil from the biomass power plant for the monitoring period is not provided to justify the FAR raised during validation. 3. The GWP of methane is not transparent in the MR specific to the commitment period. 4. The MD approach for emission reduction is not explained in the MR in line with the registered PDD	C.6.5, D.1.2, D.1.3, D.1.4, D.1.5	1st Response 27/02/2015 1. The export electricity to grid during 18/10/2011 to 31/10/2011 is based on the conservative calcuation of the monitored data as following; Total electricity generated (ID20) minus Internal consumption of project (ID21) and Electricity exported to CPO mill (ID23). The data calculated is more conseravative than the value calcuated from the PEA reading report considered with the number of days in a month. The calcuation detail is provided in the ER calucation sheet. 2. The electricity generated by biomass power plant is provided in the spreadsheet of ER calcuation. All amount of electricity generated by biomass fuel are consumed in the CPO mill factory. The average value of	1st Review: 1. The calulation in ER sheet is not correct considering only 14 days are included in the month of October 2011 in this monitoring period. 2. The power generation and consumption from biomass power plant in provided in the ER sheet and the data found to be consistent with log book records. The three years avegare power consumption from the biomass power plant is more than historical data available during validation. This justify that the power generated from biogas plant is not replacing the power generation from the biomass plant. Further, PP is not claming emission reduction for the quantity of electricity exported to the CPO mill from the biogas power generation. Hence, it is

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
		three-year electricity generation from 2012 to 2014 is about 6,276.63 MWh/year. While, the historical data described in validation report is 3,907.32 Mwh/year . The biomass power plant has operated normally and there is no reduction in power generation which can be attributed to the project activity. The data during monitoring period is higher than the historical data from the registered PDD. Therefore, it clear that the electricity generated in the project activity is not replacing the electricity generated in the biomass power plant. The ex post emission reduction calcuation of electricity supplied to mill is transparent and conservative. 3. The GWP of methane value of 21 is applied the monitoring data from 18/10/2011 to 31/12/2012, while the GWP of methane value of 25 is applied 01/01/2013 to 31/07/2014. The GWP value of 25 for the second commitment period has been effective since 01/01/2013 according to EB 69, Annex 3. The GWP value is lited in conlummn entitled “GWP for Given time Horiso” in the table 2.14 as following link; http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14.	transparent that power generation from project activity has not replaced power generation from biomass power plant. 3. The GWP of methane is transparently presented in the MR specific to its commitment period. 4. The MD approach for emission reduction is explained transparently in the revised MR in consistent with registered PDD. PP is requested to respond to the open queries. CAR is open. 2nd Review: The export to grid electricity for the period 18/10/2011 to 31/10/2011 are now provided with conservative approach in the ER sheet. The calculation found to be correct and hence accepted. **CAR is closed**.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
		4. The MD approach for emission reduction is described in the revised MR. 2nd Response 24/04/2015 (for 1st-1) Calculation of ER sheet is corrected. PEA value of EG_export to grid from 18th to 31 October 2011 is more conservative the monitored data corrected by the project proponent. The value in the MR is revised accordingly.	
CL1: Following documents are not provided: a) Commissioning certificate of the project activity. b) Commissioning certificate of the gas engines	B.1	1st Response 27/02/2015 1. Commissioning certificate of the project activity as Att-1.3. The COD was on 1 October 2009. 2. Commissiong certificate of the gas engines is pending. It will be provided to DOE soon. 2nd Response 24/04/2015 The commissioning certificate of gas engine as Att 2.6. The COD date was on 24/10/2009. The info in MR is revised.	1st Review: a) Commissioning certificate from ERDI dated 01/10/2009 for the biogas plant is cross checked and found to be correct with site visit records. b) The commissioning certificate of gas engine is pending. CL is open. 2nd Review: The commissioning certificate of gas engines are provided and hence **CL is closed**.
CL 2: Calibration certificates covering the entire monitoring period for the following equipments are not submitted: - Flow meter used to monitor volume of wastewater treated in the project treatment system ($Q_{ww,i,y}$)-1b - The burette to monitor COD untreated, treated and discharged. - Weighbridge used to weigh sludge	C.4.1, C.4.2, C.4.2, C.4.3, C.4.4, C.4.5, C.6.3	1st Response 27/02/2015 The calibration certificate covering the entire monitoring period for the following equipments; 1. Flow meter used to monitor volume of wastewater treated in the project treatment system ($Q_{ww,i,y}$)-1b as Att-1.4. 2. The burette to monitor COD	1st Review: - The calibration details are cross checked for the flow meter used to monitor volume of wastewater treated in the project treatment system (Q ww,i,y)-1b and found the calibration cover the monitoring period. - The calibration certificates

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
- Flow meter and computing to monitor total quantity of biogas generated ($FV_{digester,y}$) - Continuous gas analysers and portable gas analyser - Temperature sensor and pressure sensor - Flow meter and flow computing for biogas used for flaring (ID-13 and ID-9) - Flow meter and flow computing for biogas used in two generators (ID-19.1, ID-19.1 (FC), ID-19.2 and ID-19.2 (FC)) - Energy meter for electricity generation from two generators (ID-21.1 and ID-21.2) - Energy meter for auxiliary power consumption-ID-22 and ID-23 - Energy meter for electricity exported (ID-24 and ID-25).		untreated, trated and discharged as Att-1.5. 3. Weightbridge used to weigh sludge as Att-1.2. 4. Flow meter and computing to monitor total quantity of biogas generated ($FV_{digester,y}$) as Att-1.6. 5. Con tinuous gas analysers and portable gas analyser as following; ID11 at digester as Att-1.7 ID15 at flare as Att-1.16 ID20.1 at Gen no. 1 as Att-1.17 ID20.2 at Gen no. 2 as Att-1.18 6. Temperature sensor and pressure sensor as following; ID12 at digester as Att-1.12 ID13 at flare as Att-1.13. ID18.1 at Gen no.1 as Att-1.14. ID18.2 at Gen no.2 as Att-1.15. 7. Flow meter and flow computing for bigoas for flaring (ID-14) as Att-1.8. 8. Flow meter and flow computing for biogas used in two generators (ID-19.1, ID-19.1 (FC), ID-19.2 and ID-19.2 (FC)) as Att-1.9 and Att1.10. 9. Energy meter for electricity generation from two generators (ID-21.1 and ID-21.2) are pending. They will be delivered to DOE soon. 10. Energy meter for auxiliary power consumption-ID-22 and ID-23 are pending and will be delivered to DOE soon.	covering entire monitoring period for the burette to monitor COD untreated, treated and discharged are verified. - Calibration certificates covering entire monitoring period for the Weighbridge used to weigh sludge is cross verified. - Calibration certificates for Flow meter and computing to monitor total quantity of biogas generated ($FV_{digester,y}$) cross verified. It is found that there has been delay in calibration during the monitoring period. However, PP has not used the monitored value. Instead, PP has used the total value of biogas sent to flare and consumed in generator for this parameter. This is accepted by the verification team since the ER calculation is derived respective to its flow to generator and flaring and flaring found to be zero during the entire monitoring period. - Calibration certificate of continuous gas analysers at digester (ID11), at flare (ID15), at Gen no. 1 (ID20.1) and at Gen no. 2 (ID20.2) verified and found that there is calibration gap during the monitoring period. However, PP has applied error margin as per EB guideline and hence accepted. - Calibration certificate of temperature sensor and pressure sensor at digester (ID12), at flare

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Verification Conclusion
		11. Energy meter for electricity exported to the grid (ID-25) as Att-1.11. 2nd Response 24/04/2015 1. Energy meter for electricity generation from two generators as Att 2.2 for ID-21.1 and Att-2.3 for ID-21.2. 2. Energy meter for auxiliary power consumption ID-22 as Att 2.4 and ID-23 as Att-2.5.	as (ID13), at Gen no.1 (ID18.1) and at Gen no.2 (ID18.2) verified and found that there is calibration gap during the monitoring period. However, PP has applied error margin as per EB guideline and hence accepted. - Calibration certificate of Flow meter and flow computing for biogas for flaring (ID-14) is verified and found to be correct. - Calibration certificate of Flow meter and flow computing for biogas used in two generators (ID-19.1, ID-19.1 (FC), ID-19.2 and ID-19.2 (FC)) is verified and found to be correct. - Calibration certificate of Energy meter for electricity generation from two generators (ID-21.1 and ID-21.2) are pending. - Energy meter for auxiliary power consumption-ID-22 and ID-23 are pending. - Calibration certificate of Energy meter for electricity exported to the grid (ID-25) is verified and found to be correct. PP is requested to respond to the open queries. CL is open. 2nd Review: All calibration certificates are submitted and records are found to be consistent with details presented in MR. Hence, response is accepted and **CL is closed**.

TABLE 3 FORWARD ACTION REQUEST

Forward action request	Reference to Table 2	Response by project participants Verification Conclusion

RINA

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra: *We declare that Mr/Mrs/Ms:*	**Rekha Menon**
è qualificato come[1]: *is qualified as:*	**CDM–TEC, –VAL, -VER, -TL**
per le seguenti aree tecniche: for the following technical areas:	**1.2, 2.1, 13.1, 13.2, 14.1**

AREE TECNICHE **TECHNICAL AREAS**	**DESCRIZIONE DELL'AREA TECNICA** ***TECHNICAL AREA DESCRIPTION***	**SCOPO SETTORIALE** ***SECTORAL SCOPE***
1.2	Renewables	1
2.1	Energy Demand	2
13.1	Solid Waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

in accordo alle istruzioni della Divisione Certificazione.
in accordance with the instructions of the Certification Division.

REVISIONE ***REVISION***	**DATA** ***DATE***	**MOTIVAZIONI PER LA REVISIONE** ***REASON FOR THE REVISION***
0	06-03-2008	-
10	22-12-2014	Update qualification according to AS ver.6.0

Il Resp. QPT
Head of QPT

[1] Legend:

VAL:	Validator	CDM: Clean Development Mechanism
VER:	Verifier	VCS : Verified Carbon Standard:
TEC:	Technical Expert	GS: Gold Standard
TL:	Team Leader	SCS: SocialCarbon Standard
FIN-EXP:	Financial Expert	JI: Joint Implementation
DET:	Determiner	

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

RINA

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra: *We declare that Mr/Mrs/Ms:*	**Champok Buragohain**
è qualificato come[1]: *is qualified as:*	**CDM –TEC, -VAL, -VER, -TL**
per le seguenti aree tecniche: for the following technical areas:	**1.2, 2.1, 13.1, 13.2**

AREE TECNICHE **TECHNICAL AREAS**	**DESCRIZIONE DELL'AREA TECNICA** ***TECHNICAL AREA DESCRIPTION***	**SCOPO SETTORIALE** ***SECTORAL SCOPE***
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13

in accordo alle istruzioni della Divisione Certificazione.
in accordance with the instructions of the Certification Division.

REVISIONE ***REVISION***	**DATA** ***DATE***	**MOTIVAZIONI PER LA REVISIONE** ***REASON FOR THE REVISION***
0	19-01-2011	-
10	22-12-2014	Updated according to AS ver 6.0

Il Resp. QPT
Head of QPT

[1] Legend:

VAL:	Validator	CDM: Clean Development Mechanism
VER:	Verifier	VCS : Verified Carbon Standard:
TEC:	Technical Expert	GS: Gold Standard
TL:	Team Leader	SCS: SocialCarbon Standard
FIN-EXP:	Financial Expert	JI: Joint Implementation
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RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

RINA

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra: *We declare that Mr/Mrs/Ms:*	**Rita Valoroso**
è qualificato come1: *is qualified as:*	**CDM -TEC, -VAL, -VER, -TL** **TECHNICAL REVIEWER**
per le seguenti aree tecniche: for the following technical areas:	**1.2, 13.1**

AREE TECNICHE **TECHNICAL AREAS**	**DESCRIZIONE DELL'AREA TECNICA** ***TECHNICAL AREA DESCRIPTION***	**SCOPO SETTORIALE** ***SECTORAL SCOPE***
1.2	Renewables	1
13.1	Solid Waste and waste water	13

in accordo alle istruzioni della Divisione Certificazione.
in accordance with the instructions of the Certification Division.

REVISIONE ***REVISION***	**DATA** ***DATE***	**MOTIVAZIONI PER LA REVISIONE** ***REASON FOR THE REVISION***
0	18-01-10	-
9	22-12-2014	Update qualification according to AS ver.6.0

Il Resp. QPT
Head of QPT

[1] Legend:

VAL:	Validator	CDM: Clean Development Mechanism
VER:	Verifier	VCS : Verified Carbon Standard:
TEC:	Technical Expert	GS: Gold Standard
TL:	Team Leader	SCS: SocialCarbon Standard
FIN-EXP:	Financial Expert	JI: Joint Implementation
DET:	Determiner	

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports