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VERIFICATION AND CERTIFICATION REPORT

PROJECT TITLE

METHANE RECOVERY IN WASTEWATER TREATMENTPROJECT AIN07-W-04, SUMATERA UTARA, INDONESIA

(UNFCCC Registration Ref. No. 2130)

Verification Period:
16 January 2009 – 28 February 2010

Report No. : SQAS-CDM-EA07360004
Revision No.:03

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SQAS-CDM-EA07360004	26 October 2010	03	24 November 2010

Project title	:	Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia
Organisational Unit	:	SIRIM QAS International Sdn Bhd
Client	:	PT AES AgriVerde Indonesia

Summary:

PT AES AgriVerde Indonesia has appointed SIRIM QAS International Sdn Bhd to perform the first verification and certification of the emissions reduction reported for the 'Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia' for the period from16 January 2009 to 28 February 2010. The project activity was registered by the UNFCCC Executive Board on16 January 2009. The verification was based on the validated project design document (PDD)/2/dated 10 July 2008 (version 5), validation report/4/, monitoring reports/5/&/8/ and other supporting documents made available to the verification team by the client.

The project activity captures and combusts methane gas produced from the anaerobic portion of an existing wastewater treatment system by installing sealed covers over the existing anaerobic POME lagoons to create an anaerobic digester system. The captured biogas is routed to high temperature enclosed flares to destroy the methane gas produced. The project results in the reduction of GHG emissions by the avoidance of methane from being emitted into the atmosphere.

As a result of the verification, the SIRIM QAS Intl. verification team confirms that the project has achieved emissions reduction for the monitoring period as below:

Monitoring period	16 January 2009 – 28 February2010
Total Methane Destroyed	15,923.61 tCO_2e
Total Project Emissions	9,443.53 tCO_2e
Emissions Reduction (rounded down)	6,480.00 tCO_2e

Subject : CDM Verification

Work carried out by :

Aernida Abdul Kadir - Verification Team Leader
Azhar Abdul Raof - Verification Team Member

Technical Reviewer : Syed Anuar Shah Syed Mansor
Date : 4 November 2010

Report approved by : Parama Iswara Subramaniam
Date : 24 November 2010

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Abbreviations

AES AgriVerde	PT AES AgriVerde Indonesia
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emissions Reduction
CH_4	Methane
CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ER	Emissions Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
IPCC	Intergovernmental Panel on Climate Change
MR	Monitoring Report
MP	Monitoring Plan
PDD	Project Design Document
POME	Palm Oil Mill Effluent
PP	Project Participant
SIRIM QAS Intl.	SIRIM QAS International Sdn Bhd
UNFCCC	United Nations Framework Convention for Climate Change
VVM	Validation and Verification Manual version 1.2

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1. INTRODUCTION

1.1 Objective

The objectives of this verification were:

- To verify that the actual monitoring system and procedures were in full compliance with the system and procedures described in the monitoring plan of registered PDD[/2/];
- To verify that the data reported were accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation; and
- To verify and certify GHG emissions reduction reported for 'Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia' for the period from 16 January 2009 to 28 February 2010.

1.2 Scope

The scope of the verification was the independent and objective review and *ex-post* determination of the monitored reduction in GHG emissions from'Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia'. The verification of this CDM project was based on the validated and registered project design document (PDD), validation report, monitoring reports and supporting documents made available to the verification team. These documents were reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures, related rules and guidance, and the Validation and Verification Manual[/1/].

The verification was not meant to provide any consulting towards the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Description of the Project Activity

Project Participants	:	**I)** AES AgriVerde Ltd. / Netherlands **II)** PT AES AgriVerde Indonesia/ Indonesia
Project title	:	Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia
UNFCCC registration No	:	2130
Registered date	:	16 January 2009
Crediting period	:	16 January 2009 – 15 January 2016 (renewable)

Project location	:	PT Victorindo Alam Lestari, Desa Huta Lombang, Kecamatan Lubuk Barumun, Kabupaten Padang Lawas, North Sumatera, Indonesia
GPS coordinates	:	N 1.08367 E 99.46227

The 'Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia' project (hereafter referred to as the project) is an anaerobic digestion project, which treats wastewater from PT Victorindo Alam Lestari (hereafter referred as the project facility). The project involves capturing of biogas containing methane generated from covered anaerobic ponds. The captured biogas is flared in a high temperature enclosed flare system. The project results in the reduction of GHG emissions by avoiding the release of methane from the open lagoons into the atmosphere.

The project is a registered small scale CDM project that applies CDM methodology AMS III.H - Methane Recovery in Wastewater Treatment, version 7[/3/].The project was registered by the CDM Executive Board on 16 January 2009 under the sectoral scope no. 13 (Waste handling and disposal). The project has been reducing GHG emissions since then.

1.4 Verification team

The following verification team was assigned to carry out the verification of the project:

Verification team leader	:	Aernida Abdul Kadir
Verification team member	:	Azhar Abdul Raof

Aernida Abdul Kadir holds a Degree in Electrical-Electronics Engineering and a Diploma in Palm Oil Milling and Technology Management. She has several years of working experience in palm oil milling including the operation of treatment system for POME. She has been trained in CDM validation and verification processes, and was qualified as a CDM Lead auditor in accordance with SIRIM QAS qualification criteria for CDM lead auditors. She is also a qualified Environmental Management System (ISO 14001) lead auditor.

Azhar Abdul Raof is a Chemical Engineer by qualification. He has extensive experience in the area of wastewater treatment technology including anaerobic waste treatment processes in the palm oil mill industry. He has been trained in the CDM validation and verification processes, and was qualified as a CDM auditor in accordance with SIRIM QAS's qualification criteria.

2. METHODOLOGY

The SIRIM QAS Intl.'s verification process consisted of the following phases:

i) document review of the CDM registered PDD, the Monitoring Report and the emissions reduction calculation spreadsheets submitted by the client;

ii) verification audit planning;

iii) on-site visit to the project activity which included interviews with the project owner and the client, review of various monitoring records and records of calibration of the monitoring equipment, and verification of measurement procedures;

iv) preparation of draft verification report (issuance of verification audit findings);

v) resolution of outstanding issues and the issuance of final verification report and opinion.

The verification of the project was carried out between April 2010 and November 2010, with details as follows:

Off site preparation/document review and planning: 2 – 6 April 2010

On-site verification: 28 April &1 May 2010

Preparation of draft report: 30 June – 7 July 2010

Preparation of final report: 29 September 2010 – 24 November 2010

The project assessment was based on the methodology developed in the VVM. In order to ensure transparency, a verification protocol was customized for the project, according to the VVM. The protocol shows, in a transparent manner, requirements, means of verification and the results. The verification protocol serves the following purpose;

- it organizes, provides details and clarifies the requirements that the verification of a CDM project is expected to meet;
- it ensures a transparent verification process where the verifier will document how a particular requirement has been proved, and the results of the verification.

The completed protocol is enclosed in Annex 1 to this report.

2.1 Review of Documentation

The following documentation were reviewed and verified:

- Registered PDD[/2/], version 5, dated 10 July 2008
- Validation Report[/4/] by TUV Sud, version 1, dated 12 August 2008(Report no.:1087012)
- Monitoring Report[/5/] version 1, dated 25 March 2010(Document ID : MR01-AIN07-W-04)

- Victorindo ER Spreadsheet[/6/] version 1
- Victorindo's Verification Calculation[/7/] version 1
- Monitoring Report[/8/] version 6, dated 22 November 2010 (Document ID : MR01-AIN07-W-04)
- Victorindo ER Spreadsheet[/9/] version 5
- Victorindo's Verification Calculation[/10/] version 6

A complete list of all documents reviewed is as listed in part 6 (References) of this report.

2.2 Site Visits

SIRIM QAS Intl.'s verification team conducted an on-site audit at the project site in Padang Lawas, North Sumatera on 28 April 2010 and at the PP's head office in Jakarta on 1 May 2010. The audit at the project site included the verification of the project implementation including reviewing of the location of the monitoring equipment and the method of monitoring and recording of data. At the head office, the verification team conducted a review of documents and the monitored data. Interviews with relevant personnel were also carried out to confirm the method of recording the GHG data.

The verification of data in the monitoring report included the raw data from the respective checklists, results of analysis and the plant design and status.

The personnel interviewed and the coverage of interviews is summarized below.

Coverage	Source of information/Persons interviewed
• GHG reporting and calculation • Information in the monitoring report • Assessment of project boundary • Qualification and training • Roles and responsibilities • GHG raw data compilation • Reporting and reviewing of GHG data • CDM Monitoring and reporting	Christopher Soesanto – CDM Regional Regulatory & Quality (RRQ) Manager, PT AES AgriVerde Indonesia. Lintang K.A. Walandouw – CDM Services Manager, PT AES AgriVerde Indonesia. Wahyu Puspita Sari – CDM Services Manager (acting), PT AES AgriVerde Indonesia.
• Review of physical components • Mill operation	Sudin Sembiring – Mill Manager, PT Victorindo Alam Lestari. Benny Sijabat – Site Technician, PT AES AgriVerde Indonesia.
• Biogas plant operation • Collection of measurements • Data logging and reporting	Benny Sijabat – Site Technician, PT AES AgriVerde Indonesia. John Robert S – Construction Project Manager, PT AES AgriVerde Indonesia.

• Maintenance of monitoring equipment • Calibration of equipment	Sakti Azhar Siregar – HQ Support Team (Senior Wastewater Engineer), PT AES AgriVerde Indonesia. Fathuroji Suhaemi – HQ Support Team (Asset and IT Data Management Manager), PT AES AgriVerde Indonesia.

2.3 Assessment

Means of verification used were:

i) desk review, involving
- a review of the data and information presented to verify their completeness;
- a review of the monitoring plan and monitoring methodology;
- an evaluation of data management and the quality assurance and quality control system;

ii) on-site assessment, involving
- an assessment of the implementation and operation of the CDM project activity as per the registered PDD;
- a review of information flows for the monitoring parameters;
- interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD;
- a cross-check between information provided in the monitoring report and data from other sources;
- a check of the monitoring equipment including their calibration status and observations of monitoring practices;
- a review of calculations and assumptions made in determining the GHG data and emissions reduction;
- an identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

Details of all findings are recorded in the verification protocol in Table 2 of Annex 1 of this report.

2.4 Reporting of Findings

Findings identified during the verification may be classified into Corrective Action Request (CAR), Clarification Request (CL) and/or Forward Action Request (FAR).

A CAR is raised if one of the following occurs:
- non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient; or
- mistakes have been made in applying assumptions, data or calculations of emissions reduction that will impair the estimate of emissions reduction; or

- issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

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

For CAR and CL, the client is required to take necessary corrective actions and provide evidence of the implementation. All CARs and CLs shall be resolved prior to submitting a request for issuance.

A FAR should be issued, where:

- the actual project monitoring and reporting requires attention and /or adjustment for the next verification period, or
- an adjustment of the MP is recommended.

In the context of FARs, risks have been identified, which may endanger the delivery of high quality CERs in the future, i.e. by deviations from standard procedures as defined by the monitoring plan. As a consequence, such aspects should receive a special focus during the next consecutive verification. A FAR may originate from lack of data sustaining claimed emissions reduction.

3 VERIFICATION FINDINGS

During this first periodic verification, five (5) CARs and three (3) CLs were raised after the on-site audit carried out on 28 April and 1 May 2010. Details of the findings are provided in Table 2 of Annex 1 of this report.

3.1 Remaining Issues, CARs, FARs from Previous Validation or Verification

This is the first verification for the project activity. No FAR was raised during the validation stage. All findings had been satisfactorily closed out.

3.2 Project Implementation

The project has been implemented as described in the PDD[/2/] and monitored in accordance to the monitoring plan of the registered PDD[/2/].The project involves capturing and combusting of biogas containing methane generated from the covered anaerobic portion of an existing wastewater treatment system. Two of the existing anaerobic POME lagoons were covered with HDPE liner to create an anaerobic digestion system and two high temperature enclosed flare systems were installed for each lagoon to combust the captured methane.

The verification team noted that during this crediting period, there was no renewable energy component being implemented at the project facility. It was also observed that one of the anaerobic ponds (pond no. 1) was not fully operational. The project activity was also equipped

with four units of flaring system, two for each pond. A CL 1 was raised as the status of the project implementation was not included in the first version of the Monitoring Report.

3.3 Completeness of Monitoring

The monitoring was confirmed to be in accordance with the monitoring plan contained in the registered PDD[/2/] and the approved methodology applied by the CDM project activity, i.e. AMS III.H version 7. Following are the parameters which were required to be monitored:

- Volume of wastewater treated ($Q_{y,ww}$),
- Chemical oxygen demand of the wastewater entering the anaerobic treatment system ($COD_{y,ww,untreated}$),
- Chemical oxygen demand of the treated wastewater ($COD_{y,ww,treated}$),
- Methane content of biogas (MC_{biogas}),
- Efficiency of flaring process (CFE_{ww}),
- Amount of biogas recovered and directed to flare for combustion (BGP_{Flare}),
- Emissions from electricity or diesel consumption ($PE_{y,power}$),
- Amount of biogas recovered and directed to Renewable Energy Unit (BGP_{RE}),
- Temperature signal to prove the Renewable Energy Unit is combusting the biogas (RE_{ON}),
- End use of final sludge ($S_{f,end\ use}$).

All parameters stated in the validated monitoring plan were monitored and reported appropriately. The monitoring report had included each parameter required by the monitoring plan and the information flow (i.e from data generation, aggregation, recording, calculation and reporting) for these parameters was provided in the monitoring report. The monitoring methodology and sustaining records were sufficient to enable the verification of the emissions reduction. The verification of each parameter was as follows:

Data/parameter:	$Q_{y,ww}$
Data unit:	m^3
Description:	Volume of wastewater treated
Source of data used:	Determined from FFB production data and site verified effluent conversion factor. To be field verified by a third party on an annual basis
Means of verification :	The volume of wastewater treated was determined using the following formulae: $Q_{y,ww}$ = FFB production x effluent conversion factor. The FFB production data was provided by the mill on a monthly basis. During the site verification, the verification team had cross checked the monthly data with the daily FFB processed records ('Laporan Tahunan PKS PT Victorindo Alam Lestari 2009 & 2010'[/12/]). The determination of the effluent conversion factor was carried out by a third party accredited laboratory, PT Nusantara Water Centre, Jakarta on 3 December 2009.The test report[/11/] (No.061/SHA-P-Rev/XII/09) dated 8 December 2009 was reviewed and the verification team was able to confirm that the process to determine

	the conversion factor was acceptable and was commonly used in the industry. The determination of the factor applied the following process: iii) Measurement of flowrate at the inlet of the cooling pond, iv) Average volume of wastewater for the day = average flowrate (m^3/hr) x operating hours of the mill (18 hours/day) v) Effluent conversion factor = average wastewater volume generated for the day/FFB processed for the day The determined effluent conversion factor was 0.80. Based on the verification team's and technical reviewer's experience, and supported by a publication entitled ' Feasibility Study Report POME Treatment Co-benefits CDM Project, February 2009', this value can be confirmed as acceptable as it is within the standard range of the effluent conversion factor in the palm oil mill industry. The calculation of $Q_{y,ww}$ presented in the monitoring report/8/ and spreadsheet/9/ (including the formulae) was checked and no errors were found.

Data/parameter:	$COD_{y,ww,untreated}$
Data unit:	Tonnes/ m^3
Description:	Chemical oxygen demand of the wastewater entering the anaerobic treatment system
Source of data used:	Sample analysed semi annually by third party laboratory and data recorded in the AES AgriVerde monitoring form
Means of verification :	According to the monitoring plan, this parameter is to be monitored semi-annually. However, in actual practice, the analysis was carried out on a monthly basis except for January and February 2010. Sampling of wastewater was carried out by the AES AgriVerde's technician and samples were sent to a third party accredited laboratory, UPT Laboratorium Lingkungan Pemerintah Provinsi Sumatera Utara, Medan for analysis. PP had established a Sampling Point Diagram to ensure that sampling was done consistently at the same place. The verification team checked the sampling point and concluded that the sampling point was appropriate as it was at the inlet to the covered anaerobic pond no. 1. The COD values recorded in the spreadsheet were checked against the actual test reports/13/ and found to be consistent.

Data/parameter:	$COD_{y,ww,treated}$
Data unit:	Tonnes/ m^3
Description:	Chemical oxygen demand of the treated wastewater
Source of data used:	Sample analysed semi annually by third party laboratory and data recorded in the AES AgriVerde monitoring form.
Means of verification :	According to the monitoring plan, this parameter is to be monitored semi-annually. However, in actual practice, the analysis was carried out on a monthly basis except for January and February 2010.

	Sampling of wastewater was carried out by the AES AgriVerde's technician and samples were sent to a third party accredited laboratory, UPT Laboratorium Lingkungan Pemerintah Provinsi Sumatera Utara, Medan for analysis. PP had established a Sampling Point Diagram to ensure that sampling was done consistently at the same place. The verification team checked the sampling point and concluded that the sampling point was appropriate as it was at the outlet of the covered anaerobic pond no. 2. The COD values recorded in the spreadsheet were checked against the actual test reports/13/ and found to be consistent.

Data/parameter:	MC_{biogas}
Data unit:	Percentage (volume)
Description:	Methane content of biogas
Source of data used:	Measured and recorded quarterly using methane gas analyzer.
Means of verification :	The sampling points were located in the biogas pipeline near to the flare systems. The measurement was done by the Site Technician using a portable methane gas analyzer. According to the monitoring plan, the measurement shall be done on a quarterly basis and sufficient measurements should be made to meet a 95% confidence level. From the data verification, it was found that the measurement of methane was conducted on a monthly basis except for Q2 and Q3 2009, where only one measurement was taken for each quarter. The monitoring report included the calculation of methane concentration with 95% confidence level. However, these values were not used in the spreadsheets (i.e. the spreadsheet used the monthly analysis results). The spreadsheet provided had also included the Q4 2008 data which was not relevant for this monitoring report. A CAR was raised on these issues (CAR 3). In response to the finding, the PP revised the method to determine the MC_{biogas}. All measured data was subsequently calculated using the 95% confidence level requirement. A value of 62.60% concentration was used for this monitoring period. The verification team accepted this value as it had been determined using the 95% confidence level method and the value was also within the typical range of methane concentration in biogas from POME. This was supported by a publication entitled 'Baseline study of methane emission from anaerobic ponds of palm oil mill effluent', by S. Yacob et al (2005). Based on this corrective action, CAR 3 was closed. The spreadsheet and the monitoring report were revised accordingly.

Data/parameter:	CFE_{ww}
Data unit:	Percentage
Description:	Efficiency of flaring process
Source of data used:	Flares shall be operated in accordance with manufacturer's specifications. Flare combustion temperature and biogas flow rate data will be recorded more frequent than hourly. If in any specific hour either of these parameters is out of specification, a flare efficiency of 50% will be used for this specific hour. If at any given time the temperature of the flare is below 500°C, 0% efficiency will be used for this period. Provided these parameters are within specification, a value of 0.9 shall be used.
Means of verification :	The on-site verification confirmed that the project activity had four units of enclosed flare system (i.e. two for each digester system). The system was equipped with a thermocouple that measures the flaring temperature continuously and a biogas flowmeter that measured the flowrate of the biogas. The measured data was captured by a data logger which then transferred it electronically to the ER spreadsheet. According to the flare manufacturer's specification and requirement specified in the methodology, the flare efficiency can either be 0%, 50% or 90% depending on the temperature and flowrate of the biogas for every 10 minutes. The determination of the flare efficiency is tabulated in the ER spreadsheets. Formula and linkages were provided in the spreadsheet. The verification team was able to confirm that the determined flare efficiency was in accordance with the specification provided by the manufacturer. During the on-site verification, it was observed that only 2 of the 4 units of flaring systems were operational. This was because the amount of biogas produced was low and the 2 units of flare system were adequate. During the verification of data in the spreadsheet, the verification team noted that the temperatures exceeded 2000°C for the period from 16 August 2009 to 21 August 2009 for Flare no. 1 and 7 December 2009 to 8 December 2009 for Flare no. 2. This temperature range was found to be exceeded the manufacturer's specified range (between 500°C to 1300°C). A CL (CL 3) was raised on this issue. In response to the CL, PP provided an explanation from the manufacturer/16/ of the equipment. The manufacturer has confirmed that the out of range temperature value was due to thermocouple wire connection, and does not warrant a replacement of the thermocouple. Further to that, the 'Total Qualified Biogas' for the period where the temperature exceeded 1300°C has also been amended. The 'Total Qualified Biogas' was taken as zero. No emission reduction has been claimed for that period. This is found to be conservative as no ER was claimed. Details of the finding and discussion on the closure of the CL 3 are as in Table 2 of Annex 1 of this report.

Data/parameter:	BGP_{Flare}
Data unit:	NCMH
Description:	Amount of biogas recovered and directed to flare for combustion
Source of data used:	Continuous flowmeter
Means of verification :	The location of the biogas flowmeter was verified during the site visit. The meter is mounted in the gas pipeline to the flaring system. The measurement is carried out every 10 minutes and the captured data is linked and stored in a data logger. The data then transferred electronically into the ER spreadsheet. The direct measurement reading from the flowmeter was normalized using a Linear Regression Equation as specified by the flowmeter manufacturer. The normalized values were checked and it can be confirmed that the normalization was carried out in accordance with the recommended procedure. No data transfer error was found.

Data/parameter:	PE_{power}
Data unit:	tCO_2e/yr
Description:	Emissions from electricity or diesel consumption
Source of data used:	This will be measured or conservatively calculated. Data collected on the AES AgriVerde Monitoring Form
Means of verification :	In the project activity, it was confirmed that electricity is supplied by either the steam turbine from a biomass boiler or diesel generator. The mill is not connected to the grid, and therefore, the PE_{power} was calculated using the following formulae: $PE_{power} = EC_{project} * \%EG_{diesel} * EF_{diesel} / 1000$ $EC_{project}$ is the electricity consumed by the project in kWh. The electricity consumed by the biogas plant was estimated using the equipment power rating provided by the manufacturer. The power ratings for all equipment/17/-/22/ identified in the registered PDD were checked against the equipment specifications. It can be confirmed that the maximum power rating used in the calculation were consistent with that in the equipment specifications except for the gas flowmeter FCI ST50, data logger and desludging pump Rotomac. These inconsistencies were highlighted in CAR 2. The ER spreadsheet was amended in accordance with the equipment specification and hence the CAR was closed. The electricity consumed by the project was determined as = maximum power rating multiplied by 8760 running hours (24 hours x 365 days). The EF_{diesel} ; $0.8kgCO_2/kWh$ was used in the calculation, in accordance to the requirement specified in paragraph 7, AMS-III.H version 7. The method used in this calculation was found to very conservative as not all equipment had been used and or had been in operation continuously.

	$\%EG_{diesel}$is the percentage of the electricity produced via on-site diesel generators from the total electricity generated onsite through diesel generators(EG_{diesel}) and biomass boiler with steam powered turbine ($EG_{biomass}$). It was determined using the formulae: $\%EG_{diesel} = EG_{diesel} / (EG_{diesel} + EG_{biomass})$ The verification team was able to confirm that the diesel generators were mainly used as a standby and will only be in operation during mill start up, maintenance and breakdown. The records of the kWh generation were provided by the mill where readings were taken from the installed kWh meters, located at the mill power house. The data was then transferred into the ER spreadsheet by the AES AgriVerde CDM Service Manager. The monthly kWh in the ER spreadsheet was verified against data from 'Buku Laporan Pemakaian Solar Genset/Turbin' and it was found that for November 2009 EG_{diesel} and $EG_{biomass}$ were not the same as stated in the referred record. Due to this error, the average electricity generation was not accurate.CAR 2 was raised on this issue. In response to the CAR, PP has corrected the data as required. Details of the finding and discussion on the closure of the CAR 2 are as in Table 2 of Annex 1 of this report.

Data/parameter:	BGP_{RE}
Data unit:	NCMH
Description:	Amount of biogas recovered and directed to Renewable Energy Unit
Source of data used:	Continuous flowmeter
Means of verification :	The component has yet to be installed. Therefore, no data was available.

Data/parameter:	RE_{ON}
Data unit:	°C
Description:	Signal to prove the Renewable Energy Unit is combusting the biogas
Source of data used:	Thermocouple
Means of verification :	The component has yet to be installed. Therefore, no data was available.

Data/parameter:	$S_{f,end\ use}$
Data unit:	NA
Description:	End use of final sludge
Source of data used:	Monitoring of the end use of final sludge to be recorded in the AES AgriVerde monitoring form
Means of verification :	During the on-site verification, the verification team checked with the mill on the end used of final sludge. The team visited the mill wastewater treatment plant and the nearby plantation. The site visit confirmed that there was no desludging activity during the

	period. Based on the interviews and visit done, it can also be confirm that the final sludge from the wastewater treatment can be land applied in the plantation area.

The verification team was able to confirm that the above parameters had been monitored in accordance with the monitoring plan contained in the registered PDD[/2/] and the approved methodology AMS III.H version 7. All inconsistencies were highlighted in CAR 2, CAR 3 and CL 3. Details of the responses are contained in Table 2 of Annex 1 of this report. The changes made are evident in version 6 of the Monitoring Report[/8/] and version 5 of the emissions reduction calculation spreadsheets[/9/].

3.4 Accuracy of Emissions Reduction Calculations

In the calculation of the emissions reduction, the following data input were used:

i) data recorded from meters either installed in the plant or measured using portable meters;
ii) default values determined during the validation period;
iii) data provided from mill's report and third party laboratory report;
iv) data obtained from calculation.

The data recorded from the meters installed in the plant were the biogas flowmeter and the thermocouple which are mounted near at the flare system. Both readings are linked to a data logger where data is captured and stored every 10 minutes. The data from the data logger is then transferred to the spreadsheets electronically by the Site Technician. The information is then sent to the AES AgriVerde CDM Services Manager at the head office via email on weekly basis.

For methane concentration in biogas which is measured using portable methane gas analyser, the data is recorded manually in the Site Visit Checklist Form by the Site Technician. The filled form is sent to the AES AgriVerde CDM Services Manager at the head office via email on weekly basis. Summary of parameters is as follows:

Parameter	Equipment	Unit	Remarks
BGP_{Flare}	Biogas flowmeter	NCMH	Nil
CFE_{ww}	Thermocouple	°C	Refer to CL 3
MC_{biogas}	Portable gas analyzer	Percentage (volume)	Refer to CAR 3 and CL 2

For the default values, the values determined during the validation were used. These values will remain fixed for the entire crediting period of the project. Following are the default values that were used in the calculation of the emissions reduction:

Parameter	Value	Unit	Remarks
D_{CH4}	0.0007168	tCH_4/m^3CH_4	IPCC 2006. In the first version of the monitoring report, a different value was used. CAR4 was raised to request for clarification. In response to this, the IPCC value was used.
GWP_{CH4}	21	-	AMS III H version 7
EF_{diesel}	0.8	$kgCO_2/kWh$	AMS-I.D version 7
$MCF_{ww, final}$	1.0		Registered PDD AMS III H version 7 Refer to CAR 1
$B_{o,ww}$	0.21	kg CH4 / kg COD	AMS III H version 7
$[CH4]_{y, ww, treated}$	0.0001	$tonnes/m^3$	AMS III H version 7

As for the data provided by the mill and third party laboratory report, the reports are submitted to the AES AgriVerde CDM Services Manager directly via fax, email or post. The summary of the parameters is as below:

Parameter	Value	Unit	Remarks
Effluent conversion factor	0.80	m^3/tonnes FFB	Third party testing/11/.
FFB	As in ER spreadsheet	Tonnes	'Laporan Tahunan PKS PT Victorindo Alam Lestari 2009 & 2010'/12/provided by the Mill.
$COD_{y,ww,untreated}$	As in ER spreadsheet	Tonnes/ m^3	Third party testing/13/.
$COD_{y,ww,treated}$	As in ER spreadsheet	Tonnes/ m^3	Third party testing/13/.
$S_{f,end\ use}$	-	-	No desludging in this monitoring period. The final sludge will be land

			applied in the plantation area.
EG_{diesel}	As in Excel spreadsheet	kWh	'Buku Laporan Pemakaian Solar Genset/Turbin'/14/ provided by the Mill.
$EG_{biomass}$	As in Excel spreadsheet	kWh	'Buku Laporan Pemakaian Solar Genset/ Turbin'/14/provided by the Mill.

The following is the input data derived using calculation:

$Q_{y,ww}$	As in ER spreadsheet	m^3	Derived from FFB processed multiplied with effluent conversion factor.
$EC_{project}$	As in ER spreadsheet	kWh	Derived from kW rating multiplied by running hours.

All data was compiled in the AES AgriVerde monitoring form by the CDM Services Manager at the head office. Data from this form was then transferred to the spreadsheets and the monitoring report. Relevant formulae and linkages for the calculation of the emissions reduction were adequately provided in the spreadsheet. Final checking of the information in the spreadsheets and monitoring report was carried out by the CDM Regulatory Manager.Most of the data transferring was carried out using electronic transfer. Thus, errors due to transferring were minimized.

<u>Emissions reduction calculations:</u>

In accordance with paragraph 16 of AMS-III.H version 7/3/, "the calculation of emissions reduction shall be based on the amount of methane recovered and fuelled or flared that is monitored ex-post. Also for these cases, the project emissions and leakage will be deducted from the emissions reduction calculated from the methane recovered and combusted."

Thus, the total emission reductions are calculated as follows:

$$ER_y = (MD_y * GWP_{CH4}) - PE_y$$

where:

ER_y Emissions reduction in the year 'y' (tonnes CO_2e)

MD_y Amount of methane fuelled and flared in year 'y' (tonnes CH_4)

GWP_{CH4} Global warming potential for CH_4

PE_y Project activity emissions in the year 'y' (tonnes CO_2e)

Amount of methane destroyed

The amount of methane destroyed (either fuelled or flared) is determined as follows:

$$MD_y = (BGP_{Flare,y} + BGP_{RE,y}) * MC_{biogas,y} * D_{CH4} * CFE_{ww}$$

where:

MD_y	Amount of methane destroyed in year 'y' (tonnesCH_4)
$BGP_{Flare,y}$	Amount of biogas recovered and directed to the flare for combustion (Nm^3)
$BGP_{RE,y}$	Amount of biogas recovered and directed to renewable energy system (Nm^3)
$MC_{biogas,y}$	Methane content of biogas during the year 'y' (%)
D_{CH4}	Density of methane at normal condition (tCH_4/m^3CH_4)
CFE_{ww}	Capture and flare efficiency of methane recovery and combustion equipment

The $BGP_{RE,y}$ is zero for this monitoring period, since the renewable energy system hadyet to be installed.

Project emissions

Referring to paragraph 6 of AMS-III.H version 7, the related project emissions for this project are PE_{power}, $PE_{treated}$, $PE_{fugitive}$ and $PE_{dissolved}$. This was also summarized in page 24 of the registered PDD.

In the first version of the monitoring report and ER spreadsheet provided by PP, onlyemission from electricity or diesel consumption, PE_{power} was taken into account. CAR 1 was raised on this issue. As a result of this finding, the related project emissions have been considered and deducted from the final emissions reduction. All of the project emissions have been calculated in accordance with the methodology requirements.

The project emissions in the year 'y' are calculated as follows:

$$PE_y = PE_{y,power} + PE_{y,ww,treated} + PE_{y,dissolved} + PE_{y,fugitive,ww}$$

where:

PE_y	Project activity emissions in the year 'y' (tonnesCO_2e)
$PE_{y,power}$	Emissions from electricity or diesel consumption in the year 'y' (tonnes CO_2e)
$PE_{y,ww,treated}$	Emissions through degradable organic carbon in treated wastewater in the year 'y' (tonnes CO_2e)
$PE_{y,dissolved}$	Emissions through dissolved methane in treated wastewater in the year 'y' (tonnes CO_2e)
$PE_{y,fugitive,ww}$	Emissions from methane release in capture and flare systems in the year 'y' (tonnes CO_2e)

$PE_{y,power}$

$PE_{y,power}$was conservatively calculated based on the following formula:

$$PE_{y,\ power} = EC_{project} * \%EG_{diesel} * EF_{diesel} / 1000$$

where:

$PE_{y,\ power}$	Project emissions due to electricity consumption of equipment (tCO_2e/yr)
$EC_{project}$	Amount of electricity consumed by project equipment (kWh)
$\%EG_{diesel}$	Percentage of total site electricity derived from diesel generators
EF_{diesel}	Emission factor for diesel generator system (0.8 $kgCO_2/kWh$)

The electricity consumed by project activity equipment was sourced from the Mill which generates its own electricity primarily from steam turbine, using steam from a biomass boiler and diesel genset as backup. It was agreed that the generation of electricity from the biomass boiler is carbon neutral and only electricity generation from the diesel genset contributes to CO_2 emission in the project activity. Thus, the percentage of electricity derived from diesel generators is determined as follows:

$$\%EG_{diesel} = EG_{diesel} / (EG_{diesel} + EG_{biomass})$$

where:

EG_{diesel}	Electricity produced on-site due to fossil fuel consumption(kWh)
$EG_{biomass}$	Amount of electricity produced on-site by biomass turbines (kWh)

The above formulae were found appropriate to determine the $PE_{y,power}$.

$PE_{y\ ,ww,\ treated}$

As stated in the paragraph 8 of AMS III-H version 7, the following formula is used to calculate $PE_{\ y,\ ww,\ treated}$:

$$PE_{y,\ ww,\ treated} = Q_{\ y,ww} * COD_{\ y,\ ww,\ treated} * B_{o,ww} * MCF_{\ ww,\ final} * GWP_{\ CH4}$$

where:

$Q_{\ y,ww}$	Volume of wastewater treated in the year y (m^3)
$COD_{y,ww,treated}$	Chemical oxygen demand of the treated wastewater in the year (tonnes/m^3)
$B_{o,ww}$	Methane generation capacity of the treated wastewater (IPCC adjusted default of 0.21 kg CH_4 /kg COD)
$MCF_{\ ww,\ final}$	Methane correction factor based on type of treatment and discharge pathway of the wastewater (fraction) (MCF higher value in table III. H.I for anaerobic deep lagoon i.e.1.0)
$GWP_{\ CH4}$	Global warming potential of methane (value of 21 is used)

$PE_{y, dissolved}$

As stated in the paragraph 11 of AMS III-H version 7, the following formula is used to calculate $PE_{y, dissolved}$:

$$PE_{y, dissolved} = Q_{y,ww} * [CH4]_{y, ww, treated} * GWP_{CH4}$$

where:

$[CH4]_{y, ww, treated}$	Dissolved methane content in the treated wastewater, default value of 0.0001 (tonnes/m^3)

The calculation of $PE_{y, dissolved}$ was verified and found to be appropriate.

$PE_{y\ fugitive,ww}$

As stated in the paragraph 10 of AMS III H version 7, the following formula is used to calculate $PE_{y\ fugitive,ww}$:

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

where:

CFE	Capture and flare efficiency of methane recovery and combustion equipment
$MEP_{y,ww,treatment}$	Methane emission potential of the wastewater treatment plant in the year y (tonnes)

However, the calculation of $PE_{y\ fugitive,ww}$ was not using the above formula as during the calculation of $MD_{y,}$ the efficiency of the flaring system has been considered. The verification team had verified the calculation in the spreadsheet and confirmed that in the calculation of MD_y, $PE_{y\ fugitive,ww}$ had been indirectly considered.

The spreadsheet was verified accordingly and it can be concluded that all related project emissions namely, $PE_{y,power}$, $PE_{y,\ ww,\ treated}$, $PE_{y,\ dissolved}$ and $PE_{y,fugitive,ww}$ were accounted in the emissions reduction calculation.

Based on all of the above, the following were confirmed for the monitoring period :

Total methane destroyed (MD_y)	15,923.61 tCO_2e
$PE_{y,power}$	3.68 tCO_2e
$PE_{y,\ ww,\ treated}$	8,875.90 tCO_2e
$PE_{y,\ dissolved}$	563.95 tCO_2e
Total project emissions	9,443.53 tCO_2e
Emissions reduction	6,480.08 tCO_2e
Final emissions reduction (rounded down)	6,480.00 tCO_2e

3.5 Quality of Evidence to Determine Emissions Reduction

The equipment used to monitor and measure the parameters in the monitoring plan had been calibrated accordingly. The project participant had established a calibration master list/16/ to ensure that the equipment history and the calibration status were being tracked. For all on-line measuring equipment the calibration status was determined based on the calibration certificate issued by the equipment manufacturer at the time of purchase. It was the practice of the project participant to replace all on-line measuring equipment with new units before the calibration due date. Following are the calibration status of the equipment:

Monitoring and measuring equipment	Equipment no. and operation period	Calibration date	Frequency of calibration	Remarks
1) Biogas flowmeter: Flare no. 1 FCI Flow Meter ST50	S/N 291292 Note: This unit was in use from 19/06/2008 to 5/11/2009	8/05/2008	18 months from date of installation	• PP purchased several units of flowmeter at one time. Calibration certificates were provided by the equipment manufacturer and according to the certificate, the validity of the calibration is 18 months from the date of installation of the equipment. • Calibration was carried out by the equipment manufacturer, Fluid Components International LLC. This was as indicated in the equipment calibration certificate/25/. • Next calibration was due on18/12/2009. However, it was replaced with the new meter, S/N 295695 before the calibration due date. • CAR 5 was raised as the serial number, calibration date, installation date and calibration due date for this meter presented in section C.4.2 and D.1 of the monitoring report was found not consistent with the verified record. In response to CAR 5, PP has amended the information in both sections of the monitoring report to be in

				accordance with the calibration records and supplier requirement.Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
2) Biogas flowmeter: Flare no. 1 FCI Flow Meter ST50	S/N 295695 Note: This unit was installed on 5/11/2009 and was still in use until the end of the monitoring period	13/10/2008	18 months from date of installation	• Calibration was carried out by the equipment manufacturer, Fluid Components International LLC. This was as indicated in the equipment calibration certificate/26/. • The flowmeter calibration due date is 4/05/2011. • Refer to CAR 5. Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
3) Biogas flowmeter: Flare no. 2 FCI Flow Meter ST50	S/N 291297 This unit was in use from 19/06/2008 to 6/04/2009	8/05/2008	18 months from date of installation	• Calibration was carried out by the equipment manufacturer, Fluid Components International LLC. This was as indicated in the equipment calibration certificate/27/. • Next calibration was due on 18/12/2009. However, it was replaced with the new meter, S/N 291299 before the calibration due date. • Refer to CAR 5. Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
4) Biogas flowmeter: Flare no. 2 FCI Flow Meter ST50	S/N 291299 Note: This unit was installed on	7/05/2008	18 months from date of installation	• Calibration was carried out by the equipment manufacturer, Fluid Components International LLC. This was as indicated

	6/04/2009 and used until 5/11/2009.			in the equipment calibration certificate[28]. • Next calibration was due on 5/10/2010. However, the meter was replaced due to data abnormality detected and further verified via Outage Log. The new meter, S/N 295706 was installed on 5/11/2009. • Refer to CAR 5. Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
5) Biogas flowmeter: Flare no. 2 FCI Flow Meter ST50	S/N 295706 Note: This unit was installed on 5/11/2009 and was still in use until the end of the monitoring period	13/10/2008	18 months from date of installation	• Calibration was carried out by the equipment manufacturer, Fluid Components International LLC. This was as indicated in the equipment calibration certificate[29]. • The flowmeter calibration due date is 4/05/2011. • Refer to CAR 5. Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
6) Portable methane analyzer: ADC LFG 20	S/N 1139	19/08/2008 & 17/06/2009	Once a year	• Calibration was carried out by the equipment manufacturer, ADC Gas Analysis Limited. This was evident in the calibration certificate[30]. • Review of the calibration certificate and information reported in Section D.1 of the monitoring report found that the calibration due date did not tally with that recommended in the calibration certificate. A clarification (CL 2) was raised on this issue and PP had corrected the information accordingly.

				Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.
7) Portable methane analyzer: Landtec	BM12142 Note: The unit was in use for sampling on 2/02/2010.	12/01/2010	6 months	• This was a new unit purchased by the PP. • Calibration was carried out by the equipment manufacturer, Landtec. This was evident from the calibration certificate/31/ provided by the manufacturer. • Refer to CL2. Detailed discussion on the closure of the findings is as in Table 2 of Annex 1 of this report.

One CAR (CAR 5) and one CL (CL 2) were raised on the issues related to the calibration of the above equipment. These have been adequately addressed, and closed as detailed in Table 2 of Annex 1 of this report.

The calibration records were reviewed/25/ - /31/ and the verification team found that the calibration results were acceptable and the equipment was functioning properly during the period. All values used in determining emissions reduction were substantiated and free of any material errors.

3.6 Management System and Quality Assurance

The roles and responsibilities for monitoring of emissions reduction data had been clearly defined. AES AgriVerde had established a team of personnel to operate and maintain the CDM project activity. The AES AgriVerde CDM Services Manager and the CDM Regulatory Manager were the key personnel managing the GHG data records. Data recording was carried out by the site technicians. The transferring and compiling of data to the spreadsheets and monitoring report was carried out by the CDM Services Manager, who was also responsible for the calculation of the emissions reduction on a quarterly basis. All reports and spreadsheets were then checked by the CDM Regional Regulatory & Quality (RRQ) Manager.

4 VERIFICATION AND CERTIFICATION STATEMENT

SIRIM QAS International Sdn Bhd was engaged byPT AES AgriVerde Indonesia to verify the greenhouse gas (GHG) emissions reduction reported from 'Methane Recovery in Wastewater Treatment Project AIN07-W-04, Sumatera Utara, Indonesia' for the period from 16 January 2009 to 28 February 2010 equivalent to 6,480.00 tCO_2e.The crediting period for this project is from 16 January 2009 to 15 January 2016 (renewable).

The verification was based on the CDM registered PDD/2/, version 5 dated 10 July 2008, the approved methodology, AMS III.H.- Methane recovery in wastewater treatment,version 7/3/, the Monitoring Reports/5/&/8/, emissions reduction calculation spreadsheets/6/&/9/ and other supporting documents made available to SIRIM QAS Intl.'s verification team by the client. SIRIM QAS Intl. expresses no opinion on the baseline methodology of both the project and the validated and registered PDD.

The management of PT AES AgriVerde Indonesia was responsible for the preparation and reporting of GHG emissions data, and the reported GHG emissions reduction on the basis set out within the project monitoring plan. The development and maintenance of records and reporting procedures in accordance with the monitoring plan, including the calculation and determination of GHG emissions reduction from the project was the responsibility of the management of the project.

It is the responsibility of SIRIM QAS Intl. verification team to express an independent GHG verification opinion on the GHG emissions from the project for the period from 16 January 2009 to 28 February 2010 and on the calculation of GHG emissions reduction from the project based on the verified emissions for the same period.

The verification was carried out in accordance with the requirements of the VVM. As a result of the verification, the verification team confirms that for the reporting period:

- all operations of the project were implemented as described in the registered PDD/2/, version 5 dated 10 July 2008,
- the monitoring plan is in accordance with the approved monitoring methodology, AMS III.H.- Methane recovery in wastewater treatment,version 7/3/ applied by the CDM project activity,
- the monitoring has been carried out in accordance with the with the monitoring plan contained in the registered PDD/2/,
- the monitoring aspects (i.e additional monitoring parameters, monitoring frequency and calibration frequency) were in place and functional, with the installed equipment essential for generating emissions reduction operating appropriately and the calibration of all the equipment had been carried out accordingly, and
- the GHG emissions reduction achieved were calculated correctly on the basis of approved monitoring methodology AMS III.H.- Methane recovery in wastewater treatment,version 7/3/.

The verification team has verified the information included in the final monitoring report[8](version 6, dated 22 November 2010) is correct and that the emissions reduction achieved had been determined correctly. In our opinion, the GHG emissions reduction for the period 16 January 2009 to 28 February 2010stated in the final monitoring report[8] (version 6, dated 22 November 2010) for the project are fairly stated.

The verifier confirms that the GHG emissions reductions were calculated without material misstatements for the whole monitoring period. Our opinion is based on the project's GHG emissions and resulting GHG emissions reduction reported, and on the valid and registered project baseline and monitoring documents. Based on the information we have seen and evaluated, we confirm the following:

Monitoring period	16 January 2009 to 28 February 2010
Total Methane Destroyed	15,923.61 tCO_2e
Total Project Emissions	9,443.53 tCO_2e
Emissions Reduction	6,480.08 tCO_2e
Final Emissions Reduction (rounded down value)	6,480.00 tCO_2e

Prepared by: (Aernida Abdul Kadir) Verification Team Leader

Date: 24 November 2010

Approved by: (Parama Iswara Subramaniam) DOE Representative

Date: 24 November 2010

5 REFERENCE

/1/ Validation and Verification Manual, version 1.2
/2/ Registered PDD, dated 10/07/2008 (version 5)
/3/ AMS III.H – Methane recovery in wastewater treatment, version 7
/4/ Validation Report by Tuv Sud, dated 12/08/2008 (Report no.: 1087012)
/5/ Monitoring report, dated 25/03/2010 (version 1)
/6/ VAL's ER Spreadsheet (version 1)
/7/ VAL's Verification Calculation (version 1)
/8/ Monitoring report, dated 22/11/2010 (version 6)
/9/ VAL's ER Spreadsheet (version 5)
/10/ VAL's Verification Calculation (version 6)
/11/ Third party test certificate – Effluent conversion rate
/12/ FFB process for the year 2009& 2010
/13/ Third party test certificate – COD (treated & untreated)
/14/ Mill record for electricity generation via diesel genset and steam turbine
/15/ CDM Regulatory Monitoring Form (Quarterly)
/16/ Correspondence – Omega
/17/ Equipment specification – Agitator
/18/ Equipment specification – Biogas flowmeter
/19/ Equipment specification – Data logger
/20/ Equipment specification – Desludging pump
/21/ Equipment specification – Rain water removal pump
/22/ Equipment specification – Blower
/23/ Equipment specification – Portable methane analyzer (Landtec)
/24/ Equipment specification – Thermocouple (Omega)
/25/ Calibration records – Biogas flowmeter (S/N 291292)
/26/ Calibration records – Biogas flowmeter (S/N 295695)
/27/ Calibration records – Biogas flowmeter (S/N 291297)
/28/ Calibration records – Biogas flowmeter (S/N 291299)
/29/ Calibration records – Biogas flowmeter (S/N 295706)
/30/ Calibration records – Gas Analyzer ADC LFG 20 (S/N 1139)
/31/ Calibration records – Gas Analyzer Landtec (BM12142)
/32/ Flare design diagram

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ANNEX 1:

VERIFICATION PROTOCOL

SQAS-CDM-EA07360004

SIRIM QAS INTERNATIONAL SDN BHD
Verification protocol

Project name : **Methane Recovery in Wastewater Treatment, Project AIN07-W-04, Sumatera Utara (North Sumatera), Indonesia**

TABLE 1: VERIFICATION REQUIREMENTS BASED ON CDM VALIDATION AND VERIFICATION MANUAL VERSION 01.2

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1. Project implementation in accordance with the registered PDD **Any concern related to the conformity of the actual project activity and its operation with the registered PDD shall be identified.**					
1.1 Was an on-site visit conducted for this verification? If no, please justify the rationale of the decision.	VVM	196	Yes, site visit was conducted on 28/04/2010 at PT Victorindo Alam Lestari, Huta Lombang, Lubuk Barumun, Padang Lawas, North Sumatera, Indonesia and 1/05/2010 at AES HQ, Jakarta.	OK	OK
1.2 Are all physical features of the proposed CDM project activity proposed in the registered PDD in place?	VVM	196	All physical features as described in the PDD were available at the project activity. These include the following: i) covered lagoons – 2 units ii) enclosed flare systems equipped with thermocouples – 4 units flare, 2 units each for one lagoon iii) online biogas flowmeter for each flare system	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1.3 Have the project participants operated the proposed CDM project activity as per the registered PDD?	VVM	196	Yes, the methane recovery and flaring components of the project activity were as per the registered PDD. It was noted that there were 4 units of flaring systems in the project activity, and only 2 units were in operation. These 2 units were sufficient to support the current production of biogas. The Renewable Energy component was not implemented during this monitoring period. Therefore, the monitoring requirement for this component was not available. A clarification was raised as the status of the project implementation was not included in the monitoring report.	~~CL 1~~	OK
1.4 Is there any implementation or operation of the CDM project activity not conforming with the description contained in the registered PDD? If yes, proceed to 1.5)	VVM	197	No such situation observed.	OK	OK
1.5 Has an assessment been conducted on the potential impacts due to these changes following EB 48 report, paragraph 73 and its annex 67? If yes, proceed to 1.6)	VVM	197	Not applicable.	NA	NA
1.6 Has a notification or a request for approval of changes been submitted from the project activity as described in the registered PDD prior to the conclusion of the verification/certification for the corresponding monitoring period based on the assessment above?	VVM	197	Not applicable.	NA	NA

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
2. **Compliance of the monitoring plan with the monitoring methodology** **The monitoring plan of the proposed CDM project activity shall comply with the applied methodology.**					
2.1 Is the monitoring plan of the CDM project activity complying with the applied methodology?	VVM	200	Yes, the monitoring plan of the project is in compliance with the applied methodology of AMS III H. version 7.	OK	OK
2.2 If no, was a request for revision of the monitoring plan done? (Approval from EB for the revised monitoring plan shall be obtained prior to concluding the verification and certification decisions.)	VVM	201	Not applicable.	NA	NA
2.3 Are there any monitoring aspects of the project activity that are not specified in the methodology, particularly in the case of small scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency)?	VVM	202	No. All monitoring aspects of the project activity have been described in the PDD.	OK	OK
2.4 If yes, is the request for revision of the monitoring plan necessary? (This revision may contribute in enhancing the level of accuracy and completeness of the monitoring plan)	VVM	202	Not applicable.	NA	NA

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
3. Compliance of monitoring with the monitoring plan. **Monitoring of reductions in GHG emissions to result from the proposed CDM project activity shall be implemented in accordance with the monitoring plan contained in the registered PDD per the accepted revised monitoring plan.**					
3.1 Have the monitoring plan and the applied methodology been properly implemented and followed by the project participants?	VVM	205 (a)	Yes, PP had followed the monitoring requirement as in the monitoring plan of the registered PDD and methodology except for the amount of biogas recovered and directed to Renewable Energy Unit (BGP_{RE}) and signal to prove the Renewable Energy Unit is combusting the biogas (RE_{ON}). These two parameters were not monitored as the Renewable Energy components were not implemented during this monitoring period. The others were monitored as described below:	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			i) Volume of wastewater treated $Q_{y,ww}$ – according to the PDD this parameter is determined from FFB production data and site verified effluent conversion factor. To be field verified by a third party on an annual basis Actual practice - the above requirement were followed where the monthly FFB production data provided by the mill was multiplied with the effluent conversion factor which was determined by third party accredited laboratory, PT Nusantara Water Centre. Effluent conversion factor was based on third party analysis carried out on 3/12/09. Certificate of Analysis (No. 061/SHA-P-Rev/XII/09) dated 8/12/09 was provided to the verification team. The effluent conversion factor determined as 0.80m^3POME/FFB. This was found appropriate as it is within the normal range of this type of industry.	OK	OK
			ii) COD of the wastewater entering the anaerobic treatment ($COD_{untreated}$) – according to the PDD this parameter is to be measured and recorded semi-annually by third party sampling and analysis. Actual practice – the sampling and analysis were carried out monthly (except for January and February 2010) by third party accredited laboratory, UPT Laboratorium Lingkungan, Medan	OK	OK
			iii) COD of the treated wastewater ($COD_{treated}$) – according to the PDD this parameter is to be measured and recorded semi-annually by third party sampling and analysis.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			Actual practice – the sampling and analysis were carried out monthly (except for January and February 2010) by third party accredited laboratory, UPT Laboratorium Lingkungan, Medan		
			iv) Methane content of biogas (MC_{biogas}) – according to the PDD this parameter is to be measured and recorded quarterly. Sufficient measurements will be made to meet a 95% confidence level. Actual practice – this parameter was measured using portable gas analyzer once in every 3 months period. Although the frequency of monitoring complied with that in the PDD, a CAR was raised on the determination of the value complying with the 95% confidence level requirement.	~~Refer to CAR 3~~	OK
			v) Efficiency of the flaring/combustion process (CFE_{ww}) – according to the PDD, the flares shall be operated in accordance with manufacturer specifications. Flare exhaust temperature and biogas flowrate to be recorded electronically more frequently than hourly. Actual practice – the flare systems were equipped with thermocouples to monitor the flare temperature and continuous flowmeter. These meters were linked to a data logger. Continuous compliance check with the manufacturer's specification of the flare systems were carried out accordingly.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			vi) Amount of biogas recovered and directed to flare for combustion (BGP_{Flare}) – according to the PDD this parameter is to be measured more often than hourly Actual practice – a continuous flowmeter is available for each flare system. The flowmeters were linked to a data logger.	OK	OK
			vii) Emissions from electricity or diesel consumption (PE_{power}) – according to the PDD, this parameter is to be measured or conservatively calculated in accordance with the para 7 of AMS III.H version 7. Actual practice – this parameter was calculated following the PDD and methodology requirements. Refer to clause 3.2(a) of this protocol for details.	OK	OK
			viii) End use of final sludge ($S_{f,end,use}$) – according to the PDD this parameter is to be monitored and inspected on site with verification by mill personnel. Actual practice – PP had established a form for monitoring the end use of sludge. However, during this monitoring period there was no desludging carried out.	OK	OK
3.2 Have all parameters stated in the monitoring plan, the applied methodology and relevant CDM Executive Board decisions been sufficiently monitored and updated as applicable, including:	VVM	205 (b)			

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
i) project emission parameters			According to para 6 of AMS-III.H ver.7, the related project emissions for this project activity are : PE_{power}, $PE_{treated}$, $PE_{fugitive}$ and $PE_{dissolved}$. (also refer to page 24 of the registered PDD). However, based on the monitoring report and ER spreadsheet provided by PP, only PE_{power} was taken into account. A CAR was raised on this issue to request PP to explain why other PEs was not considered. Calculation of PE_{power} was provided in the spreadsheet and following were the findings: • according to para 7 of AMS III.H version 7, $PE_{power} = EC_{project} * \%EG_{diesel} * EF_{diesel} / 1000$ • $EC_{project}$ is the maximum kWh for every equipment * no. of unit * 8760 hours) / 12 months, EF_{diesel} = 0.8 $kgCO_2/kWh$ (based on AMS I.D) and $\%EG_{diesel} = EG_{diesel} /(EG_{diesel} + EG_{biomass}) * 100\%$ • EG_{diesel} is the total kWh reading for the year for power generated by diesel generator , as provided by the mill and • $EG_{biomass}$ is the total kWh reading for the year for power generated by biomass steam turbine, as provided by the mill • In determining the $EC_{project}$, the maximum kWh for gas flowmeter FCI ST50, data logger and desludging pump Rotomac were not consistent with that indicated in the equipment specification. • the values used for EG_{diesel} and $EG_{biomass}$ for Nov 2009 were not tally with the data seen during the audit.	~~CAR 1~~ ~~CAR 2~~	OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
ii) baseline emission parameters			As referred in AMS-III.H version 7, paragraph 16, for the case of option (iv) which was selected as the project category, there were no parameters required for the calculation of baseline emission parameters as the emission reductions shall be based on the amount of methane recovered and fuelled or flared, that is monitored ex-post. The following formulae was used to determined the amount of methane recovered and fuelled or flared: $MD_y = BGP_{flare} * MC_{biogas} * D_{CH4} * CFE_{ww}$, where MD_y is the amount of methane destroyed, BGP_{flare} is the biogas recovered and flared, MC_{biogas} is the methane content of biogas, D_{CH4} is the density of methane at normal condition CFE_{ww} is the capture and flare efficiency of methane recovery and combustion equipment • BGP_{flare} was measured continuously using biogas flowmeter. The flowmeters are linked to the data logger where data is captured and stored every 10 minutes. The biogas flow readings were checked and found no errors. • MC_{biogas} was measured using portable methane gas analyser. The reading from this analyser was then corrected to normal conditions using the Linear Regression Equation, provided by the biogas flowmeter supplier.	OK OK	OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			In accordance with the para 17 of AMS III.H, the fraction of methane in the gas should be measured with a continuous analyzer or, alternatively, with periodical measurements at a 95% confidence level. The latter was applied to the project activity where the methane concentration was measured and reported on quarterly basis. The determination of methane concentration using the 95% confidence level were reviewed and the following were found: i) it was unsure of how the methane concentration determined in the spreadsheet meeting the requirements of 95% confidence level. The methane concentration in the spreadsheet used the actual value determined during each sampling. The value was used for a period until the next measurement. ii) for Q2 and Q3 of 2009 only one sample was analysed where the value of 64.50% and 77.00% respectively were used in the calculation. It was unsure how the values fulfil the requirements of 95% confidence level. iii) in the ER spreadsheet, there are two readings available for Q1 2010, but only one was reported in the calculation spreadsheet. iv) Data for Q4 2008 was also presented in the spreadsheet. This was not relevant to this monitoring period	~~CAR 3~~	OK
			• For D_{CH4} a default value of 0.0007179 tCH_4 /m^3CH_4 was used in the spreadsheet. This value was not as in the PDD, where the IPCC value of 0.0007168 tCH_4 /m^3CH_4 was used.	~~CAR 4~~	OK

<table>
<tr><th>Checklist Questions</th><th>Ref.</th><th>§</th><th>Comments by verifier</th><th>Draft Concl</th><th>Final Concl</th></tr>
<tr><td></td><td></td><td></td><td>

For the capture flare efficiency CFE_{ww}, the % efficiency was determined using compliance with the manufacturers specification of the flare device (temperature and biogas flow rate)' and meth requirement. Following is the specification:

.
<table>
<tr><th colspan="4">Compliance with the manufacturers specification of the flare device (temperature, biogas flow rate)</th></tr>
<tr><th>Temp</th><th>Default FE</th><th>Biogas flow rate</th><th>Default FE</th></tr>
<tr><td>-400000000000.00</td><td>0</td><td>0</td><td>0.9</td></tr>
<tr><td>0.00</td><td>0</td><td>33.33</td><td>0.9</td></tr>
<tr><td>500.00</td><td>0.9</td><td>33.34</td><td>0.5</td></tr>
<tr><td>900.00</td><td>0.9</td><td></td><td></td></tr>
<tr><td>1100.00</td><td>0.9</td><td></td><td></td></tr>
<tr><td>1100.01</td><td>0.5</td><td></td><td></td></tr>
<tr><td>1300.00</td><td>0</td><td></td><td></td></tr>
</table>
Both flare temperature and biogas flow rate was used to determine the efficiency of the flare. The lowest efficiency value among the two values was taken in the calculation of MD_y. The method used was found to be consistent with the manufacturer's recommendation. The data from the thermocouple and flowmeters were captured and stored in a data logger.
</td><td>OK</td><td>OK</td></tr>
</table>

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			The values of efficiency used in the spreadsheet were checked against the manufacturer specification. This was carried out by reviewing the temperature of the flare which was downloaded from the data logger. No errors were found.		
iii) leakage parameters			Leakage is not applicable as the equipment used in the project activity was all new equipment, not transferred from another activity or transferred to another activity.	OK	OK
iv) Management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan?			The responsibilities and authorities for monitoring and reporting were in accordance with that defined in the monitoring plan. The management and operational system, as reported in CDM Monitoring Report ID: MR01-AIN07-W-04, V.1, Section B.2, Figure 2. Diagram of monitoring data capture and transfer system (pg. 6 of 34), the position & role of each person in the GHG data management process. From the data verification and interview carried out, the responsibilities on specific monitoring and reporting task were understood by the field staffs. The personnel involved in the system were : i) Christopher Soesanto – AES, CDM Regional Regulatory & Quality (RRQ) Manager. He is responsible for final data checking and verification prior to submission of data to DOE. ii) Wahyu Puspita Sari – AES, CDM Services (CS), responsible for compilation of data from various sources and update data in ER Spreadsheet & Monitoring Report. iii) Lintang K.A.W – AES, CDM Services (CS) . She is responsible for data compilation from different sources. Update data in ER Spreadsheet & Monitoring Report. iv) Fathuroji Suhaemi – AES, Asset and IT Data Management	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			v) John Robert Sinaga – AES, Construction Project Manager /RMT vi) Benny Sijabat – AES, Site Technician / RMT vii) Sakti Azhar Siregar – HQ Support Team (Senior Wastewater Engineer) viii) Sudin Sembiring – PKS Victorindo Alam Lestari, Mill Manager. Reporting flow : Site Engineer (RMT) / Mill / Third party lab result -> CDM Services -> CDM Regional Regulatory & Quality Manager Trainings on the operation and management of the project activity were provided to all staff involved in the operation and management of the CDM project. Following were the trainings provided : i. Waste water treatment system ii. PDD & Site performance discussion iii. Safety presentation iv. OMM & CDM Training The personnel involved in the operation and monitoring of the system are competent to perform the job.	OK OK	OK OK
3.3 Is the accuracy of equipment used for monitoring is in accordance with the relevant guidance provided by the CDM Executive Board and is controlled and calibrated in accordance with the monitoring plan?	VVM	205 (c)	The accuracy of the monitoring equipment was in accordance with the monitoring plan. PP had established a monitoring system to track calibration status of the monitoring equipment. This has been reported in Section C.4.2 and Section D.1 of the monitoring report.		

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			Following were verified during on-site audit : 1) Portable methane analyser – 2 units were used during this monitoring period. <u>i) Analyser 1 (ADC LFG 20 S/N 1139):</u> • Calibration frequency as specified by the equipment supplier is 1 year interval • First calibration was carried out by ADC Gas Analysis Ltd (equipment supplier) on 19/08/2008 and second calibration on 17/06/2009. • The next calibration due date was supposed to be 16/06/2010. However, Section D.1 of the monitoring report indicated that the next calibration due date was 17/06/2010. <u>ii) Analyser 2 (Landtec BM12142):</u> • Calibration frequency as specified by the equipment supplier is once in every 6 months • During this monitoring period, the equipment was only used during the measurement of methane concentration in February 2010. • First calibration was carried out by Landtec on 12/01/2010. • Next due date was supposed to be on 11/07/2010. However, Section D.1 of the monitoring report indicated that the next calibration due date was 12/07/2010.	OK ~~CL 2~~ ~~CL2~~	OK OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			2) Biogas flowmeter for Flare no. 1 – 2 units available, one operating at a time. • Calibration requirement – 18 months upon installation. This was confirmed from the calibration certificate and correspondence between PP and the manufacturer • Calibration was carried out by Fluid Components International i) <u>Meter no.1 (S/N 291292):</u> • Operational from 19/06/2008 to 5/11/2009. • Calibration date 8/05/2008, installation date19/06/2008 • Next calibration due date 18/12/2009 • Meter was changed with a new meter on 5/11/2009 (i.e. during the scheduled replacement/change for flowmeter at flare no. 2) • Serial number of the meter, calibration date and next due date reported in Section C.4.2 and D.1 of the monitoring report not consistent with the above verified information. ii) <u>Meter no.2 (S/N 295695)</u>: • Operational from 5/11/2009 and the meter still in used during the on-site audit. • Calibration date 13/10/2008, installation date 5/11/2009 • Next calibration due date 4/05/2011 • Serial number of the meter, calibration date and next due date reported in Section C.4.2 and D.1 of the monitoring report not consistent with the above verified information. 3) Biogas flowmeter for Flare no. 2 – 3 units available, one operating at a time.	~~CAR 5~~ ~~CAR 5~~	OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			• Calibration requirement – 18 months upon installation. This was confirmed from the calibration certificate and correspondence between PP and the manufacturer • Calibration was carried out by Fluid Components International i) <u>Meter no. 1 (S/N 291297):</u> • In operation from 19/06/2008 to 6/04/2009. • Calibration date 8/05/2008, installation date 19/06/2008 • Next calibration due date 18/12/2009 • Meter was changed on 6/04/2009 due to data abnormality since March 2009. Verified in Outage log. • Meter no. 2 for flare 2 was installed. • Serial number of the meter, calibration date and next due date reported in Section C.4.2 and D.1 of the monitoring report not consistent with the above verified information. ii) <u>Meter no. 2 (S/N 291299):</u> • In operation from 6/04/2009 to 5/11/2009. • Calibration date 7/05/2008, installation date 6/04/2009 • Next calibration due date 5/10/2010 • Meter was changed with a new meter on 5/11/2009 (i.e. during the scheduled replacement). • Serial number of the meter, calibration date and next due date reported in Section C.4.2 and D.1 of the monitoring report not consistent with the above verified information.	~~CAR 5~~ ~~CAR 5~~	OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			iii) Meter 3 (S/N 295706): • In operation from 5/11/2009 and the meter was still used during the onsite audit. • Calibration date 13/10/2008, installation date 5/11/2009 • Next calibration due date 4/05/2011 • Serial number of the meter, calibration date and next due date reported in Section C.4.2 and D.1 of the monitoring report not consistent with the above verified information.	~~CAR 5~~	OK
			4) Flare thermocouple • Calibration frequency defined by the manufacturer specification - 1 year from installation date • Calibration was carried out by Omega Engineering • Factory calibration certificate provided for the thermocouples. No re-calibration carried out for the thermocouple as it was replaced before the one year period ended. • For flare no. 1, 3 units of thermocouple were used (one unit at a time) i) Unit no. 1 was installed on 19/06/2008 and changed on 5/03/2009. Calibration due date 18/06/2009. ii) Unit no. 2 was installed on 5/03/2009 and changed on 21/08/2009. Calibration due date 4/03/2010. iii) Unit no. 3 was installed on 21/08/2009. Calibration due date 20/08/2010.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			• For flare no. 2, 4 units of thermocouple were used (one unit at a time) i) Unit no.1 was installed on 19/06/2008 and changed on 5/03/2009. Calibration due date 18/06/2009. ii) Unit no. 2 was installed on 5/03/2009 and changed on 10/11/2009. Calibration due 4/03/2010. iii) Unit no. 3 was installed on 10/11/2009 and changed on 8/12/2009. Calibration due date 9/11/2010. iv) Unit no. 4 was installed on 8/12/2009. Calibration due date 7/12/2010.	OK	OK
			The replacements of the thermocouples were included in the monitoring report (Section C.4.2 Equipment removal and replacements). Reasons of the replacement/changed of the thermocouples were also recorded in the log. One of the reasons was due to data abnormality recorded in the data logger. Following were noted by the verification team: i) <u>Replacement of unit no. 1 for flare no. 1</u> • Abnormal data (temperature with negative value) was detected on 12/08/2009 at 2:30 and 3:10. During this period the total qualified biogas was taken as zero. • Abnormal data (temperature recorded more than the specified range) was detected from 16/08/2009, 0:10 until 21/08/2009, 17:10. During this period, it was found that the total qualified biogas was not considered as zero. Clarification requested.	~~CL 3~~	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			• Thermocouple changed on 21/08/2009 at 17.20. ii) <u>Replacement of unit no. 2 for flare no. 2</u> • Abnormal data (negative temperature) was detected on 6/11/2009 at 4:30. The data was back to normal range at 16:10 on the same day. • Abnormal data (temperatures more than 2000ºC) was again detected on 10/11/2009 at 13:10 until 10/11/2009 at 16:00. • During the abnormal data periods, the total qualified biogas was considered as zero. This was acceptable. • Thermocouple was changed on 10/11/2009. iii)<u>Replacement of unit no. 3 for flare no. 2</u> • Abnormal data (temperature more than 2000ºC) was detected on 7/12/2009 at 16.30 until 8/12/2009 at 13:00. During this period the total qualified biogas was counted (i.e. not taken as zero). Clarification requested. • Thermocouple changed on 8/12/2009. 5) Data logger of NI Module 9211 (for thermocouple, S/N 1343B91) & 9203 (for flowmeter, S/N 134FFC7) • Calibration frequency defined by the equipment manufacturer - 2 years interval after installation • Calibration was carried out by National Instrument • S/N 1343B91 was calibrated on 25/02/2008 and installed on 19/06/2008. The next calibration due date 18/06/2010 • S/N 134FFC7 was calibrated on 13/06/2008 and installed on 19/06/2008 thus, due on 18/06/2010.	OK ~~CL 3~~ OK	OK OK OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
3.4 Are monitoring results consistently recorded as per approved frequency?	VVM	205 (c)	The monitoring results were recorded as below : 1. Volume of wastewater treated • Actual practice consistent with the monitoring plan requirement. (i.e. carried out and recorded on annual basis) 2. COD of the wastewater entering the anaerobic treatment • Requirement of the monitoring plan– recorded 6 monthly • Actual practice – the analysis were carried out monthly except for January and February 2010. 3. COD of the final treated wastewater • Requirement of the monitoring plan– recorded 6 monthly • Actual practice – the analysis were carried out monthly except for January and February 2010. 4. Methane content of biogas • Actual practice consistent with the monitoring plan requirement (i.e. measurement and recorded quarterly) 5. Efficiency of the flaring/combustion process • Requirement of the monitoring plan – results shall be recorded more often than hourly • Actual practice – continuously recorded in the data logger 6. Amount of biogas recovered and directed to flare for combustion • Requirement of the monitoring plan - results shall be recorded more often than hourly • Actual practice – measured using online biogas flowmeter which is linked to data logger.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
			7. Emissions from electricity or diesel consumption for EG_{diesel}, $EG_{biomass}$ and $EC_{project}$ • Requirement – PDD referred to the reporting via AES monitoring form which is prepared in quarterly basis. • Actual practice – EG_{diesel} and $EG_{biomass}$ were recorded monthly based on data provided by the mill. • As for $EC_{project}$, it was estimated based on yearly consumption of the listed equipment in accordance with the equipment specification. 8. End use of final sludge • Requirement – PDD referred to the reporting via via AES monitoring form which is prepared on quarterly basis. • Actual practice – the activity is to be recorded quarterly in the AES monitoring form.	OK OK	OK OK
3.5 Have quality assurance and quality control procedures been applied in accordance with the monitoring plan monitoring plan?	VVM	205 (c)	Yes, the quality assurance and quality control procedures were applied accordingly. The QA/QC is done by the QQR Manager.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
4. Assessment of data and calculation of greenhouse gas emission reductions. GHG emission reduction achieved by/resulting from the proposed CDM project activity calculated applying the selected methodology.					
4.1 Is a complete set of data for the specified monitoring period is available? (If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, the DOE shall opt to either make the most conservative assumption theoretically possible in finalizing the verification report, or raise a request for deviating prior to issuance if appropriate).	VVM	208 (a)	A complete set of data for the specified monitoring period was available. All data as specified in the monitoring plan were monitored accordingly.	OK	OK

4.2	Has information provided in the monitoring report been crosschecked with other sources such as plant log books, inventories, purchase records, laboratory analysis?	VVM	208 (b)	Yes, information provided in the monitoring report and spreadsheet was cross checked against other sources. Following were the audit trailing of the monitored parameters a) FFB production • Mill's annual report "Laporan Tahunan PKS PT Victorindo Alam Lestari 2009 & 2010" b) Effluent conversion factor • Testing result by PT Nusantara Water Centre. Certificate of Analysis (No. 061/SHA-P-Rev/XII/09) dated 8/12/09. Sampling was carried out on 3/12/09. c) COD value • Monthly analysis results from UPT Laboratorium Lingkungan, Medan. d) Amount of biogas recovered and directed to flare for combustion • data recorded in the data logger e) Methane content of biogas • Regulatory Site Visit Checklist Form f) Efficiency of the flaring/combustion process • data recorded in the data logger g) Emissions from electricity or diesel consumption • Mill's annual report "Laporan Tahunan PKS PT Victorindo Alam Lestari 2009 & 2010" • project activity equipment specifications h) End use of final sludge • site visit to the mill wastewater treatment plant and plantation for land application area	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
4.3 Have calculations of baseline emissions, proposed CDM project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document?	VVM	208 (c)	As in para 16 of AMS III.H version 7, the emissions reduction calculation was based on the actual project activity implementation. The calculation need to be revised as findings were raised on some of the input values to the calculations. As for the project emissions, a CAR was raised as not all PEs have been considered in the final calculation. Findings were as highlighted in part 3.2 of this verification protocol. No leakage was considered in the calculation as leakage is not applicable for the project. The equipment used in the project activity was all new equipment, not transferred from another activity or transferred to another activity.	Refer to ~~CAR 1~~ ~~Refer to CAR 2~~ OK	OK OK OK
4.4 Any assumptions used in emission calculations? If yes, they been justified?	VVM	208 (d)	Assumption used in the calculation of the project emissions i.e the exclusion of other PE except for PE_{power}, were not acceptable as it was not done in accordance with the methodology and PDD.	~~CAR 1~~	OK
4.5 Have appropriate emission factors, IPCC default values and other reference values been correctly applied?	VVM	208 (e)	The following values were in used and correctly applied : i) Methane GWP = 21, referred to AMS-III.H ver.7. ii) Emission factor for on-site diesel generators = 0.8kgCO_2/kWh, referred to AMS-I.D ver.13 (Table 1.D.1). iii) Density of methane = as highlighted in part 3.2 of this verification protocol. The above default values were fixed during the crediting period.	 OK OK ~~CAR 4~~	 OK OK OK

TABLE 2 : RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
CAR 1 In the calculation of PE, only PE_{power} was considered. Others as defined in para 6 of AMS III H. version 7 were not considered.	3.2	AES response 1: According to the methodology, both the ex-ante and ex-post calculations aimed at calculating the amount of methane available for recovery (recoverable), but the calculation methods are different. During the ex-ante estimation, the total methane generation potential (BEy) is estimated using IPCC model. From this value the methane emissions of the treated wastewater, which is the non-recoverable methane generation potential is deducted (PEy,ww treated +PEy,dissolved). The difference between these figures (BEy – (PEy,ww, treated + PEy, dissolved)) is the amount of methane available for recovery (recoverable) In the ex-post calculation, the amount of methane is directly measured using flow meter and this is immediately is the amount of methane recoverable. As such the PEy,ww treated and PEy,dissolved cannot be deducted from the ex-post calculation	Response to comment no. 1: Para 8 of the methodology mentioned that $PE_{treated}$ was meant to for the emission from the residual COD of wastewater leaving the covered lagoon. In the project activity, the wastewater from the covered lagoon is channelled into existing anaerobic lagoon which has the depth of more than 2 metres, MCF = 1.0 (as specified in the PDD). Thus, the $PE_{treated}$ and $PE_{dissolved}$ are applicable. Review of the revised ER spreadsheet_MxT* 2009 & 2010 (received on 29/07/10) revealed that the $PE_{fugitive,}$ has been considered in the emissions reduction calculation. It can be also be concluded that $PE_{fugitive}$ has been correctly calculated and considered as project emission in the emissions reduction calculation. MxT* - 'x' referred to the months reported in the ER spreadsheet

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
		Therefore both ex-ante and ex-post methane recovery method in effect have different calculated approach for determining the same value/result for both calculations. Capture and Flare Efficiency (CFE) has been incorporated in the emission reduction calculation, however to demonstrate this process, the monitoring report has been revised to show this.	
		AES response 2: PE y treated and PE y dissolved during project operation calculation has been added to the ER spreadsheet. For PEy, fugitive,ww, in accordance with the approved PDD section B.7.1 the CFE is described as the "*Efficiency of flaring process*" CFE measurement methods have been applied in accordance with the approved monitoring plan where flare has been operated in accordance with manufacturer specifications. Flare combustion temperature and biogas flow rate data has been recorded and if the parameters are out of specification, a flare efficiency of 50% has	Comments on response no.2: The revised ER spreadsheet had included both $PE_{treated}$ and $PE_{dissolved}$. The tab; ER spreadsheet_PE Calc is referred. Noted that the $MCF_{ww,final}$ in the $PE_{treated}$ calculation was 0.1 (aerobic treatment, well managed), not as same as that available in the registered PDD; 1.0 (pg 18, 22 & 39 of the PDD). Please explain and provide justification on the highlighted issue. As for the $PE_{fugitive}$, the revised ER spreadsheet_Mx-T 2009, clearly shown that the $PE_{fugitive,}$ was already incorporated in the emission reduction calculation. The spreadsheet was verified accordingly and it can be

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
		been applied and if the temperature of the flare is below 500C, 0% efficiency has been applied and if the parameters are within specification then a value of 0.9 has been used. As such PEy,fugitive,ww has already been incorporated in the calculation process. The ER spreadsheet has been revised to highlight this by including CFE in Monitoring Data table. Below is the section of the PDD pertaining to the parameter. **Data / Parameter:** CFE_{ww} Unit: Percentage Description: Efficiency of flaring process Source of data to be used: Refer to UNFCCC AMS III H, V.7 methodology Value of data: 0.90* Description of measurement methods and procedures to be applied: Flares shall be operated in accordance with manufacturer specifications. Flare exhaust temperature and biogas flow rate data will be recorded electronically more frequently than hourly via the thermocouple(s) that is (are) part of the automated flaring system. (Refer to Section A.4.2. for equipment description and Annex 4 for more details). *According to the methodology, *"If option (a) is chosen continuous check of compliance with the manufacturers specification of the flare device (temperature, biogas flow rate) should be done. If in any specific hour any of the parameters is out of the range of specifications 50% of default value should be used for this specific hour. For open flare 50% default value should be used, as it is not possible in this case to monitor the efficiency. If at any given time the temperature of the flare is below 500°C, 0% default value should be used for this period.* QA/QC procedures to be applied: All flare monitoring equipment will be operated and calibrated according to manufacturer's specifications. Flare exhaust temperature and biogas flow data will be compiled and analyzed using software. A calibration/service log will be maintained for the flare monitoring equipment. Any comment: Data will be archived electronically or on paper and kept for the duration of the project + 2 years. 26	concluded that $PE_{fugitive}$ was accounted as project emission in the emission reduction calculation.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
		AES Response 3: ER Spreadsheet has been revised, where the PEy,ww,treated and PEy,dissolved have been accounted in to the final ER calculation.	Comments on response no. 3: Based on the latest ER spreadsheet provided, it was confirmed that both $PE_{treated}$ and $PE_{dissolved}$ were calculated in accordance to the methodology and registered PDD. **CAR 1 : CLOSED**
CAR 2 In the calculation of PE_{power} the following were found: 1) In determining the $EC_{project}$, the maximum kWh for gas flowmeter FCI ST50, data logger and desludging pump Super Rotomac were not consistent with that indicated in the equipment specification. 2) the values used for EG_{diesel} and $EG_{biomass}$ for Nov 2009 were not tally with the data seen during the audit.	3.2	AES response 1: 1. The spreadsheet has been revised by amending the kWh for project equipments as per equipment specifications for gas flowmeter FCI ST50, data logger and desludging pump Rotomac (not recycling pump). Evidences of each equipment specification have been submitted. 2. The Spreadsheet has been revised, and the data have been amended in accordance to the mill's data as verified during the site audit.	Comments on response no. 1: 1) The maximum kWh for gas flowmeter FCI ST50, data logger and desludging pump Super Rotomac have been amended in the revised ER spreadsheet_PE Calc . The values used were as verified during the on-site audit. 2) The tab; ER spreadsheet_PE Calc has been amended to include the actual valus of EG_{diesel} and $EG_{biomass}$ for Nov 2009. The values were consistent with that in 'Buku Laporan Pemakaian Solar Genset/Turbin'. **CAR 2 : CLOSED**

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
CAR 3 i) It was unsure of how the methane concentration determined in the spreadsheet meeting the requirements of 95% confidence level. The methane concentration in the spreadsheet used the actual value determined during each sampling. The value was used for a period until the next measurement. ii) For Q2 and Q3 of 2009 only one sample was analysed where the value of 64.50% and 77.00% respectively were used in the calculation. It was unsure how the value fulfil the requirements of 95% confidence level. iii) In the ER spreadsheet, there are two readings available for Q1 2010, but only one was reported in the calculation spreadsheet. iv) Data for Q4 2008 was also presented in the spreadsheet. This was not relevant to this monitoring period	3.2	AES response 1: i) & ii) The spreadsheet has been revised to accommodate the 95% confidence interval methane reading for this crediting period iii) & iv) this was an oversight and the ER Spreadsheet has been revised accordingly.	Comments on response no. 1: The tab; ER spreadsheet_Methane Content has been revised where the calculation method for MC_{biogas} had been changed to accommodate the 95% confidence level requirement. With this method MC_{biogas} was determined as 62.60%. The verification team had accepted the value as based on a study '*Baseline study of methane emission from anaerobic ponds of palm oil mill effluent' by S. Yacob et al (2005*)', the methane of biogas content was reported to be between 35% to 70%. Furthermore the calculation met the requirement of 95% confidence level. **CAR 3 : CLOSED**
CAR 4 The value used in the spreadsheet for D_{CH4} is 0.0007179 tCH_4 /m^3CH_4 while in the PDD was 0.0007168 tCH_4 /m^3CH_4 (IPCC).	3.2	AES response 1: 1. The ER Spreadsheet has been revised to use 0.0007168 tCH4 /m3 of CH_4 as per approved PDD.	Comments on response no. 1: The ER spreadsheet_MxT 2009 & 2010 has been corrected to include the methane density to 0.0007168 tCH_4 /m^3CH_4 as provided in the registered PDD. **CAR 4 : CLOSED**

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
CAR 5 Information i.e serial number, calibration date, installation date and calibration due date for flowmeters no. 1 & 2 of Flare 1 and no. 1, 2 & 3 of Flare 2 as provided in Section C.4.2 and D.1 in the monitoring report (pg.12 of 28) was found not consistent with verified information during the site audit (i.e. the replacement history system) PP is requested the correct the information accordingly.	3.3	AES response 1: The monitoring report has been revised. Equipment removal and replacement table in section C.4.2. and MMD requiring calibration D.1. for Flare 1's and Flare 2's gas flowmeters FCI ST50 have been revised with accurate information.	Comments on response no. 1: Section C.4.2. of the latest version of the monitoring report has been revised to include the correct serial number, calibration date, installation data and calibration due date for flowmeters no. 1 & 2 of Flare 1 and no. 1, 2 & 3 of Flare 2. **CAR 5 : CLOSED**
CL 1 There were 4 units of flaring systems in the plant, and 2 units were in operation during the visit. These 2 units were sufficient to support the current production of biogas. However, this information was not reflected in the monitoring report. PP needs to include the details in the monitoring report Section A.4 to make it transparent for the status of the implementation.	1.2	AES response 1: Additional information on status of implementation has been added to the monitoring report section A.4. These changes encompass information on the number of flares implemented and operational, also the status of the digester during the monitored crediting period.	Comments on response no. 1: Section A.4.2 of the latest version of the monitoring report has been revised to include the actual status. **CL 1 : CLOSED**
CL 2 From the verified calibration record, it was found that the next calibration due date indicated in Section D.1 of the monitoring report for the portable	3.3	AES response 1: The calibration date for both gas analyzer ADC LFG 20 S/N 1139 and Landtec	Comments on response no.1: Section D.1 of the latest version of the monitoring report has been amended to

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
methane analysers were not consistent. 1) ADC LFG 20 S/N 1139 – calibration due date: 16/06/2010 2) Landtec BM12142 – calibration due date: 11/07/2010		BM12142 have been revised, this was an oversight.	include the correct calibration due dates for portable methane analysers, namely ADC LFG 20 S/N 1139 and Landtec BM12142. **CL 2 : CLOSED**
CL 3 Abnormalities were found in the temperature recorded for the month of August 2009 (Flare no.1) and December 2009 (Flare no.2) as below: 1) Recorded temperatures were more than 2000ºC from 16/08/2009, 0:10 until 21/08/2009, 17:10. The reading was only stable and back into the permissible range on 21/08/2009, at 17:20. 2) Recorded temperatures were more than 2000ºC from 7/12/2009, at 16:30. The reading was stable back into the permissible range on 8/12/2009, at 13:00. There was some Total Qualified Biogas counted during that period. PP is required to explain this situation.	3.3	AES response 1: 1. The high temperature reading of above 2000 C is a built in value in our data logger to indicate, that the thermocouple wire was disconnected. During the mentioned period, intermittent connection were experienced due to technical issue and during this occurrence, the data has been amended. Manufacturer explanation is provided. (Please see : NI explanation above 2000 C temp.pdf) 2. See response 1 of CL 5	Comments on response no.1: The explanation from the Manufacturer was reviewed. The letter confirms that the reading of above 2000ºC was due to problem to the connection wire (i.e. either loose or broken). The revised tab for ER spreadsheet_Month 8 2009 and Month 12 2009 were checked. • Total qualified biogas was considered as zero for the period from 16/08/2009 0:10hr to 21/08/2009, 17:10hr for all readings with temperature higher than 1300ºC. • Total qualified biogas was considered as zero for the period from 7/12/2009 16:30hr to 8/12/2009, 13:00hr, for all readings with temperature higher than 1300ºC. **CL 3 : CLOSED**