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# Verification Report

Second Periodic Verification of the Registered CDM Project  
“Methane Recovery and Utilization at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia”

UNFCCC 1153-CDMP

Monitoring period 2: 01-05-2009 to 31-01-2011

Report No. 600500599

**27<sup>th</sup> July 2012**

TÜV SÜD Industrie Service GmbH  
Carbon Management Service  
Westendstrasse 199 - 80686 Munich - GERMANY

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 1 of 29

Report No.	Date of first issue	Version No.:	Revision date
600500599	30-09-2011	04	27-07-2012
Subject:	Second Periodic Verification		
Executing Operational Unit:			
TÜV SÜD Industrie Service GmbH, Carbon Management Service Westendstrasse 199 - 80686 Munich, Federal Republic of Germany			
Project Participant (client):			
Danish Ministry of Climate and Energy / Danish Energy Agency Asiatisk Plads 2, Copenhagen K, DK 1448, Denmark			
Registration number / Project Title		Project 1153: “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”	
Monitoring period:		01-05-2009 to 31-01-2011	
First Monitoring Report (version/date)		Version 01 / 05-04-2011	
Final Monitoring Report (version/date)		Version 08 / 21-03-2012	

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 2 of 29

### Summary:

TÜV SÜD Industrie Service GmbH has performed the second periodic verification of the registered CDM project: "Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia". The project consists of the installation of a closed continuous-flow stirred tank reactor (CSTR) plant for the treatment of palm oil mill effluent (POME) producing biogas. The captured biogas is used to generate steam for own consumption at the nearby Unitata Refinery replacing the use of medium fuel oil (MFO). Unitata Refinery is a sister company of United Plantation Berhad (UP Bhd.) located next to the Jendarata palm oil mill. Any surplus biogas produced will be combusted by an open flare system.

The management of United Plantation Berhad is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions.

A document review, followed by a site visit was conducted to verify the information submitted by the project participant regarding the present verification period. Based on the assessment carried out, the verifier confirms the following:

- the project has been implemented and operated in accordance with the description given in the registered PDD (version 04, 25-06-2007, registration date 08-11-2007).
- the project is completely implemented as described in the registered PDD and an approved deviation request (I-DEV0266) which relates to parameter  $FR_{bio}$  (total biogas generated from the digester). As per approved deviation requests it is acceptable to calculate the  $FR_{bio}$  from the summation of biogas consumed and biogas flared instead of direct monitoring. This method of calculation was approved until Nov 2009, and it was verified during the onsite visit that PPs have installed the meter (by repositioning) at Oct 2009 to have direct monitoring on  $FR_{bio}$ .
- the monitoring plan complies with the applied methodology (Avoided methane emissions from organic waste-water treatment, AM0013 version 4) and the monitoring has been carried out in accordance with the monitoring plan.
- The verified emission reduction for this monitoring period is 60,569 tCO<sub>2</sub> eq. It was further verified that this emission reduction is higher than estimated emission reduction in the registered PDD because of the increased COD content compared to value mentioned in registered PDD. The verified COD value achieved during this monitoring period is 76.76 kg COD/m<sup>3</sup> (average of monthly values sourced from the third party COD test results) whereas estimated COD value in the registered PDD is 52.00 kgCOD/m<sup>3</sup>. Detailed verification on the increase of emission reduction have been provided in section 3.2 of the report.

Installed equipment essential for generating emission reductions run reliably and the meters are calibrated appropriately. The project is generating emission reductions as a CDM project.

The verifier can confirm that the GHG emission reductions are calculated without material misstatements. Our opinion refers to the project's GHG emissions and resulting GHG emission reductions reported, both determined using the valid and registered project's baseline, its monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm that the implementation of the project resulted in 60,569 t CO<sub>2e</sub> of emission reductions during the verification period 01-05-2009 to 31/01/2011.

#### Assessment Team Leader:

Nikunj Agarwal

#### Verification Team Members:

Praveen Tekchandani

#### Technical Review:

Rachel Zhang

#### Certification Body responsible:

Thomas Kleiser

## SECOND PERIODIC VERIFICATION

“Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia”



Industrie Service

Page 3 of 29

## Abbreviations

<b>ACM</b>	Approved Consolidated Methodology
<b>CAR</b>	Corrective Action Request
<b>CDM</b>	Clean Development Mechanism
<b>CDM-EB</b>	CDM Executive Board
<b>CER</b>	Certified Emission Reduction
<b>CMP</b>	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
<b>CO<sub>2e</sub></b>	Carbon dioxide equivalent
<b>CR / CL</b>	Clarification Request
<b>DNA</b>	Designated National Authority
<b>DOE</b>	Designated Operational Entity
<b>EF</b>	Emission Factor
<b>EIA / EA</b>	Environmental Impact Assessment / Environmental Assessment
<b>ER</b>	Emission Reduction
<b>FAR</b>	Forward Action Request
<b>FSR</b>	Feasibility Study Report
<b>GHG</b>	Greenhouse Gas(es)
<b>GWP</b>	Global Warming Potential
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IRL</b>	Information Reference List
<b>KP</b>	Kyoto Protocol
<b>MP</b>	Monitoring Plan
<b>MR</b>	Monitoring Report
<b>PDD</b>	Project Design Document
<b>PP</b>	Project Participant
<b>TÜV SÜD</b>	TÜV SÜD Industrie Service GmbH
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VVM</b>	Validation and Verification Manual

## SECOND PERIODIC VERIFICATION

“Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia”



Industrie Service

Page 4 of 29

### Main Documents (referred to in this report)

Methodology (name / version)	AM0013 / Ver. 04	
Scope	13	
Technical Area	13.1	
Registered PDD:	Version 04, 25-06-2007	
Revised Monitoring Plan:	Registered PDD and an approved deviation request I-DEV0266	
	Version	Date
Published Monitoring Report	01	05-04-2011
Revised Monitoring Report	08	21-03-2012
Project documentation link:	<a href="http://cdm.unfccc.int/Projects/DB/DNV-CUK1181122330.1/view">http://cdm.unfccc.int/Projects/DB/DNV-CUK1181122330.1/view</a>	

### Table of Contents

### Page

1	Introduction .....	5
1.1	Objective .....	5
1.2	Scope .....	5
1.3	GHG Project Description .....	5
2	Methodology .....	7
2.1	Verification Process .....	7
2.2	Verification Team .....	7
2.3	Review of Documents .....	7
2.4	On-site Assessment and follow-up Interviews .....	8
2.5	Quality of Evidence to Determine Emission Reductions .....	8
2.6	Resolution of Clarification and Corrective and Forward Action Requests .....	9
2.7	Internal Quality Control .....	9
3	Verification Results .....	10
3.1	FARs from Validation / Previous Verification .....	10
3.2	Project Implementation in accordance with the registered Project Design Document .....	10
3.3	Compliance of the Monitoring Plan with the Monitoring Methodology .....	12
3.4	Compliance of the Monitoring with the Monitoring Plan .....	12
3.5	Assessment of Data and Calculation of Greenhouse Gas Emission Reductions .....	21
4	Summary of Findings .....	23
5	Verification Statement .....	29

Annex 1: Verification Protocol

Annex 2: Information Reference List

Annex 3: Appointment Certificate

## **1 INTRODUCTION**

### **1.1 Objective**

Danish Ministry of Climate and Energy / Danish Energy Agency has commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its registered CDM project: “Methane Recovery and Utilization at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”.

The objective of the verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. According to this assessment TÜV SÜD shall:

- ensure that the project activity has been implemented and operated as per the registered PDD ““Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia” Version 04 dated 25-06-2007, and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place,
- ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable CDM requirements,
- ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the “Avoided methane emissions from organic waste-water treatment”, AM0013 Version 04.& an approved deviation request I-DEV0266.

### **1.2 Scope**

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, previous verification reports, the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity’s resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

Based on the requirements in the VVM, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions.

The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

### **1.3 GHG Project Description**

Project activity:	“Methane recovery and utilization project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”
UNFCCC registration number:	1153
Project Participants:	United Plantations Berhad

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 6 of 29

Danish Ministry of Climate and Energy / Danish Energy Agency

Location of the project:

United Plantation Jendarata Palm Oil Mill,  
Jendarata Estate, 36009 Teluk Intan, Perak Darul  
Ridzuan, Malaysia

Date of registration:

08-11-2007

Starting date of the crediting period: 08-11-2007

The project activity includes the installation of three CSTRs and an open flare system. The treated wastewater is discharged to open lagoons with a combination of aerobic and anaerobic condition. The wastewater continuously treated in this pond system is discharged to the waterways. The biogas captured is directed to a boiler at Unitata refinery, Unitata Refinery, a sister company of United Plantations Berhad located next to the Jendarata palm oil mill, which was previously fed by MFO. This boiler has a steam output of 3 t/h at 11 bar equipped with an advanced Dunphy Dual Burner with automatic control. Surplus biogas will be combusted by an automatic open flare system.

## 2 METHODOLOGY

### 2.1 Verification Process

The verification process is based on the approach depicted in the Validation and Verification Manual.

Standard auditing techniques have been adopted for the verification process. The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a protocol that includes all the findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the verification report. This verification report and other supporting documents then undergo an internal quality control by the CB “climate and energy” before submission to the CDM-EB.

### 2.2 Verification Team

The appointment of the verification team takes into account the technical area(s), sectoral scope(s) and relevant host country experience required amongst team members for verifying the ER achieved by the project activity in the relevant monitoring period for this verification.

The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Verifier (V);
- Verifier Trainee (T);
- Technical Experts (TE).

The verification team consisted of the following members:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect	Host country experience
Nikunj Agarwal	ATL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> (13.1)	-	<input checked="" type="checkbox"/>
Praveen Tekchandani	V	-	-	-	<input checked="" type="checkbox"/>

Technical reviewer:

- Rachel Zhang

### 2.3 Review of Documents

The Monitoring Report version 01 submitted by the PP was made publicly available on the UNFCCC website before the verification activities started. The published MR was assessed based on all the relevant documents as listed above. The aim of the assessment in the desk review was to:



## SECOND PERIODIC VERIFICATION

“Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia”



Industrie Service

Page 8 of 29

- verify the completeness of the data and the information presented in the MR,
- check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

A complete list of all documents reviewed is available in annex 2 of this report.

## 2.4 On-site Assessment and follow-up Interviews

During 05-05-2011 to 06-05-2011, TÜV SÜD performed a physical site inspection and on-site interviews with project stakeholders to:

- confirm the implementation and operation of the project,
- review the data flow for generating, aggregating and reporting the monitoring parameters,
- confirm the correct implementation of procedures for operations and data collection,
- cross-check the information provided in the MR documentation with other sources,
- check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.,
- review the calculations and assumptions used to obtain the GHG data and ER,
- identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

A list of the persons interviewed during this verification activity is included in annex 2.

## 2.5 Quality of Evidence to Determine Emission Reductions

Among several evidence items submitted, the following relevant and reliable evidence material have been used by the audit team during the verification process:

1. Primary data records (e. g. COD analysis, SCADA data), logbooks significant for the monitoring period (IRL #18, 19)
2. CER calculation spreadsheet accordant to the monitoring period (IRL #24)
3. CDM/Operating Monitoring Manual (IRL #25)
4. Calibration certificates (IRL #12)
5. Biogas Plant Drawing (IRL #02)
6. Dunphy Burner specifications, Marshall Boiler specifications (IRL #06, 08)
7. UP2\_Biogas Plant Leakage Detection Results (IRL #11)

Sufficient evidence covering the full verification period in the required frequency is available to validate the figures stated in the final MR. The source of the evidence will be discussed in chapter 3 of this report. Specific cross-checks have been done in cases that further sources were available. The monitoring report's figures were checked by the audit team against the raw data. The data collection system meets the requirements of the monitoring plan as per the methodology.

## **2.6 Resolution of Clarification and Corrective and Forward Action Requests**

The objective of this phase of the verification process is to resolve any outstanding issues which require clarification for TÜV SÜD's positive conclusion of the achieved GHG emission reduction. The findings raised as Forward Action Requests (FARs) (if any) indicated in previous reports (validation/verification) were discussed during this phase and, issues raised in the FARs were resolved, during communications between the PP and TÜV SÜD.

Concerns raised in the desk review, the on-site audit assessments and the follow up interviews and the responses provided for the raised concerns are documented in Annex 1 (verification protocol) to guarantee the transparency of the verification process.

A Corrective Action Request is raised where TÜV SÜD identifies:

- non-conformities in monitoring and/or reporting with the monitoring plan and/or methodology;
- that the evidence provided is not sufficient to prove conformity;
- mistakes in assumptions, data or calculations that impair the ER;
- FARs stated during validation that are not solved until the on-site visit.

A Clarification Request is raised where TÜV SÜD does not have enough information or the information is not clear in order to confirm a statement or data.

A Forward Action Request is raised where TÜV SÜD identifies that monitoring and/or reporting require special attention or adjustments for the next verification period.

Information or clarifications provided as a response to a CAR, CL or FAR could also lead to a new request.

## **2.7 Internal Quality Control**

As a final step of verification, the final documentation including the verification report and annexes have to undergo an internal quality control by the Certification Body (CB) "climate and energy", i.e. each report has to be finally approved either by the Head of the CB or the Deputy (a Veto person can be used). In case one of these two persons is part of the assessment team, the approval can only be given by the person who is not a part of the assessment team. If the documents have been satisfactorily approved, the Request for Issuance is submitted to the CDM-EB along with the relevant documents.



### 3 VERIFICATION RESULTS

In the following sections, the results of the verification are stated. The verification results relate to the project performance as documented and described in the final PDD and Monitoring Report (21-03-2012, version 08). The verification findings for each verification subject are presented below.

#### 3.1 FARs from Validation / Previous Verification

No FARs have been presented, neither in the validation report nor in the previous verification reports.

However one FAR has been raised in this second verification which needs to be verified during the next verification. Please refer to section 5 of annex-1 (verification protocol).

#### 3.2 Project Implementation in accordance with the registered Project Design Document

The project is fully implemented according to the description presented in the registered PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the registered PDD. The project activity is completely operational and the same has been confirmed on-site.

By comparing the actual ER claimed in this monitoring period with the estimate in the registered PDD. The actual result is verified to be higher than what is stated/estimated in the PDD. The following data and or variables differ from the PDD and the explanation of this difference is presented here:

1. The verified COD value achieved during this monitoring period is 76.76 kgCOD/m<sup>3</sup> (average of monthly values sourced from the third party COD test results, although monthly data has been used for emission reduction calculation as per applied methodology and registered PDD) whereas estimated COD value in the PDD is 52.00 kgCOD/m<sup>3</sup>. The increase in COD is 48% which has inturn increased the emission reduction during this monitoring period. Please find below a quick comparison in the values of COD which is one of the cause for increasing the verified emission reduction:

	Value	Source
COD <sub>c,baseline</sub> value validated for the actual baseline scenario	74.63 kg/m <sup>3</sup>	As per annex-3 of registered PDD.
COD <sub>c,baseline</sub> value used in registered PDD to estimate CERs	52.00 kg/m <sup>3</sup>	Ma A.N., S.C. Cheah and M.C. Chow, 1993. Current Status of Palm Oil Processing Wastes Management in Waste Management in Malaysia: Current Status amd Prospects for Bioremediation. B.G. Yeoh et al. (Eds),

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 11 of 29

		1993, pp 111-136. This source has been validated during registration as well. It is a conservative figure compared to actual baseline COD value of 74.63 kg/m <sup>3</sup> presented above.
COD <sub>c,baseline</sub> value verified during the monitoring period	76.76 kg/m <sup>3</sup>	Average of monthly values sourced from the third party COD test results

The difference in the estimation of CERs between ex-ante (in the PDD) and ex-post (in the MR) is due to the application of a smaller COD value (52.0 kgCOD/m<sup>3</sup>) than the monitored COD average (76.76 kgCOD/m<sup>3</sup>) derived from samples taken during the second monitoring period. Further, the verified value of 76.76 kgCOD/m<sup>3</sup> for the current monitoring period (verified from external COD analysis by accredited laboratory once a month) is also cross-checked with internal COD analysis performed thrice in a week. It could be verified that COD data taken from external source was more conservative than in-house analysis of COD done. Hence the value of COD considered in the calculation is verified to be reliable and accepted for this monitoring period.

2. The verified flaring activity during the monitoring period is only 0.4%, whereas PDD assumed it to be 15% flaring. This caused to reduce the project emission, hence increased emission reduction.

Further information have been requested from EB to include verification details pertaining to para 197 of VVM ver 1.2, which is indicated as below:

1. It was verified during the onsite visit that all physical features of the project activity is implemented as proposed in the PDD (IRL # 02, 03, 04, 06, 07, 08, 09, 28). Further, it was also confirmed from the verification report of first monitoring period.
2. As verified above, project implementation and operation fully conforms with the registered PDD, however further assessment has been made in order to discuss whether the procedure for notification of changes is applicable, as per para 197 of VVM & EB 48 annex 67.
  - a) Average COD value for the monitoring period is verified to be 76.76 kgCOD/m<sup>3</sup>, which is different from COD value provided in the registered PDD (52 kgCOD/m<sup>3</sup>). However it was verified from the design specification of the plant (given in the contract between Novaviro Technology Sdn Bhd & United Plantation Berhad, IRL #28) that designed COD parameter is 52 kgCOD/m<sup>3</sup>. Hence it is verified that implemented design specification for COD of the project activity is in line with registered PDD.
  - b) 'Guidelines on assessment of different types of changes from the project activity as described in the registered PDD', EB 48 annex 67 was checked to ensure that no notification is required for the project activity. Para 5 (a, b, c) of EB 48 annex 67 is not applicable as it is verified in point 1 & 2(a) above that installed capacity, number of units and other physical features are implemented as per registered PDD (IRL # 02, 03, 04, 06, 07, 08, 09). Para 5 (d) of EB 48 annex 67 refers to actual operational parameters, which in this case is COD, it was verified that COD value is a monitoring value for the project activity and is not within the control of project participant. COD value is dependent on the quality of Palm Oil Mill Effluent (POME), which in turn is not controlled by the PPs during the

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 12 of 29

operation of the FFB processing mill, which is outside the registered project boundary. As a further assessment, operation of processing mill in terms of quantity of FFB processed and ratio of POME to FFB quantity was also verified and no changes were identified. It was verified that 165,992 tons & 137,120 tons of FFB was processed during 2009 & 2010 respectively (IRL #29), which is below the limit of 180,000 tons FFB/year from registered (PDD considers 600 tons per day for 300 days). It was further verified that 99,595 m<sup>3</sup> & 82,272 m<sup>3</sup> of POME was generated in 2009 and 2010 respectively (IRL #29), which gives a POME ratio of 0.6 m<sup>3</sup> POME/tons FFB for both year, which is less than expected ratio in the registered PDD (0.67 is given in the registered PDD).

Furthermore as it is clear from the data of COD presented for the different months, the values are varying which shows that this change cannot be considered as a permanent change of the operational parameter (COD). Hence it has been verified that change in actual COD value is not within the control of project participant and is dependent on external parameters, additionally this change cannot be considered permanent, therefore none of the options mentioned in para 5 of EB 48 annex 67 is applicable and no notification was required to be submitted to EB.

- c) As per section A.2 of registered PDD, 'The captured biogas will be utilised to displace the fossil fuels (MFO & diesel) used in the steam boilers and/or thermal heaters of UP group's palm oil refinery plant located next to the palm oil mill. Excess biogas, if it occurs, will be flared', the actual situation during the monitoring period is verified to be in line with registered PDD, as only 0.4% of biogas is flared which is excess to the requirement of palm oil refinery.

Also, it is clearly mentioned in the registered PDD page 32 "*The intention of the industrial plant is to combust 100 % of the biogas in order to minimize the consumption of MFO. Only in the event when the steam is not needed at all, the biogas will then be flared*", hence it can be confirmed that project is in compliance with the registered PDD.

Hence it has been successfully verified that implementation & operation of the project activity is in line with registered PDD and none of the changes leading to increased amount of emission reduction requires submission of notification as per para 197 of VVM & EB 48 annex 67 based on the reasons presented above.

### 3.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The monitoring plan is in accordance with the applied methodology, AM 0013, Version 4, registered monitoring plan of PDD and an approved deviation request (I-DEV0266) which relates to parameter FR<sub>bio</sub> (total biogas generated from the digester). As per approved deviation requests it is acceptable to calculate the FR<sub>bio</sub> from the summation of biogas consumed and biogas flared instead of direct monitoring. This method of calculation was approved until Nov 2009, and it was verified during the onsite visit that PPs have installed the meter (by repositioning) at Oct 2009 to have direct monitoring on FR<sub>bio</sub>.

### 3.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD. All parameters were monitored and determined as per the Monitoring Plan.

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 13 of 29

The verification of the parameters required by the monitoring plan is provided as follows:

<b>Data / Parameter:</b>	$F_{dig}$
<b>Data unit:</b>	m <sup>3</sup> /month
<b>Description:</b>	Flow rate of organic wastewater into the digester.
<b>Source of data used:</b>	<p>Hourly data has been sourced from the SCADA system verified online. <math>F_{dig}</math> data for the monitoring period was verified onsite. The verified value for this monitoring period is 194,604 m<sup>3</sup>.</p> <p>PPs use Magnetic Flowmeter for the monitoring with the following specifications:            Make/Model: Siemens / MagFlo Mag 5100W            Accuracy class: IP67            Serial no: 7ME651 553114T296</p> <p>Calibration:            Calibration frequency is verified to be annual and have been verified to be done on the following dates:            Date of initial calibration: 14/11/08            Date of 2<sup>nd</sup> calibration: 06/11/09            Date of last calibration: 05/11/10            The third party used is accredited for the activity, hence the information can be considered verifiable.</p>
<b>Means of verification/Comments:</b>	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
<b>Cross-check</b>	Total organic waste water (POME) to the digester is cross-checked with the generation of waste water of 0.44 to 1.18 m <sup>3</sup> POME/ tones of FFB (Malaysian research value sourced from "Microbial Biopolymerization Production from Palm Oil Mill Effluent (POME), Universiti Teknologi Malaysia"). Hence it was successfully cross-checked that the generated POME was under the limit given by the referred article above.

<b>Data / Parameter:</b>	$COD_{c,baseline}$
<b>Data unit:</b>	kg/m <sup>3</sup>
<b>Description:</b>	COD concentration of organic wastewater into the digester.
<b>Source of data used:</b>	<p>Measurement of this parameter is done using external testing testing once a month to ISO 17025 accredited laboratory who uses APHA 5220 C test methods. Further, actual monitoring of the same has been done thrice in a week by certified chemist in an internal laboratory.</p> <p>Average of COD values is verified to be 76.76 kgCOD/m<sup>3</sup> (IRL #13)</p>
<b>Means of verification/Comments:</b>	External laboratory certificates have been verified for each month of the monitoring period (IRL #13). COD values are further transferred form the hard copy of the certificate to the xl spreadsheet to use in the emission reduction calculation.
<b>Cross-check</b>	The COD values from the external accredited laborotary is also cross-checked with COD values taken internally (thrice a week). It



**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 14 of 29

	was verified that external COD values were lower than internal values, hence is verified to be conservative (IRL #22)
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<b>Data / Parameter:</b>	COD <sub>a,in</sub> & COD <sub>a,out</sub>
<b>Data unit:</b>	kg/m <sup>3</sup>
<b>Description:</b>	COD <sub>a,in</sub> : COD concentration of the effluent that enters the lagoon COD <sub>a,out</sub> : COD concentration of the effluent that leaves the lagoon.
<b>Source of data used:</b>	As per registered PDD, COD <sub>a,in</sub> & COD <sub>a,out</sub> shall be monitored during the crediting period. However as per applied methodology, historical fixed value for COD <sub>a,in</sub> & COD <sub>a,out</sub> has to be considered.  Since it is a baseline scenario parameter, it could not be monitored during crediting period.  Hence, as per applied methodology & registered PDD, the following values have been considered & successfully verified: COD <sub>a,out</sub> is validated as 2.941 kg/m <sup>3</sup> from registered PDD. COD <sub>a,in</sub> is validated as 52 kg/m <sup>3</sup> from registered PDD.
<b>Means of verification/Comments:</b>	Since COD <sub>a,in</sub> & COD <sub>a,out</sub> are mentioned as a baseline parameter in applied methodology which shall be measured during the baseline scenario, hence validated figure during registration indicated above is used in emission reduction calculation.
<b>Cross-check</b>	NA

<b>Data / Parameter:</b>	T <sub>lag</sub>
<b>Data unit:</b>	Degree Celcius
<b>Description:</b>	Temperature of lagoon.
<b>Source of data used:</b>	It was verified that ambient temperature for the site is sourced from the Malaysian Meteorology Services (MMS) Department. Daily temperature reading from the MMS department has been verified to be available for this monitoring period.  Verified average temperature for this monitoring period is 27.5 °C, daily & monthly readings have been verified during the onsite visit (IRL 19)
<b>Means of verification/Comments:</b>	Daily temperature reading from the MMS department has been verified to be available for this monitoring period.
<b>Cross-check</b>	It was cross-checked that MMS is the national authority and conducts national weather monitoring. Hence data sourced from MMS is considered to be reliable.

<b>Data / Parameter:</b>	D <sub>lag</sub>
<b>Data unit:</b>	m (meter)
<b>Description:</b>	Depth of lagoon.
<b>Source of data used:</b>	Daily data for depth monitoring of respective lagoon onsite was verified and found to be available for the monitoring period. Daily data is entered into the logsheet which is measured using measuring poles. (IRL 19)
<b>Means of</b>	Depth values for respective ponds are further transferred from the

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 15 of 29

verification/Comments:	hard copy (logsheets) to the xl spreadsheet.
Cross-check	Availability of the records for this monitoring period was verified.

<b>Data / Parameter:</b>	$h_{\text{boiler}}$
Data unit:	Hrs/year
Description:	Operating hours per year of the refinery boiler fired on biogas.
Source of data used:	Run time data recorded by the Shift supervisor. Availability of the data for the monitoring period was verified during the onsite visit.
Means of verification/Comments:	The data from the logsheet is transferred to xl sheet (although it is not used for calculation).
Cross-check	This parameter is used as a cross-check for the steam output at the monthly level.

<b>Data / Parameter:</b>	$H_{\text{refinery}}$
Data unit:	Hrs/year
Description:	Operating hours per year of the refinery using steam from biogas boiler.
Source of data used:	Run time data recorded by the Shift supervisor. Availability of the data for the monitoring period was verified during the onsite visit.
Means of verification/Comments:	The data from the logsheet is transferred to xl sheet (although it is not used for calculation).
Cross-check	This parameter is used as a cross-check for the steam output at the monthly level.

<b>Data / Parameter:</b>	$HG_{\text{Bl},y}$
Data unit:	MJ/yr
Description:	Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity using fossil fuel.
Source of data used:	<p>Hourly values of the biogas consumption is sourced from the SCADA system. Thermal energy has been calculated using biogas consumption, methane content and calorific value for the gas. Biogas consumption in the boiler is measured using the following equipment:</p> <p>Type: Vortex flowmeter  Make/Model: Yokogawa / DY100  Accuracy class: IP 68  Serial no: S5F606169-624</p> <p>Methane content is measured based on the parameter <math>P_{\text{CH}_4,\text{bio}}</math> mentioned above &amp; default calorific value for methane is used to calculate thermal energy consumed.</p> <p>The verified value of <math>HG_{\text{Bl},y}</math> for this monitoring period is 138,400,446 MJ.</p> <p>Calibration of the meter is verified to be done annually:  Date of 1st calibration: 14/11/08  Date of 2nd calibration: 06/11/09  Date of last calibration: 05/11/10  The third party used are accredited for the activity, hence the</p>



**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 16 of 29

	information can be considered verifiable.
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	Quantity of thermal energy consumption is also calculated using steam generation quantity, temperature and pressure readings. Heat energy calculated using biogas quantity is 138,400 GJ whereas the thermal energy calculated using steam generation is 161,186 GJ. Hence it was verified that the method considered for thermal energy generation using biogas quantity is conservative.

<b>Data / Parameter:</b>	$F_{dig\_out}$
Data unit:	m3/month
Description:	Flow rate of organic wastewater from the digester.
Source of data used:	<p>Hourly data has been sourced from the SCADA system verified online. As per registered PDD, <math>F_{dig\_out}</math> is considered to be same as <math>F_{dig}</math>.</p> <p>PPs use Magnetic Flowmeter for the monitoring with the following specifications: Make/Model: Siemens / MagFlo Mag 5100W Accuracy class: IP67 Serial no: 7ME651 553114T296</p> <p>Calibration: Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 14/11/08 Date of 2<sup>nd</sup> calibration: 06/11/09 Date of last calibration: 05/11/10 The third party used are accredited for the activity, hence the information can be considered verifiable.</p>
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	Total organic waste water (POME) to the digester is cross-checked with the generation of waste water of 0.44 to 1.18 m3 POME/ tones of FFB (Malaysian research value sourced from "Microbial Biopolymerization Production from Palm Oil Mill Effluent (POME), Universiti Teknologi Malaysia"). Hence it was successfully cross-checked that the generated POME was under the limit given by the referred article above.

<b>Data / Parameter:</b>	$COD_{c,dig\_out}$
Data unit:	kg/m3
Description:	COD concentration in discharged effluent from digester
Source of data used:	Measurement of this parameter is done using external testing testing once a month to ISO 17025 accredited laboratory who uses APHA

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 17 of 29

	5220 C test methods. Further, actual monitoring of the same has been done thrice in a week by certified chemist in an internal laboratory. The verified value used is 17.74 kg/m <sup>3</sup> (average of 01/05/09 – 31/01/11)
Means of verification/Comments:	External laboratory certificates have been verified for each month of the monitoring report (IRL #13). COD values are further transferred from the hard copy of the certificate to the xl spreadsheet to use in the emission reduction calculation.
Cross-check	The COD values from the external accredited laboratory is also cross-checked with COD values taken internally (thrice a week).

<b>Data / Parameter:</b>	EL <sub>Pr,y</sub>
Data unit:	MWh/yr
Description:	Amount of electricity in the year y that is consumed at the project site for the project activity.
Source of data used:	Daily data has been sourced from the logbook (IRL #19).  PPs use electricity meter for the monitoring with the following specifications: Type: kWh/electricity meter Make/Model: MPI Lenin / CA4-U672T Accuracy class: Class 2 Serial no: 2005-2035807  Calibration: Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 15/12/08 Date of 2 <sup>nd</sup> calibration: 19/10/09 Date of last calibration: 15/10/10 The third party used are accredited for the activity, hence the information can be considered verifiable.
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the logbook onsite. The logbook contains the daily meter reading which is further used in the calculations (IRL #19). Availability of the data for the monitoring period was successfully verified. The monitored data is further divided into electricity from grid & electricity supplied from biomass based on running hours of biomass boiler.
Cross-check	Availability of the record was verified during the onsite visit and instantaneous reading during the visit was also cross-checked with the records maintained (logbook record).

<b>Data / Parameter:</b>	F <sub>la</sub>
Data unit:	m <sup>3</sup> /yr
Description:	Flow rate of sludge applied to land.
Source of data used:	Daily data has been sourced from the logbook (IRL #19).  PPs use flowmeter for the monitoring with the following specifications: Type: Magnetic flowmeter

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 18 of 29

	<p>Endress Hauser Promag 10 (2 units) 8C0CC019000 / 87163719000</p> <p>Calibration: Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 14/11/08 Date of 2<sup>nd</sup> calibration: 06/11/09 Date of last calibration: 05/11/10 The third party used are accredited for the activity, hence the information can be considered verifiable.</p>
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the logbook onsite. The logbook contains the daily meter reading which is further used in the calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	Availability of the record was verified during the onsite visit and instantaneous reading during the visit was also cross-checked with the records maintained (logbook record).

<b>Data / Parameter:</b>	FR <sub>bio</sub>
Data unit:	m3/yr
Description:	Amount of biogas collected in the outlet of the Bio-digester measured using a continuous flow meter.
Source of data used:	<p>Hourly data has been sourced from the SCADA system verified online. FR<sub>bio</sub> data for the monitoring period was verified onsite. The value verified for this monitoring period is 7,777,921 m3 (IRL #18)</p> <p>For the period of 01-05-2009 to 20-10-2009 this parameter is calculated using FR<sub>f,inlet</sub> &amp; FR<sub>e,inlet</sub> (based on approved deviation request - I-DEV0266).</p> <p>From 21<sup>st</sup> Oct 2009 onwards PPs use Vortex flowmeter for the monitoring with the following specifications: Make/Model: Endress Hauser / Prowirl 72 Serial no: 85029120000 Calibration frequency: Annual</p> <p>Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 14/11/08 Date of 2<sup>nd</sup> calibration: 06/11/09 Date of last calibration: 05/11/10 The third party used are accredited for the activity, hence the information can be considered verifiable.</p>
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	Total biogas generation is also cross-checked with the sum of biogas consumed at boiler and amount of biogas flared.

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 19 of 29

<b>Data / Parameter:</b>	$P_{CH_4,bio}$
<b>Data unit:</b>	%
<b>Description:</b>	Percentage of biogas that is methane in the outlet of the bio-digester
<b>Source of data used:</b>	<p>Seven times in month data has been sourced from the gas analyzer records maintained in logsheet. This data for the monitoring period was verified onsite.</p> <p>The verified % for this monitoring period is 58.68% (IRL #23).</p> <p>PPs uses Gas analyzer for the monitoring with the following specifications: Make/Model: Geotechnical Instruments/GA 2000 Serial no: GA10356</p> <p>Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 30/07/08 Date of 2<sup>nd</sup> calibration: 16/06/09 Date of last calibration: 28/04/10 The third party used are accredited for the activity, hence the information can be considered verifiable.</p>
<b>Means of verification/Comments:</b>	<p>The data used in the xl spreadsheet for calculation is verified with the actual values onsite. Seven readings are taken once a month to compute the values for methane conten in the biogas.</p> <p>Availability of the data for the monitoring period was successfully verified.</p>
<b>Cross-check</b>	Percentage of methane is also cross-checked with the another set of analysis done at the receiving end (at boiler house), IRL #23.

<b>Data / Parameter:</b>	$FR_{f,inlet}$
<b>Data unit:</b>	m <sup>3</sup> /yr
<b>Description:</b>	Flow rate of biogas entering the flare
<b>Source of data used:</b>	<p>Hourly data has been sourced from the SCADA system verified online. <math>FR_{f,inlet}</math> data for the monitoring period was verified onsite. The value verified for this monitoring period is 29,360 Nm<sup>3</sup> (IRL #18).</p> <p>PPs uses Vortex flowmeter for the monitoring with the following specifications: Make/Model: Endress Hauser / Prowirl 72 Serial no: 8A026E20000</p> <p>Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 14/11/08 Date of 2<sup>nd</sup> calibration: 06/11/09 Date of last calibration: 05/11/10 The third party used are accredited for the activity, hence the information can be considered verifiable.</p>
<b>Means of verification/Comments:</b>	<p>The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was</p>

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 20 of 29

	successfully verified.
Cross-check	This value has been cross-checked using the total biogas generation and biogas used in the boiler.

<b>Data / Parameter:</b>	$FR_{e,inlet}$
Data unit:	m <sup>3</sup> /yr
Description:	Flow rate of the biogas entering the heat generation equipment
Source of data used:	Hourly data has been sourced from the SCADA system verified online. $FR_{e,inlet}$ data for the monitoring period was verified onsite. The value verified for this monitoring period is 7,748,561 m <sup>3</sup> (IRL #18).  PPs uses Vortex flowmeter for the monitoring with the following specifications: Make/Model: Yokogawa / DY100 Serial no: S5F606169-624  Calibration frequency is verified to be annual and have been verified to be done on the following dates: Date of initial calibration: 14/11/08 Date of 2 <sup>nd</sup> calibration: 06/11/09 Date of last calibration: 05/11/10 The third party used are accredited for the activity, hence the information can be considered verifiable.
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	This value has been cross-checked using the total biogas generation and biogas flared.

<b>Data / Parameter:</b>	$P_{CH_4,e,s}$ (heat generation)
Data unit:	%
Description:	Methane content in stack gas of heat generation equipment
Source of data used:	The sampling of $P_{CH_4,e,s}$ is done at the boiler plant chimney. A total of eight samples are analyzed by a gas analyzer of an external laboratory in every quarter to ensure a 95% confidence level.
Means of verification/Comments:	The sampling report of the external laboratory to measure the methane content in the flue gas shows no CH <sub>4</sub> detection at various boiler pressure levels (200, 300, 350, 400, 450, 500 and 550 Nm <sup>3</sup> ). This test was carried out by the accredited testing party and were verified during on-site. No methane content was detected during any of these tests (IRL 15).  In general the certificate of analysis of the external laboratory provides the raw data of this parameter and the minimum detectable limit of 0,01% v/v has been conservatively used in the emission reduction calculation.
Cross-check	-

<b>Data / Parameter:</b>	$FR_{e,s}$
Data unit:	m <sup>3</sup> /yr
Description:	Flow rate of the heat generation equipment stack gases

## SECOND PERIODIC VERIFICATION

“Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia”



Industrie Service

Page 21 of 29

Source of data used:	Hourly data has been sourced from the SCADA system verified online. FRe,s data for the monitoring period was verified onsite. The value verified for this monitoring period is 167,813,673 m3 (IRL #18).  PPs uses the following equipment for monitoring this paramters: Make/Model: Codel / VCEM 5000 series Accuracy class: IP 66 Serial no: VCEM5000-0059TRX1 / VCEM5000-0059TRX2  Calibration frequency: Once in 2 years Date of initial calibration: 30/09/08 Date of last calibration: 21/09/10 The third party used are accredited for the activity, hence the information can be considered verifiable.
Means of verification/Comments:	The data used in the xl spreadsheet for calculation is verified with the actual SCADA online values onsite. The SCADA system captures the totalizer reading of the flowmeter which is used for further calculations. Availability of the data for the monitoring period was successfully verified.
Cross-check	-

<b>Data / Parameter:</b>	<b>NC</b> (land application)
Data unit:	Kg N/Kg sludge
Description:	nitrogen content in the sludge
Source of data used:	An internal lab technician takes the samples of sludge after the facultative ponds. The nitrogen content of these samples is analysed by an external accredited laboratory once a month (IRL 26).
Means of verification/Comments:	The raw data are typed in a excel spread sheet. This sheet is linked to '1 Data Input' sheet of the ER spreadsheet. The information of the '1 Data Input' sheet are further linked to the '10 Project Emission Land Application Sludge' sheet which is also a part of the ER spreadsheet (IRL 24).  The uncertainty level of these data can be deemed low, because the samples are taken by trained personnel and the ordered lab holds relevant accreditation (IRL #26).
Cross-check	it was verified that the values used in the calculation tool (excel file) and reported in the MR are correct, since these are in line with the raw data lab reports.

### 3.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

All data has been available and all the parameters have been monitored in accordance with the registered monitoring plan. For parameter  $HG_{BI,y}$  PPs have calculated the thermal energy according to registered monitoring plan (using steam generation data) and also according to biogas consumption data (as per applied methodology). Further, it was verified that the conservative approach has been taken into consideration.

The reported data have been cross-checked against other sources available as explained above in chapter 3.4.



## **SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 22 of 29

The verifier confirms that the methods and formulae used to obtain the baseline, project and leakage emissions are appropriate. The same has been done in accordance with the methods and formulae described in the registered monitoring plan and applicable methodology.

The verifier confirms that the monitoring report includes all parameters and the monitored data at the intervals required by the methodology and PDD.

The verifier confirms that all the assumptions, emission factors and default values (ex-ante values from PDD) have been correctly justified. All the emission factors and default values are explicitly mentioned in the monitoring report.

## 4 SUMMARY OF FINDINGS

The verifier can confirm that the published MR and related documents are complete and verifiable in accordance with the CDM requirements. All the findings that were raised by the verification team, the responses by the PPs and the conclusion from the team are presented in Annex 1. The means of verification and resulting changes in the MR or related documents are identified in the following table:

<p><b>CAR 1:</b> Please update the MR to include the following:</p> <ol style="list-style-type: none"> <li>1. Details on manufacturer, serial number &amp; commissioning date of respective equipment installed (namely digester tanks &amp; flaring equipment).</li> <li>2. Appropriate reporting and site visit date (page-3 of published MR).</li> <li>3. Please update MR to include correct monitoring period as mentioned in UNFCCC webpage (please see page-8 of published MR).</li> </ol>
<p><b>CAR 1, means of verification</b></p> <p>Revised monitoring report has been verified to be updated.</p>
<p><b>CAR 1, changes in the MR or related documents</b></p> <p>Monitoring report has been revised to contain details on manufacturer, serial number &amp; commissioning date of respective equipment installed. Further, it is also updated to contain appropriate reporting and site visit date.</p>
<p><b>CAR 2:</b> As per EB 54 annex-34, please update the MR to include details on the actual operation of the project activity during the monitoring period like any downtimes of equipments, overhaul, etc. Also include the legal approval or license required to run the project.</p>
<p><b>CAR 2, means of verification</b></p> <p>Revised monitoring report has been verified to be updated and the same was also verified during the onsite visit.</p>
<p><b>CAR 2, changes in the MR or related documents</b></p> <p>Monitoring report has been revised to contain details downtimes of equipments, overhaul &amp; legal approval required.</p>
<p><b>CAR 3:</b> It was verified onsite that the flow meter at the heat generation equipment stack gases was faulty from 25th feb'2011. Please clarify how PP monitored the flow of stack gases for the faulty period &amp; also include the same in the monitoring report.</p>
<p><b>CAR 3, means of verification</b></p> <p>PPs revised the monitoring period, hence EB was informed via email to revise the monitoring period, the same has been verified to be updated in UNFCCC webpage. Further, revised monitoring excludes february 2011.</p>
<p><b>CAR 3, changes in the MR or related documents</b></p> <p>Monitoring report has been revised to indicate the updated monitoring period.</p>
<p><b>CAR 4:</b> Please include the ID number in the MR to maintain consistency with registered PDD &amp; applied methodology.</p>
<p><b>CAR 4, means of verification</b></p> <p>Revised monitoring report has been verified to be updated in line with the registered PDD.</p>
<p><b>CAR 4, changes in the MR or related documents</b></p> <p>Monitoring report has been revised to contain ID number in line with registered PDD.</p>
<p><b>CAR 5:</b> Please update the monitoring report to indicate the correct model number of the meter</p>



**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 24 of 29

as verified onsite for Fdig.
<b>CAR 5, means of verification</b>
Revised monitoring report has been verified to be updated in line with model number verified during the onsite visit.
<b>CAR 5, changes in the MR or related documents</b>
Monitoring report has been revised to contain the correct model number of the meter.
<b>CAR 6:</b> Please update the MR to indicate the correct serial number of the electricity meter as verified during the onsite visit.
<b>CAR 6, means of verification</b>
Revised monitoring report has been verified to be updated with correct serial number.
<b>CAR 6, changes in the MR or related documents</b>
Monitoring report has been revised to contain correct serial number of the electricity meter.
<b>CAR 7:</b> Please indicate crosschecks for all the monitored parameter in the monitoring report.
<b>CAR 7, means of verification</b>
Revised monitoring report has been verified to be updated with cross check for relevant parameters.
<b>CAR 7, changes in the MR or related documents</b>
Monitoring report has been revised to contain cross check for the relevant paramters.
<b>CAR 8:</b> As per registered PDD, PPs shall use values from external accredited laboratory for all CODs, please update the CER calculation which uses internal COD values as well. Further, it was observed that the spreadsheet of COD didn't have COD values for Jan 2010, please include the COD values for Jan 2010 as well.
<b>CAR 8, means of verification</b>
Revised monitoring report & emission reduction have been verified to use external laboratory COD values. All the COD values were verified onsite using the certificate from external laboratory. All the external values have been cross-checked from the COD values measured internally.
<b>CAR 8, changes in the MR or related documents</b>
Monitoring report & emission reduction sheet have been updated to consider COD values from external laboratory as per registered PDD.
<b>CAR 9:</b> As per registered PDD, please update the CER calculation to take the conservative value among the ex-ante and ex-post emission reduction.
<b>CAR 9, means of verification</b>
Revised emission reduction sheet and monitoring report has been verified
<b>CAR 9, changes in the MR or related documents</b>
Monitoring report & emission reduction sheet have been updated to consider conservative approach between the two approaches.
<b>CR 1:</b> Please provide documentary evidences to verify the technical details of biogas boiler, anaerobic digester & flaring system including: a) capacity & other specifications b) commissioning date
<b>CR 1, means of verification</b>
Following documents have been verified for technical details: i) Biogas boiler – refer file 'Marshall Boiler specifications' ii) Burner – refer file 'Dunphy burner specifications' iii) CSTR – 'Biogas plant drawing'

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 25 of 29

iv) Flare system – 'Flare Capacity and specifications (Operation Manual)'
Further, operation manual has been verified to check the commissioning date for the plant.
<b>CR 1, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 2: Please provide us the quality manual/CDM manual for the project activity.</b>
<b>CR 2, means of verification</b>
The CDM manual/quality manual has been verified to be in line with the registered monitoring plan.
<b>CR 2, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 3: Please update the MR to transparently indicate the responsible entity for project management &amp; MR.</b>
<b>CR 3, means of verification</b>
The revised monitoring plan has been verified to contain transparent responsible entity for the project activity.
<b>CR 3, changes in the MR or related documents</b>
Monitoring report has been verified to have transparent responsible entity for the project.
<b>CR 4: It was verified during the onsite visit that electricity consumption from blower and burner connected to boiler was not monitored. Please provide us the list of all equipments consuming electricity inside the project boundary. Also update the CER calculation considering the project emissions from them.</b>
<b>CR 4, means of verification</b>
The revised emission reduction has been verified to contain power consumption including electricity consumption from boosting fan & biogas blower motor.
<b>CR 4, changes in the MR or related documents</b>
Emission reduction sheet and monitoring report has been updated to consider electricity consumption from boosting fan and biogas blower motor.
<b>CR 5: Please provide us documentary evidence to verify the repositioning performed for the flow meter to measure total biogas generation</b>
<b>CR 5, means of verification</b>
Service report was verified for the repositioning performed for the flow meter.
<b>CR 5, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 6: As per published MR &amp; registered PDD, Tcomb,e is calculated using biogas flow rate &amp; boiler running hours whereas applied methodology mentions it to be measured through runtime meter connected to flame detector or flame continuous temperature controller, please clarify the inconsistency.</b>
<b>CR 6, means of verification</b>
UV flame detector was verified onsite and data in the SCADA system was also verified.
<b>CR 6, changes in the MR or related documents</b>
Monitoring report has been revised to indicate the correct methodology for measuring Tcomb,e (based on run time meter connected to the flame detector in the boiler).
<b>CR 7: It was verified during the onsite visit that readings in the totalizer of the meter for F<sub>dig</sub> did not match with the readings of totalizer at SCADA system, please clarify this inconsistency</b>

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 26 of 29

observed for $F_{dig}$ & biogas flow meter ( $FR_{bio}$ ).
<b>CR 7, means of verification</b>
It was verified using maintenance record that totalizer reading of the meter was accidentally set to zero, which resulted in different totalizer reading of SCADA totalizer and meter onsite.
<b>CR 7, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 8: Please provide us the cross-check for the verified parameter <math>F_{dig}</math>.</b>
<b>CR 8, means of verification</b>
Total POME generated is cross-checked with average amount of POME generation per FFB procssed sourced from the journal showing readings for malaysian plants.
<b>CR 8, changes in the MR or related documents</b>
Monitoring report is revised to include the cross-check done.
<b>CR 9: As per registered PDD, PPs are required to measure <math>HG_{BL,y}</math> using steam quantity &amp; pressure readings, however the applied methodology states to use the biogas consumption &amp; the calorific value for <math>HG_{BL,y}</math>. Please clarify which approach has been used for CER calculation.</b>
<b>CR 9, means of verification</b>
Measurement of thermal energy is verified using both the approach (one using steam generation data and other using biogas consumption record), it was also verified that PPs have considered the conservative approach (which is thermal energy computation using biogas consumption record).
<b>CR 9, changes in the MR or related documents</b>
Monitoring report is revised to include the detail on both the approach.
<b>CR 10: Please clarify the following issues with respect to calibration certificate:</b>
1. Calibration certificate of electricity meter measuring consumption of electricity could not be related to the meter verified onsite.
2. Serial number verified onsite for flow meter F3 & F5 were not consistent with the calibration certificate provided.
3. Calibration certificate for the leakage testing equipment has not been provided.
4. Serial number in calibration certificate for $F_{dig}$ is not consistent with the serial number verified onsite.
5. Also provide us the documentary evidences on the accuracy class of the electricity meter used.
<b>CR 10, means of verification</b>
Revised calibration certificate and documents for accuracy was verified to be consistent with observation during the onsite visit.
<b>CR 10, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 11: As per published MR, monitoring frequency of the methane content in biogas is daily, however the same was not conducted onsite, please clarify.</b>
<b>CR 11, means of verification</b>
Revised monitoring report has been verified to have the correct monitoring frequency of seven readings per month.
<b>CR 11, changes in the MR or related documents</b>
Monitoring report was updated to have the correct monitoring frequency of seven readings per month.
<b>CR 12: Please clarify whether the gas analyzer used for the project activity measures the</b>

**SECOND PERIODIC VERIFICATION**

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 27 of 29

methane content at wet basis as per applied methodology. Also indicate the same in the MR transparently.
<b>CR 12, means of verification</b>
It was verified during the onsite visit that the process of methane content measurement did have any removal of moisture.
<b>CR 12, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 13:</b> As per published MR, raw data for methane analyzer comes from manual logbook, however no manual logbooks were found onsite, only print out from the gas analyzer can be obtained, please clarify.
<b>CR 13, means of verification</b>
Revised monitoring report has been verified to indicate correct source of record which is print out from the analyzer directly.
<b>CR 13, changes in the MR or related documents</b>
Monitoring report was revised to indicate correct source of record which is print out from the analyzer directly.
<b>CR 14:</b> Please update the monitoring plan in the MR to include the monitoring frequency for all the parameters.
<b>CR 14, means of verification</b>
Monitoring frequency in the monitoring plan of the MR was verified with the registered PDD and applied methodology.
<b>CR 14, changes in the MR or related documents</b>
Monitoring report was revised to indicate appropriate monitoring frequency of all the monitoring paramters.
<b>CR 15:</b> Please provide us the relevant industry standards for all the monitoring parameters based on which calibration frequency has been documented in MR.
<b>CR 15, means of verification</b>
Calibration frequency for the respective parameters was verified to be taken from ISO 9000 system since no relevant standards are available for calibration frequency. Further, it was also verified that the identified error in the calibration report is below the permissible limit for respective equipment.
<b>CR 15, changes in the MR or related documents</b>
No changes required in MR or related documents.
<b>CR 16:</b> As per registered PDD, please clarify which kind of sampling plan is used to measure COD related parameters & NC. Further, please provide us all the external & internal COD analysis report. Also clarify the following inconsistency in the COD values: 1. It was also verified during the site visit that CODin, CODout & COD land application values mentioned in the spreadsheet were not consistent with the third party documents onsite, please clarify. 2. COD value for land application effluent is mentioned as 2055 in the spreadsheet for JAN 2011; where as third party document verified onsite presents it as 22055 mg/l, please clarify. 3. Internal values for CODin and CODout for June 2009 was not available, please provide documentary evidence for the same.
<b>CR 16, means of verification</b>
Revised monitoring report and emission reduction sheet was verified to consider COD values from external laboratory and other documents for internal COD was submitted and verified.
<b>CR 16, changes in the MR or related documents</b>

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad,  
Jendarata Palm Oil Mill, Malaysia"



Industrie Service

Page 28 of 29

Monitoring report and emission reduction sheet has been updated.

**CR 17:** As per registered PDD, methane content in stack gas shall be monitored continuously, please clarify whether the same has been performed during the monitoring period.

**CR 17, means of verification**

Revised monitoring report and emission reduction sheet was verified to have 0.01% detection limit of methane in the stack gases. Further, quarterly report by external party was verified to check the methane content in the stack gases.

**CR 17, changes in the MR or related documents**

Monitoring report and emission reduction sheet has been updated to consider detection limit of 0.01% as methane emission in the stack gases.

**CR 18:** As per registered PDD, PPs shall perform sampling ensuring at least 95% confidence level. Please clarify how the same has been ensured in this monitoring period.

**CR 18, means of verification**

Revised monitoring report and emission reduction sheet was verified to have 0.01% detection limit of methane in the stack gases. Further, quarterly report by external party was verified to check the methane content in the stack gases.

**CR 18, changes in the MR or related documents**

Monitoring report and emission reduction sheet has been updated to consider detection limit of 0.01% as methane emission in the stack gases.

**CR 19:** Please clarify whether the reports shown by Chemvi lab & Environmental Science Sdb Bhd are accredited to perform these services.

**CR 19, means of verification**

It was verified using further documents provided that Chemvi lab & Environmental science Sdb are accredited by SAMM (SAMM no. 17025)

**CR 19, changes in the MR or related documents**

No changes required in MR or related documents.

**CR 20:** Please clarify how the monitored biogas consumption in the boiler throughout the monitoring period is more than the total biogas generated at the biogas plant.

**CR 20, means of verification**

It was verified using letter of confirmation, "[Novaviro\\_Service Report\\_Jun 9th 2011](#)" that setting was different for biogas consumption meter and biogas generation meter. This was rectified and confirmed from service report dated 9th June 2011. It was also verified that conservative value among the two has been considered for the emission reduction calculation.

**CR 20, changes in the MR or related documents**

Monitoring report and emission reduction sheet has been updated to consider conservative values among the two.

**CR 21:** As discussed during onsite visit, there were some outages during the monitoring period, however the calculation spreadsheet presents that plant was in operation throughout the year. Please clarify.

**CR 21, means of verification**

Outages were verified during the onsite visit and the revised monitoring report has also been verified.

**CR 21, changes in the MR or related documents**

Monitoring report and emission reduction sheet has been updated to consider outages.

## SECOND PERIODIC VERIFICATION

"Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia"

Page 29 of 29



Industrie Service

## 5 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed the second periodic verification of the CDM project: "Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia". The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC).

The management of United Plantation Berhad is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's Monitoring Plan indicated in the registered PDD version 04, dated 25-06-2007 and the applied methodology AM0013, Version 04

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements;
- the monitoring plan in Monitoring Report is as per the PDD and monitoring plan approved by the EB;
- the monitoring plan in the approved PDD is as per the applied methodology.

Our opinion is based on the project's GHG emissions and resulting GHG emission reductions reported, which have been both determined through the valid and registered project's baseline, its monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm the following statement:

Reporting period: From 01-05-2009 to 31-01-2011

Verified emissions in the above reporting period:

Baseline emissions:	67,765	t CO <sub>2e</sub>
Project emissions:	7,196	t CO <sub>2e</sub>
Leakage emission:	0	t CO <sub>2e</sub>
Emission reductions:	60,569	t CO <sub>2e</sub>

Munich, 27-07-2012

Thomas Kleiser

Certification Body "climate and energy"  
TÜV SÜD Industrie Service GmbH

Munich, 27-07-2012

Nikunj Agarwal

Assessment Team Leader



# **Annex 1**

## **Verification Protocol**



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

## Old text from previous verification (unchanged situation) in black colour

### Table of Contents

- |      |   |      |   |
|------|---|------|---|
| 1.   | Project Activity Implementation   | 2.4. | Parameters obtained through external sources and accounting data              |
| 1.1. | Technology  | 2.5. | Other parameters not included in the methodology/tool but included in the PDD |
| 1.2. | Organization  | 3.   | Data Processing and ER calculation  |
| 1.3. | Quality Management System   | 4.   | Additional assessment   |
| 1.4. | Remaining FARs from previous Verifications (or forwarded issues of validation report) | 4.1. | Internal Review   |
| 2.   | Monitoring Plan Implementation  | 4.2. | Peculiarities   |
| 2.1. | Parameters  | 4.3. | Further additional requirements   |
| 2.2. | Parameters measured directly with instruments   | 4.4. | Data Reporting  |
| 2.3. | Parameters measured through sampling  | 5.   | Compilation and Resolutions of CARs, CRs and FARs                             |



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 1. Project Activity Implementation

#### 1.1. Technology

Location (s)			
	PDD Description	Verified Situation	Conclusion and IRL
Description / Address:	<p><u>Description:</u></p> <p>The project activity involves an installation of anaerobic digester tanks in United Palm Oil Mill to extract biogas from Pal oil mill effluent (POME). The extracted biogas is intended to be utilised for steam generation using an already existing boiler (10 TPH Oil fired Maashal Boiler at Unitata berhad. Estimated amount of steam generation from the project activity is 3TPH at 11 bar.</p> <p>Project activity reduces emission by avoiding methane emission from anaerobic open lagoons &amp; avoiding usage of fuel oil in the boiler by utilizing biogas for the same.</p> <p><u>Address:</u></p> <p>United Plantation Bhd, Jendarata Palm Oil Mill,</p>	<p>As per uploaded MR &amp; onsite visit, PPs have implemented a closed tank anaerobic digestion technology (2 floating roof &amp; one fixed roof), based on the continuous flow stirred tank reactor system (CSTR) with sludge return design for the palm oil mill effluent (POME) treatment at United Plantations Jendarata Palm Oil Mill.</p> <p>The captured biogas is used in a boiler to generate steam, which is used for inhouse process consumption.</p>	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	36009 Teluk Intan, Perak, Malaysia.		
GSP coordinates:	Not mentioned	3°50' 9" N and 100°57' 90" E	Ok
Technical Equipment – Main Components			
	PDD Description	Verified Situation	Conclusion and IRL
Description	Project activity has following equipments installed: 1. Continuous flow stirred tank reactor system (CSTR) – Anaerobic digester 2. Existing oil fired boiler 3. Flaring equipment	Following major equipments have been installed: 1. Two floating roof tank digester & one fixed roof tank. 2. An existing oil fired boiler fitted with a burner to combust captured biogas 3. Open flaring equipment	Ok
Component 1: Anaerobic digester Technical Features	A closed tank anaerobic digestion technology, based on the continuous flow stirred tank reactor system (CSTR) with sludge return design, will be implemented for the palm oil mill effluent (POME) treatment at UP Jendarata Palm Oil Mill. As per registered PDD, the CSTR digester system achieves 85% methane conversion efficiency in terms of total COD input.	Following are the technical specifications of anaerobic digester verified onsite:  Capacity: 2 units of floating roof tanks, each of capacity 2500 m3 and a fixed roof digester tank. Manufacturer: - Commissioning date: - Serial number: -  <b><u>Corrective Action Request No.1</u></b>	CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

		Please update the MR to include details on manufacturer, serial number & commissioning date of respective equipment installed (namely digester tanks & flaring equipment).	
Component 2: Oil fired boiler (Biogas boiler in the project activity). Technical Features	As per registered PDD, the PP shall utilize the biogas captured for steam generation using the existing 10 t/h fuel oil-fired Mashall Boiler at Unitata Berhad, an associated company located adjacent to UP Jendarata Palm Oil Mill. The boiler shall be fitted with an advanced Dunphy Dual Burner with automatic control to allow for biogas-firing	<p>As per published MR, following are details of Biogas boiler:</p> <p>Capacity: Manufacturer: Marshall Boiler, model FS6000 Commissioning date: Serial number: 98127</p> <p>For biogas burner: Capacity: Minimum gas inlet pressure is at 1.3 psi. Manufacturer: Dunphy burner, model THD 530 ZML VP RT Serial number 21865</p> <p><b><u>Clarification Request No. 1.</u></b> Please provide documentary evidences to verify the technical details of biogas boiler, anaerobic digester &amp; flaring system including: a) capacity &amp; other specifications b) commissioning date</p>	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Component 3: Open flaring system. Technical Features	No details on technical specifications have been provided in the registered PDD.	Capacity: Manufacturer: Commissioning date: Serial number:  Please refer to CAR 1 above.	CAR
Operation Status during verification			
	Verified Situation		Conclusion and IRL
Approvals / Licenses	Please refer to CAR 2 below.		CAR
Actual Operation Status	<p>Start date of operation (each site if applicable): As per published MR, operation of the project activity started on 01/09/2006</p> <p>Under construction <input type="checkbox"/></p> <p>In operation <input checked="" type="checkbox"/></p> <p>Out of operation <input type="checkbox"/></p> <p>Reason and date (if out of operation):</p>		Ok
	<p><b><u>Corrective Action Request No.2</u></b></p> <p>As per EB 54 annex-34, please update the MR to include details on the actual operation of the project activity during the monitoring period like any downtimes of equipments, overhaul, etc. Also include the legal approval or license required to run the project.</p>		CAR
Remarks to Special Operational Status During the Verification Period	<p>Phased implementation: It was verified onsite that project activity has been commissioned.</p> <p>Special cases: Please refer to CAR 2 above..</p>		CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 1.2. Organization

Project Participant (s)		
	Verified Situation	Conclusion and IRL
Entity / Responsible person: As per registered PDD, PPs are: a. United Plantations Bhd Contact person: Mr. Carl Bek-Nielsen b. Royal Danish Ministry of Foreign Affairs Contact person: Mr. Bjorn Blau	As per updated UNFCCC & site visit, following project participants can be verified:  1. United Plantations Bhd Contact person: Mr. Carl Bek-Nielsen 2. Danish Ministry of Climate and Energy/Danish Energy Agency Contact person: Mr. Ole Emmik Sorensen	Ok
CDM Project management:	United Plantation is the organization responsible for CDM project management.	Ok

### 1.3. Quality Management System

General aspects of the Quality Management System		
	Verified Situation	Conclusion and IRL
Quality Management Manual:	<b><u>Clarification Request No. 2.</u></b> Please provide us the quality manual/CDM manual for the project activity.	CR
Responsibilities:	As per uploaded MR, responsible person are: Henrik Rytter Jensen	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	<p>Danish Energy Management 37-1, The Capsquare Residences No.2, Persiaran Capsquare 50100 Kuala Lumpur, Malaysia Tel : +603 2694 3033 Fax : +603 2694 4033 E-mail: <a href="mailto:hri@dem.dk">hri@dem.dk</a></p> <p>Yogaanandh Tanggaraju Danish Energy Management 37-1, The Capsquare Residences No.2, Persiaran Capsquare 50100 Kuala Lumpur, Malaysia Tel : +603 2694 3033 Fax : +603 2694 4033 E-mail: <a href="mailto:yat@dem.dk">yat@dem.dk</a></p> <p><b><u>Clarification Request No. 3.</u></b> Please update the MR to transparently indicate the responsible entity for project management &amp; MR.</p>	
Qualification and Training:	To be assessed based on quality manual, please refer to CR 2 above. It was verified that appropriate training and qualification was done.	CR
Implementation of QM-system	To be assessed based on quality manual, please refer to CR 2 above. Based on submitted quality manual it was verified that QM system was implemented effectively.	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 1.4. Remaining FARs from previous Verifications (or forwarded issues of validation report)

Remaining Requests from Previous Verifications	Summary of project owner response	Audit team Conclusion and IRL
Forward action request No. 1:		-

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

## 2. Monitoring Plan Implementation

### 2.1. Parameters

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
$F_{dig}$ : Flow rate of organic wastewater into the digester	$F_{dig}$ Flow rate of organic wastewater into the digester	$F_{dig}$ Flow rate of organic wastewater into the digester	2.2 table 1	Both PDD & published MR has included this parameter, actual monitoring of this parameter has also been verified onsite.	Ok
$COD_{c,BI}$ concentration of organic wastewater into the digester or directed for land application	$COD_{c,baseline}$ concentration of organic wastewater into the digester	$COD_{c,baseline}$ concentration of organic wastewater into the digester	2.3 table 1	Both PDD & published MR has included this parameter, actual monitoring of the same has been done thrice in a week by certified chemist in an internal laboratory. This parameter is also sent for the external testing once a month to ISO 17025 accredited laboratory who uses APHA 5220 C test methods.	Ok
$COD_{a,out}$ COD that leaves the lagoon with the effluent	$COD_{a,out}$ COD concentration of the effluent that leaves the lagoon.	$COD_{a,out}$ COD concentration of the effluent that leaves the lagoon.	2.3 table 2	As per applied methodology & registered PDD, historical baseline scenario value has been considered & verified.	Ok



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
COD <sub>a,in</sub> COD that enters the lagoon	COD <sub>a,in</sub> COD concentration of the effluent that enters the lagoon which is assumed to be equal to the COD input to the digester.	COD <sub>a,in</sub> COD concentration of the effluent that enters the lagoon which is assumed to be equal to the COD input to the digester	2.3 table 3	As per applied methodology & registered PDD, historical baseline scenario value has been considered & verified.	Ok
T <sub>lag</sub> Ambient Temperature	T <sub>lag</sub> Temperature of lagoon.	T <sub>lag</sub> Temperature of lagoon.	2.4 table 1	Both PDD & published MR has included this parameter, actual monitoring of the same has been done by Malaysian Meteorological Services department. Daily records of the same have been verified onsite.	Ok
D <sub>lag</sub> Depth of lagoon	D <sub>lag</sub> Depth of lagoon	D <sub>lag</sub> Depth of lagoon	-	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified onsite, daily records of lagoon's depth has also been verified.	Ok
EG <sub>y</sub> Amount of electricity in the year y that	Not included in the monitoring plan	Not included in the monitoring plan	NA	NA	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
would be consumed at the project site in the absence of the project activity					
EG <sub>d,y</sub> Amount of electricity generated utilizing the biogas collected during project activity and exported to the grid during the year	Not included in the monitoring plan	Not included in the monitoring plan	NA	As per registered PDD, methane captured is not used for electricity generation, hence not applicable.	Ok
HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity using fossil fuel	HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity using fossil fuel	HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity using fossil fuel	2.2 table 2	Both PDD & published MR has included this parameter, this parameter has been calculated from biogas consumption & methane analyser, the same has been verified onsite.	Ok
F <sub>dig_out</sub> Flow rate of organic wastewater into the digester	F <sub>dig_out</sub> Flow rate of organic wastewater from the digester.	F <sub>dig_out</sub> Flow rate of organic wastewater from the digester.	2.2 table 1	Both PDD & published MR has included this parameter. As per registered PDD, this parameter has been conservatively considered same as F <sub>dig</sub> .	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
COD <sub>c,dig_out</sub> concentrations in discharged effluent from digester	COD <sub>c,dig_out</sub> COD concentration in discharged effluent from digester	COD <sub>c,dig_out</sub> COD concentration in discharged effluent from digester	2.3 table 4	Both PDD & published MR has included this parameter, actual monitoring of the same has been done thrice in a week by certified chemist in an internal laboratory. This parameter is also sent for the external testing once a month to ISO 17025 accredited laboratory who uses APHA 5220 C test methods.	Ok
EL <sub>p,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity	EL <sub>pr,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity.	EL <sub>pr,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity.	2.2 table 3	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified onsite. <b><u>Clarification Request No. 4.</u></b> It was verified during the onsite visit that electricity consumption from blower and burner connected to boiler was not monitored. Please provide us the list of all equipments consuming electricity inside the project boundary. Also update the CER calculation considering the project emissions from them.	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
$HG_{Pr,y}$ Quantity of thermal energy consumed in year y at the project site due to the project activity.	Not included	Not included	NA	NA since the project activity does not consumes thermal energy in the project activity.	Ok
$F_{la}$ Flow rate of sludge used for land application after dewatering	$F_{la}$ Flow rate of sludge applied to land.	$F_{la}$ Flow rate of sludge applied to land.	2.2 table 4	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified onsite. This parameter determines the amount of waste water discharge along with sludge to land application.	Ok
$COD_{c,la}$ of the sludge used for land application after dewatering	$COD_{c,la}$ COD concentrations in sludge used for land application.	$COD_{c,la}$ COD concentrations in sludge used for land application.	2.3 table 5	Both PDD & published MR have included this parameter. The sample from site is sent for the external testing once a month to ISO 17025 accredited laboratory who uses APHA 5220 C test methods.	Ok
$F_{c,dw}$ Flow rate of organic wastewater from the dewatering process	Not included	Not included	NA	As per registered PDD, liquid effluent is applied directly on land without dewatering, hence not applicable.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
COD <sub>c,dw</sub> of the wastewater from the dewatering process	Not included	Not included	NA	As per registered PDD, liquid effluent is applied directly on land without dewatering, hence not applicable.	Ok
FR <sub>bio</sub> Amount of biogas collected in the outlet of the Biodigester	FR <sub>bio</sub> Amount of biogas collected in the outlet of the Biodigester measuring using a continuous flow meter	FR <sub>bio</sub> Amount of biogas collected in the outlet of the Biodigester measuring using a continuous flow meter	2.2 table 5	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified onsite. <b>Clarification Request No. 5.</b> Please provide us documentary evidence to verify the repositioning performed for the flow meter to measure total biogas generation.	CR
P <sub>CH4,bio</sub> Percentage of methane in the biogas in the outlet of the biodigester	P <sub>CH4,bio</sub> Percentage of biogas that is methane in the outlet of the biodigester.	P <sub>CH4,bio</sub> Percentage of biogas that is methane in the outlet of the biodigester.	2.2 table 6	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified, it was done using portable gas analyzer.	Ok
FR <sub>f,inlet</sub> Flow rate of the biogas entering the flare	FR <sub>f,inlet</sub> Flow rate of biogas entering the	FR <sub>f,inlet</sub> Flow rate of biogas entering the flare	2.2 table 7	Both PDD & published MR has included this parameter, actual monitoring of the same has been	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
	flare			verified onsite.	
$PE_{flare,y}$ Project emissions from flaring of the residual gas stream in year $y$	$PE_{flare,y}$ Project emissions from flaring of the residual gas stream in year $y$	$PE_{flare,y}$ Project emissions from flaring of the residual gas stream in year $y$	Calculated value	Both PDD & published MR has included this parameter, calculation of the same has been verified.	Ok
$FR_{e,inlet}$ Flow rate of the biogas entering the electricity generation equipment	Not included	Not included	NA	As per registered PDD, there is no electricity generation from the captured biogas.	Ok
$FR_{e,s}$ Flow rate of the electricity generation equipment stack gases	Not included	Not included	NA	As per registered PDD, there is no electricity generation from the captured biogas.	Ok
$P_{CH_4,e,s}$ Methane content in-stack gas of electricity generation equipment	Not included	Not included	NA	As per registered PDD, there is no electricity generation from the captured biogas.	Ok
$FR_{e,inlet}$ Flow rate of the biogas entering the heat	$FR_{e,inlet}$ Flow rate of the biogas entering	$FR_{e,inlet}$ Flow rate of the biogas entering the	2.2 table 8	Both PDD & published MR has included this parameter, actual monitoring of the same has been	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
generation equipment	the heat generation equipment	heat generation equipment		verified onsite. This parameter has been monitored using flow meters onsite.	
FR <sub>e,s</sub> Flow rate of the heat generation equipment stack gases	FR <sub>e,s</sub> Flow rate of the heat generation equipment stack gases	FR <sub>e,s</sub> Flow rate of the heat generation equipment stack gases	2.2 table 9	Both PDD & published MR has included this parameter. <b><u>Corrective Action Request No.3</u></b> It was verified onsite that the flow meter at the heat generation equipment stack gases was faulty from 25th feb'2011. Please clarify how PP monitored the flow of stack gases for the faulty period & also include the same in the monitoring report.	CAR
P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	2.3 table 6	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified onsite.	Ok
T <sub>comb,e</sub> Fraction of time gas is combusted in the heat generation equipment	T <sub>comb,e</sub> Fraction of time gas is combusted in the heat generation equipment	T <sub>comb,e</sub> Fraction of time gas is combusted in the heat generation equipment	Please refer to CR 5 here	Both PDD & published MR has included this parameter. <b><u>Clarification Request No. 6.</u></b> As per published MR & registered PDD, Tcomb,e is calculated using biogas flow rate & boiler running	CR



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
				hours whereas applied methodology mentions it to be measured through runtime meter connected to flame detector or flame continuous temperature controller, please clarify the inconsistency.	
S <sub>e</sub> For land application	So Amount of sludge applied to land	So Amount of sludge applied to land	2.3 table 8	Both PDD & published MR has included this parameter, the same has been verified using total suspended solid concentration data from external accredited lab report using APHA 2540D test standard & flow of sludge for land application.	Ok
NC	NC Nitrogen content in the sludge used for land application, for estimating N <sub>2</sub> O emission in project emission.	NC Nitrogen content in the sludge used for land application, for estimating N <sub>2</sub> O emission in project emission.	2.3 table 7	Both PDD & published MR has included this parameter, actual monitoring of the same has been verified using external accredited lab using APHA 4500 Norg-B test standard.	Ok
Regulations and incentives relevant to	Regulations and incentives rele-	Regulations and incentives relevant		Both PDD & published MR has included this parameter, actual	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
effluent	vant to effluent	to effluent		monitoring of the same has been verified.	

### 2.2. Parameters measured directly with instruments

Table 1

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	$F_{dig}$ :Flow rate of organic wastewater into the digester & $F_{dig\_out}$ Flow rate of organic wastewater from the digester	$F_{dig}$ :Flow rate of organic wastewater into the digester & $F_{dig\_out}$ Flow rate of organic wastewater into the digester	$F_{dig}$ :Flow rate of organic wastewater into the digester & $F_{dig\_out}$ Flow rate of organic wastewater from the digester	Fdig & Fdig_out has been monitored by the same equipment and is expected to have same value as per registered PDD. Parameter title & description is consistent within registered PDD, MR & applied methodology.	Ok
Parameter ID (if available)	Data #1	#1	Not mentioned	<b>Corrective Action Request No.4</b> Please include the ID number in the	CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

				MR to maintain consistency with registered PDD & applied methodology.	
Data Unit	m3/month	m3/year	m3/month	m3 (obtained from the totalizer records at SCADA system onsite)	Ok
Monitoring frequency (reading)	Continuously	Continuously	Continuously	Continuously	Ok
Monitoring frequency (recording)	Monthly	Monthly	Hourly	Hourly	Ok
Calibration requirements	Calibration is subjected to industry standards.	-	Annual Calibration.	Last two calibration dates for the flow meter are on: 5 <sup>th</sup> Nov 2010 6 <sup>th</sup> Nov 2009	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Flow meter	-	Flow meter	It was verified during the onsite visit that a magnetic flow meter has been installed.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Magnetic Flowmeter				Ok
Serial Number:	7ME651 553114T296				Ok
Manufacturer Model Nr.:	Siemens <b><u>Corrective Action Request No.5</u></b> Please update the monitoring report to indicate the correct model number of the meter as verified onsite.				CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Specific Location:	It is located before holding tank.	Ok
Measurement Range:	0 to 20 mA	Ok
Gaps in operating time of instrument :	Period: Data for the period of 1 <sup>st</sup> May 2009 to 31 <sup>st</sup> Jan 2011. <b><u>Clarification Request No. 7.</u></b> It was verified during the onsite visit that readings in the totalizer of the meter for $F_{dig}$ did not match with the readings of totalizer at SCADA system, please clarify this inconsistency observed for $F_{dig}$ & biogas flow meter ( $FR_{bio}$ ).	CR
	Default value used: No default values have been used for flow meter readings.	Ok
	Justification: No default values have been used for $f_{dig}$ in this monitoring period.	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Raw data has been verified from the SCADA system available at the boiler house & also from the monitoring panel at biogas plant displaying the totalizer reading. However, the instant totalizer value of meter was not consistent with the SCADA system, please refer to CR 7 above.  Type: .csv files are obtained from the SCADA system.	CR
	Procedures: Please refer to CR 7 above.	CR
	Implementation of procedure: Please refer CR7 above.	CR
	Responsibility: Automatically captured in SCADA system.	Ok
Archiving of raw data and protection measures	Data has been archived electronically with a backup data as well.	Ok
Data transfer and protection	Automatically captured in SCADA in the form of .csv files which is in turn used for CER calcula-	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

of input data for calculations	tion.	
	Quality of evidence	Conclusion and IRL
Completeness of data	Hourly data for the full monitoring period was available onsite from SCADA system and the same has been verified successfully.	Ok
Data verification	Consistency of raw data with calculation tool: Total POME supplied to the digester tanks by the project activity has been verified to be 194,604 m <sup>3</sup> for this monitoring period.	Ok
	Consistency of calculation tool with monitoring report: Total POME supplied to the digester tanks by the project activity has been verified to be 194,604m <sup>3</sup> for this monitoring period.	Ok
Crosscheck (if available)	<b><u>Clarification Request No. 8.</u></b> Please provide us the cross-check for the verified parameter Fdig.	CR

Table 2

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of	HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of	HG <sub>Bl,y</sub> Quantity of thermal energy that would be consumed in year y at the project site in the absence of	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	the project activity using fossil fuel	the project activity using fossil fuel	the project activity using fossil fuel		
Parameter ID (if available)	Data #9	#9	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	MJ/year	MJ	MJ/year	<b><u>Clarification Request No. 9.</u></b> As per registered PDD, PPs are required to measure $HG_{BL,y}$ using steam quantity & pressure readings, however the applied methodology states to use the biogas consumption & the calorific value for $HG_{BL,y}$ . Please clarify which approach has been used for CER calculation.	CR
Monitoring frequency (reading)	Not mentioned	Continuously	Continuous measurement of Steam flow	Please refer to CR 9 above.	CR
Monitoring frequency (recording)	Not mentioned	Monthly	Not mentioned	For biogas flow meter: Hourly Methane content: Monthly	Ok
Calibration requirements	Shall be verified as recommended by manufacturer	-	Annual Calibration.	Calibration has been performed annually for the biogas flow meters monitoring biogas consumption.	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	-	-	thermal mass flow meter	Please refer to CR 9 above.	CR
	Technical aspects				Conclusion and IRL

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Instrument Type:	Vortex flowmeter	Ok
Serial Number:	S5F606169-624	Ok
Manufacturer Model Nr.:	Yokogawa / DY100	Ok
Specific Location:	Located before the boiler.	Ok
Measurement Range:	Please refer to CR 9 above.	CR
Gaps in operating time of instrument :	Period: No gaps have been identified in the monitoring period.	Ok
	Default value used: Not applied.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	SCADA system Type: Please refer to CR 9 above.	CR
	Procedures: Readings are automatically sourced to SCADA system and stored in the form csv files.	Ok
	Implementation of procedure: Yes, the system was in place effectively.	Ok
	Responsibility: Transfer of data is done in an automated way using SCADA system.	Ok
Archiving of raw data and protection measures	Data has been archived electronically with a backup data as well.	Ok
Data transfer and protection of input data for calculations	Automatically captured in SCADA in the form of .csv files which is in turn used for CER calculation.	Ok
	Quality of evidence	Conclusion



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

		and IRL
Completeness of data	It was verified that the data is complete for this monitoring period.	Ok
Data verification	Consistency of raw data with calculation tool: Yes, the verified data was found to be consistent with the figures used in emission reduction calculation.	Ok
	Consistency of calculation tool with monitoring report: Monitoring report is also verified to be consistent with the data mentioned in the emission reduction sheet. .	Ok
Crosscheck (if available)	Please refer to CR 9 above.	CR

Table 3

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	EL <sub>pr,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity.	EL <sub>p,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity	EL <sub>pr,y</sub> Amount of electricity in the year y that is consumed at the project site for the project activity.	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #12	#12	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	MWh/yr	MWh	MWh/yr	kWh	
Monitoring frequency	Continuously	Continuously	Continuous	Continuous using a electricity meter	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

(reading)				Please refer to CR 4 above.	
Monitoring frequency (recording)	Not mentioned	Not mentioned	daily	Daily	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry standards	-	Annual Calibration.	Calibration certificate of the electricity meter was verified, and it was done on: Date of initial calibration: 15/12/08 Date of 2nd calibration: 19/10/09 Date of last calibration: 15/10/10 <b><u>Clarification Request No. 10.</u></b> Calibration certificate provided for the electricity meter measuring consumption of electricity could not be related to the meter verified onsite. Please clarify. Also provide us the documentary evidences on the accuracy class of the meter used.	Ok
Uncertainty level	Not mentioned	Not mentioned	Accuracy Class 2	Please refer to CR 10 above.	CR
Measurement Principle (if applicable)	-	-	thermal mass flow meter	As per published MR, electricity meter has been installed, the same has been verified during the onsite visit.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Electricity meter (energy meter)				Ok
Serial Number:	2005-2035807 <b><u>Corrective Action Request No.6</u></b> Please update the MR to indicate the correct serial number of the electricity meter as verified dur-				CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	ing the onsite visit.	
Manufacturer Model Nr.:	MPI Lenin	Ok
Specific Location:	At the biogas plant control room.	Ok
Measurement Range:	0 to 100 A/sec	Ok
Gaps in operating time of instrument :	Period: Daily monitoring data has been verified onsite for this monitoring period. However no monitoring of electricity was done for burner (blower) & fan onsite. Please refer CR 4 above.	Ok
	Default value used: Please refer to CR 4 above.	CR
	Justification: Please refer to CR 4 above.	CR
	QA/QC aspects	Conclusion and IRL
Source of data	Raw data has been sourced from manual logbook and the same has been verified onsite. Type: Manual logbook.	Ok
	Procedures: Operator at biogas plant records the daily reading in the manual logsheet & the same is aggregated monthly by technician. The same also transferred to soft copy by a clerk onsite.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	Ok
	Responsibility: Operator at the biogas plant is responsible for recording the reading.	Ok
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

		and IRL
Completeness of data	Monitoring data for this monitoring period has been verified onsite.	Ok
Data verification	Consistency of raw data with calculation tool: It was verified onsite that total electricity consumed is 865,631 kWh in the monitoring period. However please refer to CR 4 above.	CR
	Consistency of calculation tool with monitoring report: It was verified onsite that total electricity consumed is 865,631 kWh in the monitoring period. However please refer to CR 4 above.	CR
Crosscheck (if available)	<b><u>Corrective Action Request No.7</u></b> Please indicate crosschecks for all the monitored parameter in the monitoring report.	CAR

Table 4

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	F <sub>la</sub> Flow rate of sludge applied to land.	F <sub>la</sub> Flow rate of sludge used for land application after dewatering	F <sub>la</sub> Flow rate of sludge applied to land.	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #14	#14	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	m3/yr	m3/yr	m3/yr	m3/yr	Ok
Monitoring frequency (reading)	Continuously	Continuously	Continuous	Two continuous flow meter has been installed onsite for measuring the amount of waste water & sludge to the land applica-	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

				tion.	
Monitoring frequency (recording)	Not mentioned	Not mentioned	daily	Daily recording of the totalizer reading is done onsite.	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry standards	-	Annual Calibration.	Calibration of the flow meter has been verified to be done on: Date of initial calibration: 14/11/08 Date of 2nd calibration: 06/11/09 Date of last calibration: 05/11/10	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Flow meter	-	Flow meter	Two continuous flow meter has been installed onsite for measuring the amount of waste water & sludge to the land application.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Magnetic flow meter				Ok
Serial Number:	8C0CC019000 / 87163719000				Ok
Manufacturer Model Nr.:	Endress Hauser / Promag 10				Ok
Specific Location:	Both the flow meters are located after the facultative pond 5 onsite.				Ok
Measurement Range:	-				Ok
Gaps in operating time of instrument :	Period: Daily monitoring data has been verified onsite for this monitoring period				Ok
	Default value used: No gaps has been observed, hence no default values are required.				Ok
	Justification: No gaps has been observed, hence no default values are required.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	QA/QC aspects	Conclusion and IRL
Source of data	It was verified onsite that raw data has been recorded daily on the manual logbook. Type: Manual logbook.	Ok
	Procedures: Lab technician goes to site daily to record the daily reading in the manual logsheet & the same is aggregated monthly. The same also transferred to soft copy by a clerk onsite on monthly basis.	Ok
	Implementation of procedure: Implementation of procedure has been successfully verified.	Ok
	Responsibility: Lab technician is the responsible person to take the readings from the meter. However further verification of data is performed by CDM manager.	Ok
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Monitoring data for this monitoring period has been verified onsite.	Ok
Data verification	Consistency of raw data with calculation tool: Raw data at the calculation tool has been verified with the data used for the CER calculations.	Ok
	Consistency of calculation tool with monitoring report: Calculation tool is on line with the methods mentioned in the MR.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Crosscheck (if available)	Please refer to CAR-7 above.	CAR
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Table 5

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	FR <sub>bio</sub> Amount of bio-gas collected in the outlet of the Biodigester measuring using a continuous flow meter	FR <sub>bio</sub> Amount of bio-gas collected in the outlet of the Biodigester	FR <sub>bio</sub> Amount of bio-gas collected in the outlet of the Biodigester measuring using a continuous flow meter	Parameter title & description is consistent within registered PDD, MR & applied methodology. However, before 21 <sup>st</sup> Oct 2009 this parameter was calculated by adding the amount of gas flared and amount of biogas consumed by boiler (the same is also verified to be approved as a deviation, I-DEV0266).	Ok
Parameter ID (if available)	Data #18	#18	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	m3/yr	m3/yr	m3/yr	m3/y	Ok
Monitoring frequency (reading)	Continuously	Continuously	Continuous	Continuous	Ok
Monitoring frequency (recording)	Not mentioned	Not mentioned	Hourly	Hourly	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry standards	-	Annual Calibration.	Calibration of the flow meter was verified to be done on: Date of initial calibration: 14/11/08 Date of 2nd calibration: 06/11/09 Date of last calibration: 05/11/10	Ok



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Flow meter	-	Flow meter	Vortex flow meter has been verified to be installed.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Vortex flow meter as per published MR				Ok
Serial Number:	85029120000				Ok
Manufacturer Model Nr.:	Endress Hauser/ Prowirl 72				Ok
Specific Location:	It is located at the biogas plant measuring the total biogas generated from the three digester.				Ok
Measurement Range:	-				Ok
Gaps in operating time of instrument :	Period: Monitoring data for this monitoring period has been successfully found and verified.				Ok
	Default value used: No default value is required for this monitoring period.				Ok
	Justification: NA				Ok
	QA/QC aspects				Conclusion and IRL
Source of data	It was verified onsite that the hourly readings from the sensor are automatically transferred to monitoring panel & SCADA system subsequently.				Ok
	Type: Data from SCADA system.				
	Procedures: It was verified onsite that the hourly readings from the sensor are automatically transferred to monitoring panel & SCADA system subsequently. The readings are verified CDM manager monthly.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Implementation of procedure: yes it was verified that the procedure stated above were implemented from 21 <sup>st</sup> Oct 2009 onwards. Before 21 <sup>st</sup> Oct 2009 this parameter was calculated by adding the amount of gas flared and amount of biogas consumed by boiler (the same is also approved as a deviation, I-DEV0266).	Ok
	Responsibility: Assistant engineer onsite is responsible for sourcing the values from SCADA system monthly.	Ok
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Monitoring data for this monitoring period has been verified successfully.	Ok
Data verification	Consistency of raw data with calculation tool: Total biogas generated from bio-digester is verified to be 7,777,921 Nm3 in this monitoring period.	Ok
	Consistency of calculation tool with monitoring report: Data presented in calculation tool is verified to be consistent with monitoring report.	Ok
Crosscheck (if available)	Please refer to CAR7 above.	CAR

Table 6

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

					and IRL
Parameter title	P <sub>CH4,bio</sub> Percentage of biogas that is methane in the outlet of the bio-digester.	P <sub>CH4,bio</sub> Percentage of methane in the biogas in the outlet of the bio-digester	P <sub>CH4,bio</sub> Percentage of biogas that is methane in the outlet of the bio-digester.	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #19	#19	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	%	%	%	%	Ok
Monitoring frequency (reading)	Quarterly	Quarterly	Daily	Seven readings in a month	Ok
Monitoring frequency (re-cording)	Quarterly	Quarterly	Daily	<b><u>Clarification Request No. 11.</u></b> As per published MR, monitoring frequency of the methane content in biogas is daily, however the same was not conducted onsite, please clarify.	CR
Calibration requirements	Not specified	-	Annual Calibration.	Calibration of the portable gas analyzer was verified to be done on: Date of initial calibration: 30/07/08 Date of 2nd calibration: 16/06/09 Date of last calibration: 28/04/10	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Portable gas analyzer	-	Gas analyser	Gas analyzer has been used, the same has been verified onsite.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Technical aspects	Conclusion and IRL
Instrument Type:	Portable gas analyser <b><u>Clarification Request No. 12.</u></b> Please clarify whether the gas analyzer used for the project activity measures the methane content at wet basis as per applied methodology. Also indicate the same in the MR transparently.	CR
Serial Number:	GA10356	Ok
Manufacturer Model Nr.:	Geotechnical Instruments/GA 2000	Ok
Specific Location:	Location of the sampling point is after the booster fan at biogas plant.	Ok
Measurement Range:	-	Ok
Gaps in operating time of instrument :	Period: Monitoring data for this monitoring period has been verified successfully.	Ok
	Default value used: No default values have been used for this monitoring period.	Ok
	Justification: NA.	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	<b><u>Clarification Request No. 13.</u></b> As per published MR, raw data for methane analyzer comes from manual logbook, however no manual logbooks were found onsite, only print out from the gas analyzer can be obtained, please clarify.	CR
	Procedures: Please refer to CR 13 above.	CR
	Implementation of procedure: Print out from the portable gas analyzer is maintained for this parameter by the assistant engineer onsite.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Responsibility: Assistant engineer onsite is responsible for maintaining and keeping this data.	
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Monthly data for this monitoring period has been verified onsite. However, please refer to CR 13 above.	CR
Data verification	Consistency of raw data with calculation tool: Average methane content in the biogas generated from bio-digester has been verified to be 58.68% for this monitoring period.	Ok
	Consistency of calculation tool with monitoring report: Values used in the calculation tool is consistent with the monitoring report.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

Table 7

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	FR <sub>f,inlet</sub>	FR <sub>f,inlet</sub>	FR <sub>f,inlet</sub>	Parameter title & description is consistent within registered PDD, MR & applied	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Flow rate of biogas entering the flare	Flow rate of the biogas entering the flare	Flow rate of biogas entering the flare	methodology	
Parameter ID (if available)	Data #20	#20	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	m3/yr	m3/yr	m3/yr	m3/yr	Ok
Monitoring frequency (reading)	Continuously	Continuously	Continuous	Continuous	Ok
Monitoring frequency (re-cording)	Not mentioned	Not mentioned	Daily	Hourly recording has been verified onsite	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry standards	-	Annual Calibration.	It was verified onsite to be calibrated on: Date of initial calibration: 14/11/08 Date of 2nd calibration: 06/11/09 Date of last calibration: 05/11/10	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Flow meter	-	Flow meter	Flow meter has been installed & verified onsite..	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Vortex flow meter				Ok
Serial Number:	8A026E20000				Ok
Manufacturer Model Nr.:	Endress Hauser / Prowirl 72				Ok
Specific Location:	Just before the flaring point at the biogas plant				Ok
Measurement Range:	-				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Gaps in operating time of instrument :	Period: Hourly records for this monitoring period has been found and verified.	Ok
	Default value used: No default values have been used in this monitoring period.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Raw data has been sourced from SCADA system at the Unitata boiler house. Type: .csv files from SCADA system.	Ok
	Procedures: Readings from the flow meter are automatically transferred to the computer using SCADA system. This is verified by Assistant engineer on monthly basis.	Ok
	Implementation of procedure: Procedure has been verified to be implemented onsite.	Ok
	Responsibility: Assistant engineer onsite is responsible to maintain the records for this parameter.	Ok
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Records for this monitoring period has been found and verified.	Ok
Data verification	Consistency of raw data with calculation tool: Total biogas entering the flare has been verified to be 29,360 Nm3 in this monitoring period.	Ok



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Consistency of calculation tool with monitoring report: Values used in calculation tool is found to be consistent with the MR.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

Table 8

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	FR <sub>e,inlet</sub> Flow rate of the biogas entering the heat generation equipment	FR <sub>e,inlet</sub> Flow rate of the biogas entering the heat generation equipment	FR <sub>e,inlet</sub> Flow rate of the biogas entering the heat generation equipment	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #28	#26	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	m3/yr	m3/yr	m3/yr	m3/yr	Ok
Monitoring frequency (reading)	Continuously	Continuously	Continuous	Continuous	Ok
Monitoring frequency (recording)	Not mentioned	Not mentioned	Hourly	Hourly	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry stan-	-	Annual Calibration.	Calibration details have been verified on-site as follows: Calibration frequency: Annual Date of initial calibration: 14/11/08	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	dards			Date of 2nd calibration: 06/11/09 Date of last calibration: 05/11/10	
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
Measurement Principle (if applicable)	Flow meter	-	Flow meter	Flow meter has been installed onsite.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Vortex flow meter				Ok
Serial Number:	S5F606169-624				Ok
Manufacturer Model Nr.:	Yokogawa / DY100				Ok
Specific Location:	It is located at the biogas fuel pipeline just before combustion at the boiler house in Unitata.				Ok
Measurement Range:	-				Ok
Gaps in operating time of instrument :	Period: records for this monitoring period has been found and verified.				Ok
	Default value used: No default values have been used in this monitoring period by the PP.				Ok
	Justification: NA				Ok
	QA/QC aspects				Conclusion and IRL
Source of data	Raw data has been sourced from SCADA system at the Unitata boiler house. Type: .csv files from SCADA system.				Ok
	Procedures: Readings from the flow meter are automatically transferred to the computer using SCADA system. This is verified by Assistant engineer on monthly basis.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Implementation of procedure: Procedure has been verified to be implemented onsite.	Ok
	Responsibility: Assistant engineer onsite is responsible to maintain the records for this parameter.	Ok
Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Records for this monitoring period has been found and verified.	Ok
Data verification	Consistency of raw data with calculation tool: Total biogas entering into the heat generation equipment has been verified as 7,748,561 Nm3 in this monitoring period.	Ok
	Consistency of calculation tool with monitoring report: Values in calculation tool is found to be consistent with the monitoring report.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

Table 9

Parameter and instrumentation Information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	FR <sub>e,s</sub>	FR <sub>e,s</sub>	FR <sub>e,s</sub>	Parameter title & description is consistent	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Flow rate of the heat generation equipment stack gases	Flow rate of the heat generation equipment stack gases	Flow rate of the heat generation equipment stack gases	within registered PDD, MR & applied methodology	
Parameter ID (if available)	Data #29	#27	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	m3/yr	m3/yr	m3/yr	m3/yr	Ok
Monitoring frequency (reading)	Continuously	Continuously	-	Continuously <b><u>Clarification Request No. 14.</u></b> Please update the monitoring plan in the MR to include the monitoring frequency for all the parameters.	CR
Monitoring frequency (re-cording)	Not mentioned	Not mentioned	Hourly	Hourly readings have been verified onsite.	Ok
Calibration requirements	Shall be calibrated based on the appropriate industry standards	-	Calibration frequency is once every two years.	Calibration details have been verified on-site as follows: Date of initial calibration: 30/09/08 Date of last calibration: 21/09/10 <b><u>Clarification Request No. 15.</u></b> 1. Please provide us the relevant industry standards for all the monitoring parameters based on which calibration frequency has been documented in MR. 2. Please clarify why the serial number specified in calibration certificates is not consistent with the published MR.	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	
Measurement Principle (if applicable)	Flow meter	-	Flow meter	Flow meter has been installed onsite.	Ok
	Technical aspects				Conclusion and IRL
Instrument Type:	Vortex flow meter				Ok
Serial Number:	VCEM5000-0059TRX1 / VCEM5000-0059TRX2				Ok
Manufacturer Model Nr.:	Codel / VCEM 5000 series				Ok
Specific Location:	Located at the Unitata boiler house				Ok
Measurement Range:	0 to 50 m/s				Ok
Gaps in operating time of instrument :	Period: Please refer to CAR 3 above.				CAR
	Default value used: Please refer to CAR 3 above.				CAR
	Justification: Please refer to CAR 3 above.				CAR
	QA/QC aspects				Conclusion and IRL
Source of data	Raw data has been sourced from SCADA system at the boiler house. Type: csv files from the SCADA system.				Ok
	Procedures: Readings from the flow meter are automatically transferred to the computer using SCADA system. This is verified by Assistant engineer on monthly basis.				Ok
	Implementation of procedure: Procedure has been verified to be implemented onsite.				Ok
	Responsibility: Assistant engineer onsite is responsible to maintain the records for this parameter.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Archiving of raw data and protection measures	Raw data is transferred to soft copy and it has been archived electronically at the engineering department computer.	Ok
Data transfer and protection of input data for calculations	It was verified onsite that archived files & log books can only be accessed by selected group of authorized personnel's onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CAR 3 above.	CAR
Data verification	Consistency of raw data with calculation tool: Total stack gases from heat generation equipment has been verified as 167,813,673 m3 in this monitoring period (except for the period in CAR 3 above).	CAR
	Consistency of calculation tool with monitoring report: Calculation tool has been found to be consistent with the MR.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

### 2.3. Parameters measured through sampling

Table 1

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	COD <sub>c,baseline</sub> concentration of organic waste-	COD <sub>c,BI</sub> concentration of organic waste-	COD <sub>c,baseline</sub> concentration of organic wastewa-	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	water into the digester	water into the digester or directed for land application	ter into the digester		
Parameter ID (if available)	Data #2	#02	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Kg/m3	Kg/m3	Kg/m3	Mg/litr	Ok
Sampling frequency	Monthly	Monthly	Weekly	Internally – Thrice in a week Externally – Monthly	Ok
Sampling point	-	-	-	<p><b><u>Clarification Request No. 16.</u></b> As per registered PDD, please clarify which kind of sampling plan is used to measure COD related parameters &amp; NC. Further, please provide us all the external &amp; internal COD analysis report.</p> <p><b><u>Corrective Action Request No.8</u></b> As per registered PDD, PPs shall use values from external accredited laboratory for all CODs, please update the CER calculation which uses internal COD values as well.</p>	CR CAR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 9 above.	CR
	Technical aspects				Conclusion and IRL

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Sampling Principle:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.	CR
Methodology of Sampling:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.	CR
Sample Analysed by:	As per published MR, Internal COD tests are carried out by in-house laboratory at Unitata refinery, using certified APHA/USEPA methods. External COD tests are carried out by laboratory accredited by ISO 17025 and SAMM (Accreditation Certificate of Malaysian Laboratory) Please refer to CR 16 & CAR 8 above.	CR
Certification of Analyser/Laboratory:	Please refer to CR 16 & CAR 8 above.	CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 & CAR 8 above.	CR
Measurement Range:	Please refer to CR 16 & CAR 8 above.	CR
Gaps in sampling frequency	Period: All the monthly COD values have been verified onsite.	Ok
	Default value used: No default values have been used for this MR.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: COD analysis report, please refer to CR 16 & CAR 8 above.	CR
	Procedures: Samples are collected by laboratory technician and the same is sent to external laboratory for testing.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	CR



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Responsibility: Lab technician is the responsible person for maintaining the samples & testing results by the external laboratory.	Ok
	Representativeness: Please refer to CR 16 & CAR 8 above.	CR
	Reproducibility: Please refer to CR 16 & CAR 8 above.	CR
Archiving of raw data and protection measures	External laboratory test reports are archived in the hard copy at the CDM manager's office. Further, the values from these reports are electronically saved at engineering department.	Ok
Data transfer and protection of input data for calculations	Transferred data to computer is password protected & the accessibility to the hard copies is restricted to the CDM manager.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 16 & CAR 8 above.	Ok
Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 & CAR 8 above.	CR
	Consistency of calculation tool with monitoring report: Calculation tool is consistent with the mentoring report.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

Table 2

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Parameter title	COD <sub>a,out</sub> COD concentra- tion of the efflu- ent that leaves the lagoon.	COD <sub>a,out</sub> COD that leaves the lagoon with the effluent	COD <sub>a,out</sub> COD concentra- tion of the effluent that leaves the lagoon.	Parameter title & description is con- sistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if avail- able)	Data #3	#03	Not mentioned	Please refer to CAR 3 above.	CAR
Data Unit	Kg/m3	Kg/m3	Kg/m3	mg/litr	Ok
Sampling frequency	Monthly	Monthly	Weekly	Please refer to CAR 7 above.	CAR
Sampling point	-	-	-	Please refer to CR 18 above.	CR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 18 above.	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Methodology of Sam- pling:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Sample Analysed by:	As per published MR, Internal COD tests are carried out by in-house laboratory at Unitata refinery, using certified APHA/USEPA methods. External COD tests are carried out by laborato- ry accredited by ISO 17025 and SAMM (Accreditation Certificate of Malaysian Laboratory). However, the revised MR considers the historical baseline scenario value of 52 kg /m3. Please refer to CR 16 & CAR 8 above.				CR
Certification of Analyser/ Laboratory:	Please refer to CR 16 & CAR 8 above.				CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Methodology of Sample Analysis (if applicable)	Please refer to CR 16 & CAR 8 above.	CR
Measurement Range:	Please refer to CR 16 & CAR 8 above.	CAR
Gaps in sampling frequency	Period: All the monthly COD values have been verified onsite.	Ok
	Default value used: No default values have been used for this MR.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: COD analysis reports; please refer to CR 16 & CAR 8 above.	CR
	Procedures: Samples are collected by laboratory technician and the same is sent to external laboratory for testing.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	CR
	Responsibility: Lab technician is the responsible person for maintaining the samples & testing results by the external laboratory.	Ok
	Representativeness: Please refer to CR 16 & CAR 8 above.	CR
	Reproducibility: Please refer to CR 16 & CAR 8 above.	CR
Archiving of raw data and protection measures	External laboratory test reports are archived in the hard copy at the CDM manager's office. Further, the values from these reports are electronically saved at engineering department.	Ok
Data transfer and protection of input data for calculations	Transferred data to computer is password protected & the accessibility to the hard copies to restricted to the CDM manager.	Ok
	Quality of evidence	Conclusion and IRL

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Completeness of data	Please refer to CR 16 & CAR 8 above.	
Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 & CAR 8 above.	CR
	Consistency of calculation tool with monitoring report: Please refer to CR 16 & CAR 8 above.	CAR
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 3

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	COD <sub>a,in</sub> COD concentration of the effluent that enters the lagoon which is assumed to be equal to the COD input to the digester.	COD <sub>a,in</sub> COD concentration of the effluent that enters the lagoon	COD <sub>a,in</sub> COD concentration of the effluent that enters the lagoon which is assumed to be equal to the COD input to the digester.	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if avail-	Data #4	#04	Not mentioned	Please refer to CAR 4 above.	CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

able)					
Data Unit	Kg/m3	Kg/m3	Kg/m3	mg/litr	Ok
Sampling frequency	Monthly	Monthly	Weekly	Please refer to CAR 7 above.	CAR
Sampling point	-	-	-	Please refer to CR 18 above.	CR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 18 above.	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Methodology of Sampling:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Sample Analysed by:	As per published MR, Internal COD tests are carried out by in-house laboratory at Unitata refinery, using certified APHA/USEPA methods. External COD tests are carried out by laboratory accredited by ISO 17025 and SAMM (Accreditation Certificate of Malaysian Laboratory). However, as per revised MR, historical baseline scenario value has been considered & verified. It is also verified to be in line with applied methodology. Please refer to CR 16 & CAR 8 above.				CR
Certification of Analyser/ Laboratory:	Please refer to CR 16 & CAR 8 above.				CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 & CAR 8 above.				CR
Measurement Range:	Please refer to CR 16 & CAR 8 above.				CAR
Gaps in sampling fre-	Period: All the monthly COD values have been verified onsite.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

quency	Default value used: No default values have been used for this MR.	Ok
	Justification: NA	
	QA/QC aspects	Conclusion and IRL
Source of data	Type: COD analysis reports; please refer to CR 16 & CAR 8 above.	CR
	Procedures: Samples are collected by laboratory technician and the same is sent to external laboratory for testing.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	-
	Responsibility: Lab technician is the responsible person for maintaining the samples & testing results by the external laboratory.	Ok
	Representativeness: Please refer to CR 16 & CAR 8 above.	CR
	Reproducibility: Please refer to CR 16 & CAR 8 above.	CR
Archiving of raw data and protection measures	External laboratory test reports are archived in the hard copy at the CDM manager's office. Further, the values from these reports are electronically saved at engineering department.	Ok
Data transfer and protection of input data for calculations	Transferred data to computer is password protected & the accessibility to the hard copies to restricted to the CDM manager.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 16 & CAR 8 above.	CAR
Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 & CAR 8 above.	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Consistency of calculation tool with monitoring report: Please refer to CR 16 & CAR 8 above.	CAR
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 4

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	COD <sub>c,dig_out</sub> COD concentration in discharged effluent from digester	COD <sub>c,dig_out</sub> concentrations in discharged effluent from digester	COD <sub>c,dig_out</sub> COD concentration in discharged effluent from digester	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #11	#11	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Kg/m3	Kg/m3	Kg/m3	mg/l	Ok
Sampling frequency	Monthly	Monthly	Weekly	Please refer to CAR 7 above.	CAR
Sampling point	-	-	-	Please refer to CR 18 above.	CR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 18 above.	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Methodology of Sam-	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

pling:		
Sample Analysed by:	As per published MR, Internal COD tests are carried out by in-house laboratory at Unitata refinery, using certified APHA/USEPA methods. External COD tests are carried out by laboratory accredited by ISO 17025 and SAMM (Accreditation Certificate of Malaysian Laboratory) Please refer to CR 16 & CAR 8 above.	CR
Certification of Analyser/ Laboratory:	Please refer to CR 16 & CAR 8 above.	CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 & CAR 8 above.	CR
Measurement Range:	Please refer to CR 16 & CAR 8 above.	CR
Gaps in sampling frequency	Period: All the monthly COD values have been verified onsite.	Ok
	Default value used: No default values have been used for this MR.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: COD analysis reports; please refer to CR 16 & CAR 8 above.	CR
	Procedures: Samples are collected by laboratory technician and the same is sent to external laboratory for testing.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	Ok
	Responsibility: Lab technician is the responsible person for maintaining the samples & testing results by the external laboratory.	Ok
	Representativeness: Please refer to CR 16 & CAR 8 above.	CR



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Reproducibility: Please refer to CR 16 & CAR 8 above.	CR
Archiving of raw data and protection measures	External laboratory test reports are archived in the hard copy at the CDM manager's office. Further, the values from these reports are electronically saved at engineering department.	Ok
Data transfer and protection of input data for calculations	Transferred data to computer is password protected & the accessibility to the hard copies to restricted to the CDM manager.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 16 & CAR 8 above.	CAR
Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 & CAR 8 above.	CR
	Consistency of calculation tool with monitoring report: Please refer to CR 16 & CAR 8 above.	CR
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 5

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	COD <sub>c,la</sub> COD concentra-	COD <sub>c,la</sub> of the sludge	COD <sub>c,la</sub> COD concentra-	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	tions in sludge used for land application.	used for land application after dewatering	tions in sludge used for land application.		
Parameter ID (if available)	Data #11	#11	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Kg/m3	Kg/m3	Kg/m3	mg/lt	Ok
Sampling frequency	Monthly	Monthly	Weekly	Please refer to CAR 7 above.	Ok
Sampling point	-	-	-	Please refer to CR 18 above.	CR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 18 above.	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Methodology of Sampling:	Not specified in the published MR or registered PDD, please refer to CR 16 & CAR 8 above.				CR
Sample Analysed by:	As per published MR, Internal COD tests are carried out by in-house laboratory at Unitata refinery, using certified APHA/USEPA methods. External COD tests are carried out by laboratory accredited by ISO 17025 and SAMM (Accreditation Certificate of Malaysian Laboratory) Please refer to CR 16 & CAR 8 above.				CR
Certification of Analyser/Laboratory:	Please refer to CR 16 & CAR 8 above.				CR CAR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 & CAR 8 above.				CR
Measurement Range:	Please refer to CR 16 & CAR 8 above.				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Gaps in sampling frequency	Period: All the monthly COD values have been verified onsite.	Ok
	Default value used: No default values have been used for this MR.	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: COD analysis reports; please refer to CR 16 & CAR 8 above.	CR
	Procedures: Samples are collected by laboratory technician and the same is sent to external laboratory for testing.	Ok
	Implementation of procedure: Implementation of the procedure has been verified onsite.	Ok
	Responsibility: Lab technician is the responsible person for maintaining the samples & testing results by the external laboratory.	Ok
	Representativeness: Please refer to CR 16 & CAR 8 above.	CR
	Reproducibility: Please refer to CR 16 & CAR 8 above.	CR
Archiving of raw data and protection measures	External laboratory test reports are archived in the hard copy at the CDM manager's office. Further, the values from these reports are electronically saved at engineering department.	Ok
Data transfer and protection of input data for calculations	Transferred data to computer is password protected & the accessibility to the hard copies to restricted to the CDM manager.	
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 16 & CAR 8 above.	CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 & CAR 8 above.	CR
	Consistency of calculation tool with monitoring report: Please refer to CR 16 & CAR 8 above.	CR
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 6

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	P <sub>CH4,e,s</sub> Methane content in stack gas of heat generation equipment	Parameter title & description is consistent within registered PDD, MR & applied methodology	Ok
Parameter ID (if available)	Data #30	#28	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	%	%	%	%	Ok
Sampling frequency	Atleast quarterly	Atleast quarterly	Quarterly	<b><u>Clarification Request No. 17.</u></b> As per registered PDD, methane content in stack gas shall be monitored continuously, please clarify whether the same has been per-	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

				formed during the monitoring period.	
Sampling point	-	-	-	Sampling point for external sampling is performed at chimney of the boiler. Please refer to CR 17 above.	CR
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	Please refer to CR 17 above.	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	<b><u>Clarification Request No. 18.</u></b> As per registered PDD, PPs shall perform sampling ensuring atleast 95% confidence level. Please clarify how the same has been ensured in this monitoring period.				CR
Methodology of Sampling:	Please refer to CR 18 above.				CR
Sample Analysed by:	Quarterly third party report is available for measuring the methane content in the stack gas. Please refer to CR 21 above.				CR
Certification of Analyser/ Laboratory:	Third party reports from Oshen consultants Sdn Bhd (uses Chemvi lab for test) has been provided on quarterly basis. <b><u>Clarification Request No. 19.</u></b> Please clarify whether the reports shown by Chemvi lab & Environmental Science Sdb Bhd are accredited to perform these services.				CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 18 above.				CR
Measurement Range:	Please refer to CR 18 above.				CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Gaps in sampling frequency	Period: No gaps has been observed in the monitoring period. Please refer to CR 18 above	CR
	Default value used: Please refer to CR 18 above.	CR
	Justification: Please refer to CR 18 above.	CR
	QA/QC aspects	Conclusion and IRL
Source of data	Type: External accredited laboratory report, please refer to CR 18 above.	CR
	Procedures: Please refer to CR 18 above.	CR
	Implementation of procedure: please refer to CR 18 above.	CR
	Responsibility: Laboratory technician	CR
	Representativeness: please refer to CR 18 above.	CR
	Reproducibility: please refer to CR 18 above.	CR
Archiving of raw data and protection measures	As per registered PDD, data shall be archived electronically; the same has been verified onsite.	Ok
Data transfer and protection of input data for calculations	As per registered PDD, data shall be archived electronically; the same has been verified onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 17 above.	CR
Data verification	Consistency of raw data with calculation tool: Please refer to CR 17 above.	CR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Consistency of calculation tool with monitoring report: Yes, the values verified onsite are found to be consistent with the calculation tool	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 7

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	NC Nitrogen content in the sludge used for land application, for estimating N2O emission in project emission.	NC	NC Nitrogen content in the sludge used for land application, for estimating N2O emission in project emission.	Nitrogen content has been monitored from external report.	Ok
Parameter ID (if available)	Data #33	#31	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Kg N/kg sludge	Kg N/kg sludge	Kg N/kg sludge	mg/kg	Ok
Sampling frequency	-	Monthly	monthly	Monthly	CR
Sampling point	-	-	-	It is at the discharge point located at the furrow irrigation point (after the two pumps pumping discharge waste water to land).	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	CR
	Technical aspects				Conclusion and IRL
Sampling Principle:	Grab sampling has been done during the monitoring period by the PP.				Ok
Methodology of Sampling:	Sampling is done by authorised lab technician and the samples are sent to external accredited laboratory, Chemvi Laboratory Sdn Bhd (accredited by SAMM).				Ok
Sample Analysed by:	As per published MR & verified onsite visit, external sampling and analysis is conducted by 3rd party laboratory certified with ISO 17025 and SAMM.				Ok
Certification of Analyser/ Laboratory:	Please refer to CR 16 above.				CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 above.				CR
Measurement Range:	Please refer to CR 16 above.				CR
Gaps in sampling frequency	Period: No gaps has been observed in the monitoring period. Please refer to CR 16 above.				CR
	Default value used: Please refer to CR 16 above.				CR
	Justification: Please refer to CR 16 above.				CR
	QA/QC aspects				Conclusion and IRL
Source of data	Type: External accredited laboratory report, Please refer to CR 16 above.				CR
	Procedures: Please refer to CR 16 above.				CR
	Implementation of procedure: Please refer to CR 16 above.				CR
	Responsibility: Laboratory technician				Ok



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Representativeness: NC values for present for the entire monitoring period.	Ok
	Reproducibility: Please refer to CR 16 above.	CR
Archiving of raw data and protection measures	As per registered PDD & verified onsite visit, data has been archived electronically.	Ok
Data transfer and protection of input data for calculations	As per registered PDD, data shall be archived electronically; the same has been verified onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Please refer to CR 16 above.	CR
Data verification	Consistency of raw data with calculation tool: Please refer to CR 16 above.	CR
	Consistency of calculation tool with monitoring report: Please refer to CR 16 above.	CR
Crosscheck (if available)	Please refer to CAR 7 above.	CR

Table 8

Sampling information					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	So Amount of	Se	So Amount of sludge	This parameter has been included in the PDD & MR, the same has also been verified to be calculated using	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	sludge applied to land		applied to land	flow rate of waste water discharge (Fla) & total suspended solids.	
Parameter ID (if available)	Data #32	#30	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Kg/yr	Kg/yr	Kg/yr	Kg/yr	Ok
Sampling frequency	-	Monthly	monthly	Monthly	Ok
Sampling point	-	-	-	It is at the discharge point located at the furrow irrigation point (after the two pumps pumping discharge waste water to land).	Ok
Uncertainty level	Not mentioned	Not mentioned	Not mentioned	-	Ok
	Technical aspects				Conclusion and IRL
Sampling Principle:	Grab sampling				Ok
Methodology of Sampling:	Not specified in the published MR or registered PDD, please refer to CR 9 above				CR
Sample Analysed by:	As per published MR, external sampling and analysis is conducted by 3rd party laboratory certified with ISO 17025 and SAMM. Please refer to CR 9 above.				CR
Certification of Analyser/ Laboratory:	Please refer to CR 16 above.				CR
Methodology of Sample Analysis (if applicable)	Please refer to CR 16 above..				CR
Measurement Range:	-				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Gaps in sampling frequency	Period: This value has been calculated using flow rate and total suspended solid from external third party report. No gaps were found in the report verified onsite.	Ok
	Default value used: NA	Ok
	Justification: NA.	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: Analysis conducted by external accredited laboratory	Ok
	Procedures: Please refer to CR 16 above.	CR
	Implementation of procedure: Please refer to CR 16 above.	CR
	Responsibility: Please refer to CR 16 above.	CR
	Representativeness: Please refer to CR 16 above.	CR
	Reproducibility: Please refer to CR 16 above.	CR
Archiving of raw data and protection measures	As per registered PDD, data shall be archived electronically; the same has been verified onsite.	Ok
Data transfer and protection of input data for calculations	As per registered PDD, data shall be archived electronically; the same has been verified onsite.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Data was present for the full monitoring period.	Ok
Data verification	Consistency of raw data with calculation tool: Raw data was found to be consistent with the calculation tool	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Consistency of calculation tool with monitoring report: Calculation tool is verified to be consistent with monitoring report.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

### 2.4. Parameters obtained through external sources and accounting data

Table 1

External sources and accounting information <i>use a separate table for each single parameter</i>					
	PDD	Meth/Tool	MR	Verified	Conclusion and IRL
Parameter title	T <sub>lag</sub> Temperature of lagoon.	T <sub>lag</sub> Ambient temperature	T <sub>lag</sub> Temperature of lagoon.	Ambient temperature is sourced from the Malaysian Meteorology Services (MMS).	Ok
Parameter ID (if available)	Data #05	#05	Not mentioned	Please refer to CAR4 above.	CAR
Data Unit	Degree C (converted to deg K)	K	Degree C (converted to deg K)	Degree C	Ok
	Technical aspects				Conclusion and IRL
Description of Data / Data Refers to:	Description: As per published MR & onsite visit, source of data is from Malaysian Meteorology Services (MMS) Department network of ambient temperature monitoring. The				Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	ambient temperature data for a network site nearest to the project site will be used.	
Date of Data:	Date: average of 01/05/09 – 28/02/11	Ok
Gaps in data	Period: Daily data is present from the MMS	Ok
	Default value used: NA	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: Malaysian Meteorology Services (MMS) Department network of ambient temperature monitoring. The ambient temperature data for a network site nearest to the project site will be used.	Ok
	Responsibility: CDM manager is responsible to review and keep the data for this monitoring period.	Ok
	Representativeness: Daily data has been sourced hence can be considered as reliable.	Ok
Reliability of Data Source:	Data is sourced from a government authorised body, hence considered as reliable.	Ok
Is the Data up-to-date?	Daily data for the full monitoring period has been sourced from MMS	Ok
Archiving of raw data and protection measures	Data has been archived electronically; the same has been verified onsite.	Ok
Data transfer and protection of input data for calculations	Data is sourced from MMS and the same is stored at CDM manager's computer.	
	Quality of evidence	Conclusion and IRL

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Completeness of data	Daily data of this monitoring period has been verified onsite.	Ok
Data verification	Consistency of raw data with calculation tool: Raw data is consistent with the calculation tool.	Ok
	Consistency of calculation tool with monitoring report: Calculation tool is verified to be consistent with the monitoring report.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR

### 2.5. Other parameters not included in the methodology/tool but included in the PDD

Other information <i>use a separate table for each single parameter</i>				
	PDD	MR	Verified	Conclusion and IRL
Parameter title	H <sub>boiler</sub> Operating hours per year of the refinery boiler fired on biogas.	H <sub>boiler</sub> Operating hours per year of the refinery boiler fired on biogas.	Operating hours has been included in the PDD & MR. Records of the same have been verified onsite.	Ok
Parameter ID (if available)	Data #09a	Not mentioned	Please refer to CAR 4 above.	CAR
Data Unit	Hrs/yr	Hrs/yr	Hrs/yr	Ok
	Technical aspects			Conclusion and IRL
Description of Data / Data Refers to:	Boiler operating hour records			Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Date of Data:	Date: 01/05/09 – 31/01/11	Ok
Gaps in data	Period: All the monitoring data has been verified onsite for this	Ok
	Default value used: NA	Ok
	Justification: NA	Ok
	QA/QC aspects	Conclusion and IRL
Source of data	Type: Daily Boiler operating hour manual logsheets	Ok
	Responsibility: CDM manager	Ok
	Representativeness: Data for entire monitoring period is verified successfully.	Ok
Reliability of Data Source:	Measured inhouse, hence considered as reliable data.	Ok
Archiving of raw data and protection measures	Data has been archived electronically, the same was verified onsite.	Ok
Data transfer and protection of input data for calculations	Data is recorded in the log sheets and the same is transferred to soft copy for further usage.	Ok
	Quality of evidence	Conclusion and IRL
Completeness of data	Data was verified to be complete for the entire monitoring period.	Ok
Data verification	Data has been verified from the log sheet and the spreadsheet onsite.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

	Consistency of calculation tool with monitoring report: Data is found to be consistent with calculation tool and MR.	Ok
Crosscheck (if available)	Please refer to CAR 7 above.	CAR



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 3. Data Processing and ER calculation

Description of data processing from transferred data to final results in the calculation tool		
Step	Description	Conclusion and IRL
Consistency	Raw data has been verified from the respective log sheets or SCADA readings.	Ok
Calculation Tool description	<p>Yes, the calculation sheet &amp; monitoring report is in line with calculation steps mentioned in the registered PDD &amp; applied methodology. Please refer to CR below:</p> <p><b><u>Clarification Request No. 20.</u></b></p> <p>Please clarify how the monitored biogas consumption in the boiler throughout the monitoring period is more than the total biogas generated at the biogas plant.</p> <p><b><u>Clarification Request No. 21.</u></b></p> <p>As discussed during onsite visit, there were some outages during the monitoring period, however the calculation spreadsheet presents that plant was in operation throughout the year. Please clarify.</p> <p><b><u>Corrective Action Request No.9</u></b></p> <p>As per registered PDD, please update the CER calculation to take the conservative value among the ex-ante and expost emission reduction.</p>	CR
Elimination of not plausible data (if applicable)	No elimination of data has been done by the PP, hence NA.	Ok
Transformation from useable data to input data for further calculation (if applicable)	All the transformation from raw data has been verified during the onsite visit.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Ex-ante data	Ex-ante emission factor of Malaysian grid is 0.63 tCO <sub>2</sub> eq/MWh	
Default parameter	<p>Bo: Maximum methane production potential of 0.21 kg CH<sub>4</sub>/kg COD for baseline emissions &amp; project emission from land application. Further, 0.25 kg CH<sub>4</sub>/kg COD is verified as a conservative measure for project emission from tank leakage.</p> <p>Fd: Fraction of anaerobic degradation due to depth of 0.5</p> <p>CEF<sub>BI,therm</sub> : CO<sub>2</sub> emissions intensity for thermal energy generation is 75.5 t CO<sub>2</sub>-e/TJ oil (registered PDD indicates 77.37 tCO<sub>2</sub>e/TJ oil, however conservative figure which is lower limit for fuel oil from IPCC table has been considered &amp; verified). Hence it is accepted.</p> <p>EFN<sub>2</sub>O: Emission factor of nitrogen from sludge applied to land is 0.016 kg N<sub>2</sub>O/kg N</p>	Ok
Formulae check	Please refer to CAR8 above.	CAR
Rounding functions	Yes, all the rounding off has been done conservatively.	Ok
Calculation tool changes and protection measures	Calculation tool has been verified; however please refer to CAR 8 above.	CAR
Reported data	Reported data has been verified from the raw log sheet during the onsite visit.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 4. Additional assessment

#### 4.1. Internal Review

Description and performance of internal review		
	Description	Conclusion and IRL
Procedure	Internal review has been performed as procedure mentioned on the CDM manual onsite.	Ok
Documentation	Documentation was checked during the onsite visit from CDM monitoring manual onsite.	Ok
Responsibilities	CDM manager shall be responsible for the implementation of the internal review procedure.	Ok

#### 4.2. Peculiarities

Description of Peculiarities and unexpected Daily Events during the verification period		
	Description	Conclusion and IRL
Performance	Please refer to CAR-2 above.	CAR
Documentation	As per registered PDD & published MR, PPs record daily reading in the logbooks, the same is then updated in the soft file. The same has been verified onsite.	Ok
Measures	Please refer to CAR2 and CR 6	CAR

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 4.3. Further additional requirements

Description of additional requirements to be checked		
	Description	Conclusion and IRL
Environmental issues	As per registered PDD, PPs shall: 1. Regulations on discharge limits (COD) as per Environmental Quality Act, 1974, Malaysia	Ok

### 4.4. Data Reporting

Description of the Monitoring Report		
	Comments and Results	Conclusion and IRL
Compliance with UNFCCC regulations	Monitoring report has been decided by the PP for the reporting period of 01/05/2009 to 31/01/2011 Actual implementation & reported data has been verified during the onsite visit.	Ok
Completeness and Transparency	Completeness has been verified onsite. Please refer to CAR 3 above.	CR
Correctness	Correctness of the reported values in the published MR has been verified during the onsite visit.	Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### 5. Compilation and Resolutions of CARs, CRs and FARs

Corrective Action Requests by audit team			
	Comments and Results	Ref	Conclusion and IRL
Issue	<p><b><u>Corrective Action Request No.1</u></b></p> <p>Please update the MR to include the following:</p> <ol style="list-style-type: none"> <li>1. Details on manufacturer, serial number &amp; commissioning date of respective equipment installed (namely digester tanks &amp; flaring equipment).</li> <li>2. Appropriate reporting and site visit date (page-3 of published MR).</li> <li>3. Please update MR to include correct monitoring period as mentioned in UNFCCC web-page (please see page-8 of published MR).</li> </ol>	1.1	Ok Closed
Response	<ol style="list-style-type: none"> <li>1. MR has been updated under section C, of all major equipments (digester tanks, flare system, burner and boiler). Section A.4 has been updated with the testing and commission period of the biogas plant. Please refer to document 'Testing and Commissioning (Operation Manual)' for the details.</li> <li>2. Reporting and site visit date has been updated. Please refer to updated MR.</li> <li>3. Monitoring period has been corrected. Please refer updated MR.</li> </ol> <p><b>Reply 2:</b></p> <p>The report has been standardised to state that the commissioning period was from Sept – Dec 2006 and the starting date of the project is on the 1<sup>st</sup> Jan 2007.</p>		
Assessment	<ol style="list-style-type: none"> <li>1. MR has been verified to be revised and includes details on manufacturer and commissioning date of the respective equipment. Operation manual made by Novaviro Technology and Watermech engineering has been submitted and verified for the commissioning tests and date. However, page-2 of MR indicates that commissioning was done on 1st Sept 2006</li> </ol>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>whereas page-12 says 1st Jan 2007, please clarify the inconsistency.</p> <p>2. Reporting date and site visit date has been revised and verified. Hence this point is closed.</p> <p>3. Monitoring period is corrected and verified. Hence this point is closed.</p> <p><b><u>Response by audit team:</u></b></p> <p>Revised MR has been verified to have consistent starting date of the project activity. Hence closed &amp; accepted.</p>		
Issue	<p><b><u>Corrective Action Request No.2</u></b></p> <p>As per EB 54 annex-34, please update the MR to include details on the actual operation of the project activity during the monitoring period like any downtimes of equipments, overhaul, etc. Also include the legal approval or license required to run the project.</p>	1.1	Ok Closed
Response	<p>Section C of the MR (under <i>Downtime/maintenance/inspection period of biogas plant</i>) has been updated with the downtime of the biogas plant and the replacement of the Siemens Mag flowmeter. Please refer updated MR.</p> <p>The biogas plant needs to comply with the department of safety and health (DOSH). The biogas plant obtained its approval from DOSH prior to the construction in 2007. Refer document titled 'UP2 - Biogas plant DOSH approval'. Also, on a periodic basis (at least once in 15 months), the biogas boiler is subjected to inspection by DOSH. Refer document 'UP2_Periodic DOSH Inspection'.</p> <p><b>Reply 2:</b></p> <p>1. The plant's operational starting date has been corrected to 1<sup>st</sup> January 2007. The testing and commissioning period has been maintained as September - December 2006. Please refer updated MR.</p>		
Assessment	MR has been updated to indicate the downtime of the biogas plant during the crediting pe-		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	riod. The same has been cross-checked with the help of daily records.		
Issue	<b><u>Corrective Action Request No.3</u></b> It was verified onsite that the flow meter at the heat generation equipment stack gases was faulty from 25th feb'2011. Please clarify how PP monitored the flow of stack gases for the faulty period & also include the same in the monitoring report.	2.2	Ok Closed
Response	The flowmeter mounted to the stack chimney of the boiler (heat generation equipment) was not faulty, but was sent for calibration to Codel UK (the manufacturers) on the 25 <sup>th</sup> Feb 2011. Therefore, it did not measure the stack gas flow from the 25 <sup>th</sup> – 28 <sup>th</sup> Feb 2011. In order to ensure that all monitoring data is available for this round of verification, we suggest excluding the month of Feb 2011 and revising the monitoring period to May 2009 – Jan 2011. The MR, ER and other related docs have been updated.		
Assessment	DOE would request the Secretariat to change this monitoring period (as per EB 41 para 78) till 31/01/2011 and PP has to take care of this deviation because of unavailability of data in next monitoring period and the same will verified by the verifying DOE in next monitoring period. Further, it was verified that EB has updated the UNFCCC webpage to have the revised monitoring period to 1 <sup>st</sup> May 2009 to 31 <sup>st</sup> Jan 2011.		
Issue	<b><u>Corrective Action Request No.4</u></b> Please include the ID number in the MR to maintain consistency with registered PDD & applied methodology.	2.2	Ok Closed
Response	ID number (as per PDD) has been updated under section C of PDD.		
Assessment	MR has been revised to include the ID number as per registered PDD.		
Issue	<b><u>Corrective Action Request No.5</u></b> Please update the monitoring report to indicate the correct model number of the meter as verified onsite for Fdig.	2.2	Ok Closed
Response	Section C has been updated with details verified onsite;		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<i>Siemens FM Magflo Mag 5100W (flowmeter), Siemens FM Magflo Mag 5000 (transmitter)</i>		
Assessment	Monitoring report has been updated to indicate the correct model number of the meter as verified onsite.		
Issue	<b><u>Corrective Action Request No.6</u></b> Please update the MR to indicate the correct serial number of the electricity meter as verified during the onsite visit.	2.2	Ok Closed
Response	<i>S/N of ELPr,y changed. Please refer updated MR.</i>  <b>Reply 2:</b> <i>The correct S/N of the electricity meter is 2005-2035807. Refer image 'UP2_kWh meter'.</i>		
Assessment	Serial number of the revised MR is still not updated. <b><u>Response by audit team:</u></b> MR has been revised to have the correct serial number, it was further verified with UP2_kWh meter' pic also. Hence accepted & closed.		
Issue	<b><u>Corrective Action Request No.7</u></b> Please indicate crosschecks for all the monitored parameter in the monitoring report.	2.2	Ok Closed
Response	<i>Section C has been updated with cross check methods (if available). Please refer updated MR.</i>  <b>Reply 2:</b> <i>Results of the cross-check method have been further explained under section C: crosscheck status.</i>  <b>Reply 3:</b>		



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>Please refer to the folder 'Cross-check results';</p> <ol style="list-style-type: none"> <li>1) ...Methane consumed vs Steam Generation: This file provides the energy that is used in calculating the baseline emission resulting from the avoidance of fossil fuel consumption. The 2 approaches involved have been explained in the excel sheet and the more conservative approach (methane input x methane CV) have been used in the ER calculations.</li> <li>2) COD values comparison: This file compares the average value of all COD values obtained for every month (internal lab and external lab) against the monthly external laboratory values alone. <b>As per the monitoring plan in the registered PDD, only the external lab values for both COD<sub>a,in</sub> and COD<sub>dig,out</sub> are used.</b> Only in case of abnormal issues in the external laboratory values obtained (e.g. final discharge COD is higher than COD<sub>dig,out</sub>), the internal lab values will substitute the external lab values.</li> <li>3) Methane content comparison: Methane content in biogas is analysed at 2 locations; a) at <i>the outlet of the digester plant (prior to boiler and flare system)</i> and b) <i>inlet to the boiler</i>. Throughout the entire monitoring period, multiple samples have been obtained and results have been tabulated based on 95% confidence level. Based on 95% CL, for the entire monitoring period, location (a) resulted in an average methane content of 58.88% and location (b) resulted in an average methane content of 58.50%. <b>Though location (b) is slightly more conservative than (a), the project proponent has standardised the internal procedures to use values from location (a) because values from location (a) is more accurate (outlet of digester tanks) and is applicable for both ER calculations for biogas combustion in boiler and flaring.</b></li> </ol>		
Assessment	Methods for cross-check has been included in the revised MR. Please indicate the results of the cross-checks as well.		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p><b><u>Response by audit team:</u></b></p> <p>Please provide us the calculation spreadsheet used to arrive at the result documented in the revised MR (eg for <math>COD_{a,in} - COD_{dig\_out}</math>, <math>HG_{BL,y}</math> &amp; <math>P_{CH4,bio}</math>).</p> <p><b><u>Further response by audit team:</u></b></p> <p>Appropriate spreadsheet for cross-check has been provided. Hence it is acceptable and this issue is closed.</p>		
Issue	<p><b><u>Corrective Action Request No.8</u></b></p> <p>As per registered PDD, PPs shall use values from external accredited laboratory for all CODs, please update the CER calculation which uses internal COD values as well. Further, it was observed that the spreadsheet of COD didn't have COD values for Jan 2010, please include the COD values for Jan 2010 as well.</p>	2.2	Closed
Response	The ER calculation sheets (excel file) have been updated with only COD values from external laboratory. Jan 2010 value has been updated.		
Assessment	ER has been updated to use the monthly laboratory tested values for COD and COD value for January has also been documented and verified.		
Issue	<p><b><u>Corrective Action Request No.9</u></b></p> <p>As per registered PDD, please update the CER calculation to take the conservative value among the ex-ante and ex-post emission reduction.</p>	2.2	Ok Closed
Response	<p>CER calculations have been updated to use the more conservative, which is the ex-post (gas production) value.</p> <p>For the period from May 2009 – Jan 2011 (21 mths), BE lagoon is;</p> <p>Ex-ante = 62,785 tCO<sub>2eq</sub></p> <p>Ex-post = 62,351 tCO<sub>2eq</sub></p> <p><b>Reply 2:</b></p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>For the period from May 2009 – Jan 2011 (21 mths), BE lagoon is;</p> <p>Ex-ante = 62,571 tCO<sub>2eq</sub></p> <p>Ex-post = 62,351 tCO<sub>2eq</sub></p>		
Assessment	<p>Indicated methane baseline emission here does not match with the provided emission reduction sheet, please clarify.</p> <p><b><u>Response by audit team:</u></b></p> <p>The emissions are not in line with the provided calculations. Further the calculations have been updated to take the conservative figure among expost &amp; ex-ante. Hence acceptable &amp; closed.</p>		
Clarification Requests by audit team			
	Comments and Results	Ref	Conclusion and IRL
Issue	<p><b><u>Clarification Request No. 1</u></b></p> <p>Please provide documentary evidences to verify the technical details of biogas boiler, an-aerobic digester &amp; flaring system including:</p> <p>a) capacity &amp; other specifications</p> <p>b) commissioning date</p>	1.1	Ok Closed
Response	<p>a) Capacity</p> <p>i) Biogas boiler – refer file ‘Marshall Boiler specifications’</p> <p>ii) Burner – refer file ‘Dunphy burner specifications’</p> <p>iii) CSTR – ‘Biogas plant drawing’</p> <p>iv) Flare system – ‘Flare Capacity and specifications (Operation Manual)’</p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>b) Commissioning date</p> <p>Please refer document titled 'Testing and Commissioning (Operation Manual)'. The first paragraph states that the testing and commissioning was carried out from Sept – Dec 2006.</p>		
Assessment	Documentary evidences to verify the installed capacity and commissioning date of the equipments have been submitted and verified.		
Issue	<p><b><u>Clarification Request No. 2</u></b></p> <p>Please provide us the quality manual/CDM manual for the project activity.</p>	1.1	Ok
Response	Please refer to file 'UP-MRUv6.rar'		Closed
Assessment	Quality manual or CDM manual for the project activity has been submitted and has been verified to be appropriate for the registered monitoring plan.		
Issue	<p><b><u>Clarification Request No. 3</u></b></p> <p>Please update the MR to transparently indicate the responsible entity for project management &amp; MR.</p>	1.3	Ok
Response	Section C of MR has been updated to include organization chart, roles and responsibilities of key personnel involved in this project. Also, the layout of the biogas plant has been updated in the MR.		Closed
Assessment	MR has been verified to be revised for including the responsible entity and descriptive roles and responsibilities of the personnel involved.		
Issue	<p><b><u>Clarification Request No. 4</u></b></p> <p>It was verified during the onsite visit that electricity consumption from blower and burner connected to boiler was not monitored. Please provide us the list of all equipments consuming electricity inside the project boundary. Also update the CER calculation considering the project emissions from them.</p>	2.2	Ok
Response	Burner motor power rating – 26kW, Blower (booster fan) power rating – 7.5kW, Biogas		Closed

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>blower motor – 1.85kW.</p> <p>For list of equipments (main power consumption only) consuming power inside the project boundary, refer to document titled 'UP2_Power Consumption Equipments'.</p> <p>The raw data file 'Power consumption' has been updated/added with 35.35 kW. The difference between opening and closing reading of the kWh meter has been added with this value.</p> <p><b>Reply 2:</b> The power consumption is added into the raw data file 'Power consumption'. The power consumption for the equipments listed above will be 35.35kW * 24 hours = 848.4 kWh.</p>		
Assessment	<p>35.35 kW is the rated power of the identified fans, however the meter reading are in kWh (electricity consumed), please clarify how can both these reading be added in the calculation sheet.</p> <p><b>Response by audit team:</b> 'Power consumption' sheet has been updated to consider the electricity consumption in Blowers considering 24hrs operation (conservative measure). Hence acceptable &amp; closed.</p>		
Issue	<p><b>Clarification Request No. 5</b></p> <p>Please provide us documentary evidence to verify the repositioning performed for the flow meter to measure total biogas generation.</p>	2.2	Ok  Closed
Response	<p><b>Reply 2:</b></p> <p>The repositioning was actually performed by the company Landfeld Quasa'. The brief service report is attached as 'UP2_Biogas line repositioning works'.</p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Assessment	<p>No documentary evidence has been provided for the repositioning of the flowmeter; please provide evidence for the same.</p> <p><b><u>Response by audit team:</u></b></p> <p>Service &amp; commission report by LQC Asia has been checked to verify the relocation of the flow meter (on October 2009).</p>		
Issue	<p><b><u>Clarification Request No. 6</u></b></p> <p>As per published MR &amp; registered PDD, Tcomb,e is calculated using biogas flow rate &amp; boiler running hours whereas applied methodology mentions it to be measured through run-time meter connected to flame detector or flame continuous temperature controller, please clarify the inconsistency.</p>	2.2	Closed
Response	<p>The UV flame detector (fitted within the Dunphy burner system) detects flame in the boiler and sends to an electronic run-time meter attached in the SCADA. The run-time meter then records the hours combustion have been taking place in the boiler. Please refer file 'UP2_Tcomb,e calculation'. The main file (Tcomb,e calculation.xls) obtains input from the SCADA burner files to calculate the parameter.</p>		Ok
Assessment	<p>CSV report from SCADA has been submitted to verify the calculation of Tcomb,e. The same has been verified from registered monitoring plan of PDD and applied methodology. Hence accepted and closed.</p>		
Issue	<p><b><u>Clarification Request No. 7</u></b></p> <p>It was verified during the onsite visit that readings in the totalizer of the meter for <math>F_{dig}</math> did not match with the readings of totalizer at SCADA system, please clarify this inconsistency observed for <math>F_{dig}</math> &amp; biogas flow meter (<math>FR_{bio}</math>).</p>	2.2	Ok
Response	<p><math>F_{dig}</math> flowmeter (sensor and converter), which is the Siemens Mag 5100W was replaced in the month of July 2010. The previous flowmeter used was Siemens Mag 6000 (S/N 7ME651338214T256); please refer document 'Siemens MAG Calibration 2007'. Since the</p>		Closed

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

### Corrective Action Requests by audit team

meter has been replaced, the totalizer (on the converter) of the new meter value will start again from '0'. As for FRbio, the calibration firm's technician had accidentally 'zeroed' the totalizer readings on the converter portion of the flowmeter.

Nevertheless, this is not necessarily the case with the monitoring panel board at the biodigester plant and the SCADA. The monitoring panel at the biodigester plant receives signal directly from the sensor of the flowmeter and sends the signal to the SCADA system in the boiler house. Hence, the totalizer readings on the monitoring panel and the SCADA system are always the same; as verified by the auditors during the site visit.

#### Reply 2:

Based on the current information from site (as per DEM's latest site visit on the 28<sup>th</sup> July 2011), it was noted that the POME feed flowmeter was only changed once on the 14<sup>th</sup> Nov 2008, on the day of calibration. The flowmeter that was used prior to 14<sup>th</sup> Nov 2008 was a Siemens MAG 6000. This change date is outside the current monitoring period. Nevertheless, this can be justified with the 'UP2\_Maintenance Log' document, which captures the minor repairs and replacements done around the biogas plant. The log captured the change of flowmeter on the 14<sup>th</sup> Nov 2008.

The totalizer reading for both the POME feed flowmeter (Siemens MAG 5100W) and the total biogas (Endress & Hauser) was accidentally zeroed by the calibration technician. This was done during the November 2010 calibration exercise. The totalizer merely displays what is the current rate of flow and the totalizer for a certain period of time. The totalizer readings on the flowmeters (both Siemens and E&H) can be ignored as the rate and totalizer values used for CER computing are obtained from the SCADA system. The monitoring panel at the biodigester plant receives signal directly from the sensor of the flowmeter and sends the signal to the SCADA system in the boiler house. Hence, the totalizer readings on the monitoring panel and the SCADA system are always the same; as verified by the auditors during the site visit.

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	For cross-checking records for fixed intervals, please refer to file 'UP2_July flow records'. An analysis on SCADA records and logsheet records between 21 <sup>st</sup> and 22 <sup>nd</sup> July 2011 are given.		
Assessment	<p>Please provide documentary evidences to verify the change in meters and also provide us the latest available monitoring records for totalizer and SCADA to ensure that difference in reading is because of resetting of meters (this can be done by cross-checking records for fixed intervals).</p> <p><b><u>Response by audit team:</u></b></p> <p>It could be verified from the provided logsheet &amp; SCADA readings "UP2_July flow records", daily readings of the totalizer &amp; SCADA was successfully verified for a fixed period (20-21/07/2011). Hence the inconsistency in totalizer &amp; SCADA reading can closed considering the fact that meters were changed &amp; reset during the calibration.</p>		
Issue	<p><b><u>Clarification Request No. 8</u></b></p> <p>Please provide us the cross-check for the verified parameter Fdig.</p>		Ok
Response	<p>There are no complete cross-check records for Fdig. The records at the biodigester plant will not tally with the SCADA as the records are obtained directly from the totalizer, whereas the SCADA records are from a reliable source; the sensor of the flowmeter. The project proponent calculates the ER from the SCADA records.</p> <p>Nevertheless, as an alternative, POME records can be cross-checked with FBB processed records. The industry standard for POME:FFB ratio is always within 0.6 – 0.8. Only a handful of mills record a ratio of more than 0.8, due to excess usage of water. Please refer file 'UP2_FFB POME ratio' and the last page of 'UP2_FFB-POME ratio reference.pdf'. The monitored value of POME for at the site for the monitoring period is 194,504m3; which is</p>		Closed



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>approximately 0.7 of the FFB processed tonnage.</p> <p><b>Reply 2:</b> The indicated range of POME to FFB ratio is an industrial standard for palm oil mill. The range given is usually applied for mills which are well managed. Please refer to the study 'Microbial Biopolimerization Production from POME'. Page 1 of the study indicates that the industrial standard of POME (m3) to FFB (tonnes) is within the range of 0.44 – 1.18; the average figure is at 0.87.</p> <p>UP's jendarata overall FFB processed and POME ratio is given in the file 'UP_FFB-POME ratio_2008-2011'. The overall ratio is at 0.73 (194,604 m3POME / 266,436tonnesFFB), which fits well with the industrial range given above.</p>		
Assessment	<p>The indicated range of POME to FFB of 0.6 to 0.8 cannot be verified from the provided document of "UP2_FFB-POME ratio reference.pdf". Please provide appropriate documentary evidence to verify the same.</p> <p><b>Response by audit team:</b> It was verified using 'UP_FFB-POME ratio_2008-2011' that the ratio of POME to FFB processed onsite is within the range limit provided by a publically available study 'Microbial Biopolimerization production from POME'. Hence the cross-check is accepted &amp; closed.</p>		
Issue	<p><b>Clarification Request No. 9</b> As per registered PDD, PPs are required to measure <math>HG_{BL,y}</math> using steam quantity &amp; pressure readings, however the applied methodology states to use the biogas consumption &amp; the calorific value for <math>HG_{BL,y}</math>. Please clarify which approach has been used for CER calculation.</p>	2.2	Ok
Response	<p>The approach that has been used for calculation of <math>HG_{BL,y}</math> is from the methodology. Please refer to the updated ER calculation files.</p>		Closed

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<b>Reply 2</b> The approach chosen to measure $HG_{BL,y}$ has been documented clearly under the section 'Calibration Status' and section E1.		
Assessment	Updated calculation using biogas quantity has been done, however please clarify and document the approach which is verified to be conservative between steam measurement and biogas quantity.  <b>Response by audit team:</b> Revised MR was verified to be updated to show transparently that PPs will follow the procedure mentioned in the methodology (which is measuring $HG_{BL,y}$ using biogas consumption), further the same is also cross-verified using $HG_{BL,y}$ values calculated using steam. The conservative figure is chosen among this approach. Hence acceptable & closed.		
Issue	<b>Clarification Request No. 10</b> Please clarify the following issues with respect to calibration certificate: 1. Calibration certificate of electricity meter measuring consumption of electricity could not be related to the meter verified onsite. 2. Serial number verified onsite for flow meter F3 & F5 were not consistent with the calibration certificate provided. 3. Calibration certificate for the leakage testing equipment has not been provided. 4. Serial number in calibration certificate for Fdig is not consistent with the serial number verified onsite. 5. Also provide us the documentary evidences on the accuracy class of the electricity meter used.	2.3	Ok  Closed
Response	1. Corrected calibration certificates for the kWh meter have been issued. The certificates carry the serial number and correct make/model. Please refer to 'UP2_Calibration Certificates_May09-Jan11'. 2. Please refer to 'UP2_Calibration Certificates_May09-Jan11'. Certificates have been		

# Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

## Corrective Action Requests by audit team

corrected and reissued by Endress&Hauser.

3. Please refer document '3M 950 series Certificate of Conformance'. Page 2 of the certificate states that the gas detector can be used for operations if the span range is between 35 - 250. Also, it states that a new sensor will have span value close to 100. Please refer file 'UP2\_Biogas Plant Leakage Detection Results'. The span values in the table are within the range of 35-250 and very close to 100.
4. Please refer to 'UP2\_Calibration Certificates\_May09-Jan11'. Certificates have been corrected and reissued by Endress&Hauser.
5. Please refer document 'MPI Lenin Accuracy Class'. The document is a calibration certificate from another project. The meter's make and model is the same as the one used in UP2 CDM biogas plant.

### Reply 2:

2. The meter specifications have been updated throughout the MR. Previously, F5 (steam generation) was used to calculate HGBI,y. Since HGBI,y is being calculated by using methane input, the corresponding meter should be F4.
3. Since the leakage test is carried out in 2 ways (*gas detector* and *manual*), the project proponent has opted to use the manual soap test records carried out on the digester tanks and pipeline to comply with the monitoring plan of the PDD. The monitoring plan of the PDD does not specify any particular methods to assess leakage. Hence, as long as the method carried out to test leakage is valid, it should comply with the monitoring plan of the PDD. Please refer to document 'UP2\_Leakage test'.
4. For the period 14<sup>th</sup> Nov 2008 onwards, the S/N of the POME feed flowmeter is 7ME651 553114T296. For the 208 and 2009 certificate, this number is written below the 'reference instrument used' table. The number SE510 could have been another number within the flowmeter or the converter. Nevertheless, E&H has corrected the certificates for 2008 and 2009. Refer 'Cal Certs POME feed flowmeter 07-11'.

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Assessment	<p>1. Revised calibration certificate for electricity meter has been submitted and verified for the proposed monitoring period. Hence it is acceptable &amp; this point is closed.</p> <p>2. Calibration report for F3 is submitted and successfully verified. However, serial number of F5 flow meter is still inconsistent with the submitted monitoring report (please refer table of calibration status in monitoring report). Please clarify.</p> <p>3. It is not clarified how it is justified that calibration is performed for the gas detector equipment.</p> <p>4. Fdig: It was verified that calibration report for 2010 has different serial number compared to 2009 and 2008 (2010 has 7ME651 553114T296 where as 2009 &amp; 2008 specifies SE510), please clarify.</p> <p>5. Accuracy class of the meter has been successfully documented and verified. Hence it is acceptable &amp; this point is closed.</p> <p><b><u>Response by audit team:</u></b></p> <p>2. Revised MR has been successfully verified to have consistent serial number of F4 for HGBL,y (because this parameter is now calculated using methane consumption as per applied methodology). Hence acceptable &amp; this point is closed.</p> <p>3. It can verified from the provided document “<a href="#">UP2_Leakage test</a>” (test report) that leakage test is also performed via soap testing, soap testing report for this monitoring period has been submitted by the PP &amp; successfully verified. Hence acceptable and this point is closed.</p> <p>4. Revised calibration report by E&amp;H has been verified to have consistent serial number for parameter Fdig. Hence acceptable &amp; this point is closed.</p>		
Issue	<p><b><u>Clarification Request No. 11</u></b></p> <p>As per published MR, monitoring frequency of the methane content in biogas is daily, how-</p>	2.3	Closed

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	ever the same was not conducted onsite, please clarify.		Ok
Response	The MR has been updated to capture the actual monitoring frequency of the methane content. 7 readings for each site (biodigester plant and biogas boiler house) will be obtained in a month. Value used is based on 95% CL calculation. Refer file 'Biogas composition'; part of the CER calculation folder.		
Assessment	As per registered PDD, PPs are required to conduct quarterly measurements, whereas it is verified that PPs have conservatively done the monitoring one every month with seven readings each from biodigester side and boiler house. Hence acceptable and closed.		
Issue	<b><u>Clarification Request No. 12</u></b> Please clarify whether the gas analyzer used for the project activity measures the methane content at wet basis as per applied methodology. Also indicate the same in the MR transparently.	3.0	Closed
Response	As per the method AM00013v4, the sampling of the methane content in the biogas is measured on wet basis. Wet basis means the moisture content in a flue stream/sample gas is not removed and is an element included when the methane content is measured. As such, as per verified on-site, the methane is being sampled and analyzed on wet basis. Section D.2 of the MR has been updated.		Ok
Assessment	It has been justified and also verified that moisture content in the sample gas is not removed before the measurement of methane content. Hence acceptable and closed.		
Issue	<b><u>Clarification Request No. 13</u></b> As per published MR, raw data for methane analyzer comes from manual logbook, however no manual logbooks were found onsite, only print out from the gas analyzer can be obtained, please clarify.	3.0	Closed
Response	The raw data from gas analyzer is directly from the equipment (GA 2000) itself. Manual logbook is redundant as the raw data print-outs/analyser log-sheets are sufficient. Section D.2 of MR has been updated.		Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Assessment	It was verified onsite that only print out logs are provided by the methane analyzer for all measurements. The same has been updated in the revised MR and verified.		
Issue	<b><u>Clarification Request No. 14</u></b> Please update the monitoring plan in the MR to include the monitoring frequency for all the parameters.	3.0	Closed Ok
Response	Monitoring frequency has been included under section D.2. Please refer updated MR.		
Assessment	Monitoring report has been revised and verified to contain monitoring frequency for all the monitoring parameters		
Issue	<b><u>Clarification Request No. 15</u></b> Please provide us the relevant industry standards for all the monitoring parameters based on which calibration frequency has been documented in MR.	3.0	Ok Closed
Response	Except for the petroleum retail industry (fuel meter/pump in petrol stations), no other industry is subjected to industry standard to determine calibration frequency. The project proponent has decided to calibrate all CDM related monitoring devices/ equipments on an annual basis. Nevertheless, the error found in calibration certificates is still lower than the specifications given in the devices.  Further justification;  As per ISO 9001:2000 QM requirements, measuring equipment shall  a) be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration or verification shall be recorded; <b>- the basis for UP to calibrate once a year is that the error found on the calibration certificate is still lower than the maximum permissible error specified on the technical specs.</b>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>b) be adjusted or re-adjusted as necessary;</p> <p>c) be identified to enable the calibration status to be determined;</p>		
Assessment	It has been clarified by the organization that no industry standard is available at the local market for calibration of meters except for fuel meter in petrol stations. Further, errors have been reported less than the permissible error specified, hence frequency mentioned in QMS system of the company can be accepted and closed.		
Issue	<p><b><u>Clarification Request No. 16</u></b></p> <p>As per registered PDD, please clarify which kind of sampling plan is used to measure COD related parameters &amp; NC. Further, please provide us all the external &amp; internal COD analysis report. Also clarify the following inconsistency in the COD values:</p> <ol style="list-style-type: none"> <li>1. It was also verified during the site visit that COD<sub>in</sub>, CO<sub>out</sub> &amp; COD land application values mentioned in the spreadsheet were not consistent with the third party documents onsite, please clarify.</li> <li>2. COD value for land application effluent is mentioned as 2055 in the spreadsheet for JAN 2011; where as third party document verified onsite presents it as 22055 mg/l, please clarify.</li> <li>3. Internal values for COD<sub>in</sub> and COD<sub>out</sub> for June 2009 was not available, please provide documentary evidence for the same.</li> </ol>	3.0	Ok Closed
Response	<p>The sampling plan/method that is used to analyse COD and other parameters are the 'grab' sampling method. Please refer to document titled 'Methods of wastewater sampling'.</p> <p>1. All COD values for the project have been updated, based on the external laboratory CA. Two exceptions have been applied; <b>For Jan 2011, the external lab value of COD<sub>la</sub> (22,055ppm) is higher compared with COD<sub>out</sub> (12,431ppm), which will result in negative project emissions for PE<sub>lag</sub>.</b> Rationally it could not take place, as the COD<sub>la</sub> value is too high (COD<sub>la</sub> has to be lower than COD<sub>out</sub>) but the external laboratory has reported as such. No internal lab analysis is available for this parameter. Hence, the PP has applied COD<sub>dig,out</sub> value (12,431ppm) for COD<sub>c,la</sub> (most conservative approach). <b>For May 2010,</b></p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p><b>the external lab value of CODout (1210 ppm) is too lower compared with CODla (3540ppm), which will result in negative project emissions.</b> Rationally it could not take place, as the CODout value is too low (CODout has to be higher than CODla) but the external laboratory has reported as such. Hence, the PP has applied the average value from Unitata (internal) laboratory, which is the primary cross-check source, for CODout (17,106ppm) for May 2010. Refer to 'UP2_External Lab Certs_May09-Feb11' and 'UP2 Internal Lab Certs_May09-Feb11'</p> <p>2. For PEland,app calculation, the value of 22,055ppm is applied in the calculations.</p> <p>3. Please refer file 'UP2_Unitata (Internal) Lab COD values_June09'.</p> <p><b>Reply 2:</b> The project proponent only needs to ensure that the sampling and analysis is carried out according to internationally recognised procedures (as per PDD and meth). This is being complied as the laboratories hired to carry out the analysis are ISO 17025 and SAMM certified. The laboratory certificates also carried what method is used; all monthly analysis is carried out based on APHA methods.</p>		
Assessment	<p>"Methods of waste water sampling" was verified. Please verify how 95% confidence interval can be justified using the grab sampling approach. Please provide justification for the same.</p> <p>For pointer 1,2 &amp; 3 – updated documents from external lab and records including COD values from internal has been verified. Updated calculation sheet has also been verified to be using, hence it is accepted.</p> <p><b>Response by audit team:</b> It was verified that all the COD readings has been sampled &amp; tested based on ISO 17025 &amp; SAMM accredited laboratory, hence it is acceptable &amp; this point is closed.</p>		



## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Issue	<p><b><u>Clarification Request No. 17</u></b></p> <p>As per registered PDD, methane content in stack gas shall be monitored continuously, please clarify whether the same has been performed during the monitoring period.</p>	3.0	Ok Closed
Response	<p>As per the PDD, description of measurement methods and procedures to be applied clearly states that the sampling will be at least on a quarterly basis, adhering to 95% CL. The PP has complied with this criterion.</p> <p>Further, though the QA/QC of the PDD table mentions about continuous monitoring, there is no provision to execute this as sampling and analysis is something that will be done on a batch by batch basis. Only flow measurements can be conducted continuously. Also, there is no real reason to conduct the sampling and analysis more frequently as to-date (from project start date), methane has never been detected in the flue gas of the boiler. The PP has taken conservative measure to apply the detection limit of 0.01% into the CER calculations.</p> <p><b>Reply 2:</b> Please refer file 'UP2_Stack Sampling Report_07-11'. All reports indicate ND (not detected) for methane. The detection limit is 0.01% and has been applied conservatively to the ER calculations.</p>		
Assessment	<p>Please provide us the spreadsheet giving the summary of test results conducted by third party quarterly since commissioning to verify the methane emissions in the flue gas of the boiler. Also provide all the reports given by the third party for methane content in stack gases.</p> <p><b><u>Response by audit team:</u></b> "UP2_Stack sampling report_07-11" has been verified to see any methane or other relevant gases during the third party monitoring done, however no methane was verified. Further, it is verified from the calculation that PPs have conservatively deducted 0.01% (being detection limit) from the CER calculation. Hence acceptable &amp; closed.</p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Issue	<p><b><u>Clarification Request No. 18</u></b></p> <p>As per registered PDD, PPs shall perform sampling ensuring at least 95% confidence level. Please clarify how the same has been ensured in this monitoring period.</p>	3.0	Ok  Closed
Response	<p>Please refer to file 'UP2_stack sampling certificates_May09-Feb11'.</p> <p>The PDD states that in order to achieve 95% CL, statistically valid number of samples should be taken. 7 samples are taken for each sampling period. The sampling of the stack has resulted in only one type of reading for the entire monitoring period; 'not detected'. Conservatively, 0.01 (detection limit) has been applied as the value for the entire monitoring period. Hence, it should be statistically valid to achieve 95% CL.</p> <p><b>Reply 2:</b></p> <p>Please refer file 'UP2_Stack Sampling Report_07-11'. All reports indicate ND (not detected) for methane. The detection limit is 0.01% and has been applied conservatively to the ER calculations.</p>		
Assessment	<p>Please refer to CR18 above.</p> <p><b><u>Response by audit team:</u></b></p> <p>"UP2_Stack sampling report_07-11" has been verified to see any methane or other relevant gases during the third party monitoring done, however no methane was verified. Further, it is verified from the calculation that PPs have conservatively deducted 0.01% (being detection limit) from the CER calculation. Hence acceptable &amp; closed.</p>		
Issue	<p><b><u>Clarification Request No. 19</u></b></p> <p>Please clarify whether the reports shown by Chemvi lab &amp; Environmental Science Sdb Bhd are accredited to perform these services.</p>	3.0	Closed Ok

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Response	<p>Please refer file 'SMM Accreditation.rar'. The file contains 3 documents.</p> <p>SMM Accreditation Chemvi Lab carries the SMM No. 213 and ISO17025 stamp on top right corner.</p> <p>SMM Accreditation Environmental Science states (page 2) that the lab carrying out the analysis is certified under SMM and ISO17025.</p> <p>SMM Accreditation Spectroscience lab contains the SMM/ISO17025 accreditation certificate of the lab.</p>		
Assessment	It was verified from the provided documents that Chemvi Lab and Environmental science SB Bhd are accredited by SMM to perform their respective tests or services.		
Issue	<p><b><u>Clarification Request No. 20</u></b></p> <p>Please clarify how the monitored biogas consumption in the boiler throughout the monitoring period is more than the total biogas generated at the biogas plant.</p>	3.0	<p>Ok</p> <p>Closed</p>

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
Response	<p>Please refer file 'UP2_normalize_settings.jpeg'. These settings were applied to all the vortex flowmeters supplied by Endress Hauser, in order to normalize the biogas flow at the biogas plant since the start of the project.</p> <p>Nevertheless, the boiler house have installed a meter from different maker (yokogawa) in order to monitor the biogas flow into the boiler; where a slightly different settings have been programmed into the flowmeter in order to normalize the readings. As such, the flowmeter have shown slight higher value (7% for the current monitoring period) compared to the values recorded by the Endress Hauser flowmeters. The normalize settings for the Yokogawa have been streamlined with the Endress Hauser flowmeters, as per the doc attached. The works were carried out on the 09<sup>th</sup> June 2011.</p> <p>Conservatively, for the period May 09- Jan 2011, the lower value between <b>FRe,inlet</b> and <b>difference between FRbio and FRf,inlet</b> have been applied to calculate BEheat.</p> <p><b>Reply 2:</b> Refer file 'Novaviro_Service Report_Jun 9th 2011'. This letter is for the initial site visit and assessment. Novaviro is still monitoring the percentage of difference recorded. Job is expected to be completed by end of August 2011.</p>		
Assessment	<p>It was verified that PPs have conservatively used the values between FRe,inlet and difference between FRbio and FRf,inlet, hence it can be accepted and closed for this monitoring period. However please provide us the documentary evidences to verify the works carried on 9<sup>th</sup> June 2011 to normalize the meter.</p> <p>However a Forward Action request shall be raised to verify the same during next verification.</p> <p><b><u>Response by audit team:</u></b> Service report &amp; findings raised by Novaviro Technology Sdn Bhd has been submitted, it can be verified from the services report that both the meters are made consistent by chang-</p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73



Industrie Service

Corrective Action Requests by audit team			
	<p>ing the settings of Yokogawa meter (model number DY100).</p> <p>Further it was also verified that PPs have taken the conservative reading among both the meters, however the consistency in the reading shall be verified under the FAR raised below for subsequent verifications.</p> <p>Hence this Clarification Request is closed.</p>		
Issue	<p><b><u>Clarification Request No. 21</u></b></p> <p>As discussed during onsite visit, there were some outages during the monitoring period, however the calculation spreadsheet presents that plant was in operation throughout the year. Please clarify.</p>	3.0	Closed Ok
Response	<p>The plant outages/maintenance period have been updated under section C of the monitoring report. The periods are 08-18 June 2009 and 16-26 March 2010. The outages are due to DOSH inspection. The SCADA report (boiler.csv) for the month of June 2009 and March 2010 can be cross-checked for the outages period.</p>		
Assessment	<p>Revised MR has been verified to document the outages during the proposed monitoring period. Hence accepted and closed.</p>		
Forward Action Requests by audit team			
	Comments and Results	Ref	Conclusion and IRL
Issue	<p><b><u>Forward Action Request No. 1</u></b></p> <p>Based on the service report ,‘Novaviro_Service Report_Jun 9th 2011’, it was verified that settings of the biogas consumption meter (before boiler) and biogas generation meter (after the digester) are made consistent to have same reading during no flaring starting from Aug 2011. Hence it is to be verified during the next verification whether both the meters gives same reading without any differences (during no flaring situation).</p>	-	Closed Ok
Response	<p>For the current monitoring period, the flowmeter which recorded biogas consumption in boiler recorded a higher volume of gas by 7% compared to the total biogas generation mi-</p>		

## Verification Protocol

Project Title: Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia

Date of Completion: 27.07.2012

Number of Pages: 73




Industrie Service

Corrective Action Requests by audit team			
	<p>nus biogas flared. This difference has been reduced to 4.2% (June 2011), 2.2% (July 2011) and 0.3% (Aug 2011); refer file 'UP2_CER Calculation_data input sheet.doc'.</p> <p>The settings will be further adjusted in order for both the flowmeters display readings with minimal or no difference for a particular monitoring period. Nevertheless, for future verifications too, the more conservative values between <b>FRe,inlet</b> and <b>difference between FRbio and FRf,inlet</b> will be used to calculate emission reductions.</p>		
Assessment	UP2_CER Calculation_data input sheet.doc' is verified and actual monitoring data shall be verified during the future verifications to ensure that FRe,inlet and difference between FRbio and FRf,inlet are consistent.		




## **Annex 2**

### **Information Reference List**


Final Report	27-07-2012	<p>Verification of the CDM Project  “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”</p> <p>Information Reference List</p>	Page 1 of 6	 Industrie Service
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		Onsite interview (05-05-2011 to 06-05-2011) carried out by TÜV SÜD: <u>Verification Team on site:</u> Nikunj Agarwal Praveen Tekchandani		<i>Reference to the PDD/MR chapter or CDM requirement</i>
0.	UNFCCC Webpage	“Name of the project” <a href="http://cdm.unfccc.int/Projects/DB/DNV-CUK1181122330.1/view">http://cdm.unfccc.int/Projects/DB/DNV-CUK1181122330.1/view</a>	05/05/2011 (Date of download of documents)	-
1.	EB	“Avoided methane emissions from organic waste-water treatment”, AM0013 ver04	05/05/2011 (Date of download of documents)	Applied methodology
2.	United Plantations	Biogas Plant Drawing	05/05/2011 (date of document submission)	To verify the implementation of the plant.
3.	NVT	Testing and Commissioning (Operation Manual)	01/02/2007	To verify the commissioning schedule and technical details
4.	Malaysian government	UP2 - Biogas plant DOSH approval	24/05/2007	Legal requirements for implementation of the plant.
5.	Kerajaan Malaysia	UP2_Periodic DOSH Inspection certificate under the factories and Machinery Act, 1967	16/03/2010 21/06/2011	Periodic check by the Malaysian government
6.	United Plantations	Dunphy Burner specifications	12/06/2011 (date of	To check the




Final Report	27-07-2012	Verification of the CDM Project “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”  Information Reference List	Page 2 of 6	 Industrie Service
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
			document submission)	technical specification of the burner installed in the boiler
7.	NVT	Flare Capacity and specifications (Operation Manual)	01/02/2007	To check flaring equipment technical specifications.
8.	United Plantations	Marshall Boiler specifications	12/06/2011 (date of document submission)	To verify technical details
9.	United Plantations	UP2_Power Consumption Equipments	12/06/2011 (date of document submission)	To verify the list of equipments consuming electricity in the project scenario.
10.	Noel Wambeck	Oil Palm process Synopsis – by Noel Wambeck. - June, 1999	12/06/2011 (date of document submission)	To cross check the POME generation quantity during the monitoring period.
11.	United Plantations	UP2_Biogas Plant Leakage Detection Results	12/06/2011 (date of document submission)	To verify the monitoring of physical leakage of the biogas.
12.	Calibration body	Third party calibration certificates for respective equipments	12/06/2011 (date of document submission)	To verify the calibration status of

Final Report	27-07-2012	Verification of the CDM Project “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”  Information Reference List	Page 3 of 6	 Industrie Service
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				each equipment
13.	ChemVi Laboratory	UP2_External Lab Certs_May09-Jan11 for COD (monthly reports)	12/06/2011 (date of document submission)	To verify the COD content in the POME to digester and waste water out from digester.
14.	United Plantations	UP2_Internal Lab COD values_June09 (thrice in a week)	12/06/2011 (date of document submission)	To cross-check the COD values
15.	OSHEN Consultants Sdn Bhd & Environmental Science (M) Sdn Bhd & ChemVi Laboratory	Stack flue gas monitoring (quarterly report by external party).	12/06/2011 (date of document submission)	To verify the methane content in the stack gases of boiler.
16.	Endress+Hauser	UP2_normalize_settings	12/06/2011 (date of document submission)	To verify the confirmation on the settings of the biogas meter (vortex flowmeter)
17.	LANDFELD QUASA ENGINEERING SDN BHD	UP2_Biogas line repositioning works	20/10/2009	To verify the biogas line repositioning work don by Landfeld Quasa.

Final Report	27-07-2012	Verification of the CDM Project “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”  Information Reference List	Page 4 of 6	 Industrie Service
--------------	------------	---	-------------	--

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
18.	United Plantations	SCADA readings in csv format for the following monitoring parameters: 1. Flowrate of organic wastewater into the digester 2. Quantity of steam generation from the boiler 3. Flowrate of organic waste water out from the digester. 4. Amount of biogas collected in the outlet of the bio-digester 5. Flow rate of biogas entering the flare 6. Flow rate of the biogas entering the heat generation equipment 7. Flow rate of the heat generation equipment stack gases	12/06/2011 (date of document submission)	To verify the raw data from the SCADA system.
19.	United Plantations	Raw logbook for the following parameters: 1. Depth of the lagoon 2. Operating hours per year of the refinery using steam from biogas boiler 3. Amount of electricity in the year y that is consumed at the project site for the project activity 4. Flow rate of sludge applied to land 5. Daily temperature readings from MMS department.	05/05/2011 (verified onsite)	To verify the raw data from the logbook for the respective parameters
20.	Novaviro Technology Sdn Bhd	Novaviro_Service Report_Jun 9th 2011	08/06/2011	To verify the reason behind the inconsistency in the reading for generation point and consumption point.

Final Report	27-07-2012	Verification of the CDM Project “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”  Information Reference List	Page 5 of 6	 Industrie Service
--------------	------------	---	-------------	--

Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
21.	United Plantations	2nd Verification_UP Biogas Methane Consumed vs Steam Generated.xls	31/08/2011 (date of document submission)	To verify the conservative approach for $HG_{BL,y}$
22.	United Plantations	COD values comparison.xls	31/08/2011 (date of document submission)	To cross-check the external COD values with the internal measured COD values
23.	United Plantations	Record of methane analyzer Methane Content Cross-check.xls	31/08/2011 (date of document submission)	To verify methane analyzer reading. To cross-check the methane content measured onsite at different loacations.
24.	United Plantations	Emission reduction calculation sheet	22/03/2012 (date of document submission)	To verify the emission reduction calculation
25.	United Plantations	CDM/Operating Monitoring Manual	05/05/2011 (verified during the onsite visit)	To cross-check the effectiveness of the monitoring plan onsite
26.	Laboratory	Monthly External accredited laboratory test report for measurement of Nitrogen content	05/05/2011 (verified during the onsite visit)	For parameter NC
27.	United Plantations	Final Monitoring report version 8	21-03-2012	Uploaded for

Final Report	27-07-2012	Verification of the CDM Project “Methane recovery and utilisation project at United Plantations Berhad, Jendarata Palm Oil Mill, Malaysia”  Information Reference List	Page 6 of 6	 Industrie Service
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				issuance
28.	Novaviro Technology Sdn Bhd & United Plantation Berhad	Contract between Novaviro Technology Sdn Bhd & United Plantation Berhad for ‘Design , supply, fabrication, installation, testing and commissioning of a POME Biogas capture anaerobic digester system for United Plantations Berhad to be located Jendarat Palm Oil, Jendarata Estate, Teluk Intan, Perak D.R.’	10-02-2006	To check the design & implementation of the project activity
29.	United Plantation Berhad	Record for EFB processed in 2009 & 2010	05/05/2011 (verified during the onsite visit)	To check the design & implementation of the project activity.



## **Annex 3**

### **Appointment Certificates**

# CERTIFICATE OF APPOINTMENT

Mr Agarwal, Nikunj, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	22.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		22.03.11	22.03.11	22.03.11	22.03.11	


Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	22.03.11				
Financial Expertise					
Date	29.03.11				

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	22.03.11
13.1_Waste handling and disposal	12.04.11
3.1_Energy demand	27.04.11
13.2_15.2_Animal waste management	21.07.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0001/06.

Date	Signature
22.03.12 Extension of Validity	





Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Tekchandani Praveen, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	05.07.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		10.05.12	10.05.12			

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	05.07.11				
Further countries					
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0122/03.

Date	Signature
05.07.2012 Extension of validity	<i>Tekchandani</i>





Industrie Service

# CERTIFICATE OF APPOINTMENT

Ms Zhang, Cuiyun (Rachel), fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	30.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		30.03.11	30.03.11	30.03.11	30.03.11	

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	30.03.11				30.03.11
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	30.03.11
13.1_Waste handling and disposal	30.03.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0033/04.

Date	Signature
30.03.12 Extension of Validity	