Monitoring report form for CDM programme of activities

(version 01.0)

MONITORING REPORT		
Title of the programme of activities (PoA)	Recovery and Avoidance of Methane from Industrial Wastewater Treatment Projects	
UNFCCC reference number of the PoA	7864	
Versionnumber(s) of the PoA-DD(s)applicable to this monitoring report	09	
Coordinating/managing entity (CME)	PT. Knowledge Integration Services (Indonesia)	
Version number of this monitoring report	02	
Completion date of this monitoring report	01/10/2016	
Monitoring period number and dates covered by this monitoring report	Monitoring period Number-02 15/09/2014 to 30/04/2016	
Monitoring report number for this monitoring period	02	
Host Party(ies)	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Indonesia	Yes
Sectoral scope(s)	13 : Waste handling and disposal	
Selectedmethodology(ies)	AMS III.H version-16	
Selected standardized baseline(s)	Not applicable	
Total amount of GHG emission reductionsor net GHG removals by sinksfor all specific-case-caseCPAs in the PoAcovered in this monitoring report	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO_2e	14215 tCO_2e

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the PoA

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Decomposition of organic content in the industrial wastewater treatment processes generates biogas (i.e. methane) which is a potent greenhouse gas (GHG). Therefore, if this methane is allowed to escape into the atmosphere, it will result in increased GHG emissions.

The purpose of this PoA, through implementation of several CPAs (including Greenfield and replacement projects) will be to recover the biogas generated from industrial wastewater and thus avoid GHG emissions. The recovered biogas might be fully or partially flared; if partially flared, the balance would be utilized for energy generating, for instance heat/steam generation in a burner or boiler or electricity generation in an engine. However, no CERs will be claimed under this PoA from use of recovered biogas (i.e. type I project activities).

The owner(s) of the agricultural product based industrial facilities will sign an agreement with the CME acknowledging the inclusion of their methane recovery project as CPA under this PoA. With respect to each CPA, the CME/CPA implementer may potentially distribute information about the benefits of undertaking such methane recovery programme including its associated economic, social and environmental benefits.

The discharge of industrial wastewater in Indonesia is regulated by the Ministry of Environment under MenLH Decree 51/1995[1]. The facility owner has an obligation to treat the wastewater generated in the facility so that the final discharge is within the water quality standards which have been set. However, the treatment technology (e.g. anaerobic digester or aerobic treatment system) to be implemented at thefacilities is not specified in this regulation or in other regulatory requirements. In addition, there is no specific requirement stipulated for methane recovery in the wastewater treatment system. The fact that there is no existing regulatory regime for methane recovery from industrial wastewater demonstrates that this PoA is a voluntary action by the CME.

A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Title: Recovery and Avoidance of Methane from Industrial Wastewater Treatment Projects **Reference–** 7864-000 **Version-**09	13 : Waste handling and disposal	AMS-III.H. ver. 16 - Methane recovery in wastewater treatment

A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/ reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
7864-0001	Recovery and Avoidance of Methane from Industrial Wastewater Treatment	06 Oct 2013 to 05 Oct 2023	No

	Projects-CPA No. 001		
7864-0002	Recovery and Avoidance of Methane from Industrial Wastewater Treatment Projects-CPA No. <002>	14 Aug 2015 to 13 Aug 2025	Yes

A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

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Mr KR Raghunath
Managing Director
PT. Knowledge Integration Services (Indonesia)

The above entity is CME for this PoA, please refer Appendix-1 for contact details.

Mr Phool Chand
Director,
PA Research & Consultants Pvt. Ltd.
317, Vardhman Star Mall, Mathura Road
Sector-19, Faridabad-121002, India
C: +91 9971003064
E: pchand@pars-consultants.com

The above entity is not a project participant to this PoA.

SECTION B. Implementation of PoA

B.1. Implementation of the management system of the PoA

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The management system validated in the PoA has been implemented in line with the provisions on the implementation of the management system in the Project Standard.

1. The CME has implemented a management system which ensures that each CPA meets the requirements and eligibility criteria under the PoA-DD before it is included in the registered PoA. The management system consists of the following:
   (a) Description of the roles and responsibilities of the personnel to be involved in the CPA evaluation process. This also include a review of their competencies;
   (b) Schedules for training of personnel for updating them on the latest developments on programmatic CDM and the CDM mechanism as a whole;
   (c) Procedures for technical review of inclusion of CPAs. These procedures has been developed keeping in view the eligibility criteria to be complied by a CPA before it could be added under the PoA; and
   (d) Documentation and control process for each CPA.

2. A record keeping system for each CPA under the PoA
3. Following records are maintained by the CME for each of the CPA under this PoA:
   - Name of entity implementing the CPA;
   - Description of the technology specification implemented under the CPA- Referring to section A.4.2.1., “Technology or measures to be employed by the SSC-CPA”, the CPA implements anaerobic digestion based on anaerobic tank based technologies/system with methane recovery;
   - Location where the CPA is implemented- City/Town/Village, State / Union Territory, GPS (latitude and longitude);
   - Date of commissioning of the CPA;

- Information pertaining to the baseline alternatives (including specifications) which would have been implemented in the absence of the CPA and how the baseline scenario has been determine;
- Data pertaining to all parameters required for baseline emissions, project emissions and leakage calculation, including source from which such data has been collected. Record of certain parameters which are to be monitored ex-post has been regularly updated based on the information collected from the CPA implementer; and CME is responsible for the verification and CER issuance for each CPA under this PoA, therefore all relevant information (for each CPA) as required for the purpose of verification and CER issuance has been maintianed.

4. Section E.6.3 and section E.7.1 lay down the data parameters which are to be reported in the CPA-DD form and those which are monitored ex-post, respectively. The CME has developed data formats for data collection with respect to these parameters. The formats being circulated to each of the CPA implementers, for them to provide actual data, including information on assumptions made if any, supporting documents for various parameters and any other relevant information.

As the CME has proposedthat all the CPAs under this PoA to be independently verified and therefore no sampling procedures are proposed for the use by DOE. Independent verification of each of the CPA will enhance the accuracy and reliability of the calculation of the amount of GHG emission reductions achieved by each CPA under the PoA.

Monitoring plan for each CPA has been developed in accordance with the guidance provided under the PoA-DD. Data parameters that are available at the time of the CPA-DD or those which need to be monitored ex-post for a given CPA is being determined in accordance with the monitoring guidance in the PoA-DD. Thus, the status of monitoring and verification can be determined anytime for each CPA as the same will be consistent with the requirements under the PoA-DD.

The general details on monitoring of parameters are included in Section E.7.1 of the PoA-DD. Each CPA- DD will include specific information on the associated monitoring plan.

B.2. Implementation of singlesampling plan(s)

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Sampling plan is implemented separately for each specific-case CPA.

SECTION C. Post-registration changes to the PoA (including the generic CPA(s))

C.1. Corrections

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There are no correction made to registered PoA or CPA.

C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration

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The monitoring plan was already included in registered PoA DD and CPA DD.

C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline

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There is no change in monitoring plan than registered with PoA DD.

C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-caseCPAs in the PoA

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No chnages to the programme design of the registered PoA DD and CPA DD.

C.5. Types of changes specific to afforestation and reforestation activities

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Not applicable.

PART II- Specific-casecomponent project activity(ies)

SECTION D. Description of specific-case CPA(s)

D.1. Brief description of implemented specific-caseCPA(s)

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This small-scale CPA is in relation to methane recovery measures implemented in wastewater treatment facility at a palm oil mill owned by PT. MAI-Poliplant Group in Indonesia. The project activity is Greenfield project implemented in a new palm oil mill commissioned in 2013 and prior to project activity there was no exisiting wastewater treatment system. The palm oil mill is located at Kedipi estate, Air Dekakah village, Manis Mata sub district, Ketapang district, Kalimantan Barat province. The project activity involves introduction of anaerobic tanks (also referred to as anaerobicdigesters) for anaerobic wastewater treatment and recovery of biogas.

As per criteria set in registered PoA DD, the project activity falls under "A Greenfield wastewater treatment system i.e. anaerobic digestion using anaerobic tank based technologies/system coupled with biogas recovery".

The palm oil mill is owned and operated by PT. MAI-Poliplant Group and processes fresh fruit bunch (FFB) with acapacity of 60 tonne FFB/hour to produce palm oil. During this process, wastewater effluent (around 726m3/day) is generated which contains high content of organic compound. In the absence of the CPA, the POME would have been treated in open anaerobic lagoons. Decomposition of the organic compound in the POME produces biogas (i.e. methane gas) which under the baseline scenario (i.e.open anaerobic lagoons) would have been emitted to the atmosphere.

The purpose of the CPA under the PoA is to recover the methane gas generated from anaerobic wastewater treatment in the palm oil mill. The CPA involves implementation of anaerobic digesters with methane recovery system for treatment of wastewater generated in the palm oil mill. The CPA thus avoids the release of greenhouse gas (i.e. methane) emissions into the atmosphere.

The CPA reduces emission of greenhouse gases (GHG) which would have been emitted in the baseline scenario (i.e. open anaerobic lagoons without methane recovery) by installation of anaerobic digester system to treat the POME from the palm oil mill and recover the biogas generated during thetreatment. The recovered biogas is combusted in steam boiler (within the mill) for energy generation and thus displace the use of palm kernelshell (PKS). Any excess of the recovered biogas being flared in a controlled manner in an open flare. Both, the anaerobic digester system as well as the biogas management system (i.e. energy generation with any excess being flared) are under the controlof the CPA implementer. The emission reductions resulting from the use of biogas not considered in the CPA.

The technology used in the CPA comprises of 3 (three) sub-activities:
1. Upstream activities
2. Anaerobic digestion using anaerobic tank based technology/system

3. Downstream activities

The upstream activities involve (a) stabilization of the POME's flow, (b) cooling of the POME and (c) removal of suspended solids and emulsified oil. The flow of raw POME from the palm oil mill is directed to the de-oiling pond and subsequently stabilized in an equalization tank. The stabilized POMEcooled through a heat exchanger system. The cooled POME then flow to a primary clarifier system for removing the suspended solids and emulsified oil.The pre-treated POME then be passed on to the anaerobic digester for POME treatment.

The anaerobic digester used in the CPA have the following characteristics:

- Capacity: 7,500 m3
- Hydraulic residence time: around 10 days (=7,500m3 / 726m3/day)
- COD removal efficiency: 85%

The POME is being treated biologically to reduce the COD content. The digester employed is equipped with biogas recovery system to recover the generated biogas. The sludge generated from the digestion process is separated from the POME in a clarifier and a portion of the sludge used to be re-circulated to thedigester to maintain adequate population of microorganism for optimum digestion process.

The clarified overflow POME from the clarifier being used for land application after treatment.

The construction of CPA started on 08/03/2012, commissioned on 27/09/2013 and operational since then during current monitoring period i.e. 15/09/2014 to 30/04/2016.

During current monitoring period i.e. 15/09/2014 to 30/04/2016 (including start and end dates) the CPA has resulted 14,215 tCO_2e of GHG emission reduction. Though the project activity was operation for entire current monitoring period, however values for emission reduction calculation is taken from the date of CPA inclusion only.

D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

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The CPA is located at Kedipi estate, Air Dekakah village, Manis Mata sub district, Ketapang district, Kalimantan Barat province in Indonesia (host country). The geo-coordinates of the project site arefor the project site are 02^0 20' 24"S and 110^0 58' 5"E.

SECTION E. Post-registration changes tospecific-case CPA(s)

E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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Not appicable

E.2. Corrections

>>
Not applicable

E.3. Changes to the start date of the crediting period of the specific-case CPA(s)

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Not applicable

E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration

>>

Not applicable

E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline

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Not applicable

E.6. Changes to project design of the specific-caseCPA(s)

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Not applicable

E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)

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Not applicable

SECTION F. Description of the monitoring system of specific-case CPA(s)

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The Monitoring Plan (MP) presents a plan to meet the requirements for the collection, processing and reporting of data parameters used for emission reduction calculations. It describes the systems and procedures implemented by CME upon implementation of each CPA in order to ensure consistencybetween the project operation as well as monitoring, processing and reporting of data required for thecalculation of emission reductions (ERs) taking into account the baseline and monitoring methodology and the guidance presented in the relevant CDM guidelines.

1. Obligations of CME
The CME has developed and implemented a management and operational system for the CPA that to meet the requirements of the MP.

2. Description of data required to be monitored
Following data parameters is being monitored. Monitoring is carried out by the CPA implementer,

supported by CME as and when required.

3. Recommendations for improvisation in the monitoring plan

During the course of monitoring and verification; if the CME or CPA implementer is of the opinion that there exist potential to improve the monitoring process which would eventually result in improving thequality of monitoring and reporting of emission reductions, then such quality enhancement measures maybe implemented in the monitoring process.

There are no such instance observed by CME for current monitoring period of this CPA.

4. Detailed description on monitoring of each of the data parameters

Please refer section G.1 and G.2 below.

SECTION G. Data and parameters

G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period

Data/parameter	**$B_{o,ww}$**
Unit	kg CH_4/kgCOD
Description	Methane producing capacity of the wastewater
Source of data	Paragraph 20 AMS-III.H (version 16)
Value(s) applied	0.25
Choice of data ormeasurement methods and procedures	IPCC value, as per AMS-III.H (version 16)
Purpose of data	Baseline emission calculation
Additional comments	NA

Data/parameter	**U_{FBL}**
Unit	-
Description	Model correction uncertainty factor to account for model uncertainties.
Source of data	Paragraph 20 of AMS-III.H (version 16)
Value(s) applied	0.89
Choice of data ormeasurement methods and procedures	As per AMS-III.H (version 16) paragraph 20
Purpose of data	Baseline and project emission
Additional comments	NA

Data/parameter	GWP_{CH4}
Unit	-
Description	Global warming potential of methane.
Source of data	IPCC value as in Paragraph 20 of AMS-III.H (version 16).
Value(s) applied	21
Choice of data ormeasurement methods and procedures	As per AMS-III.H (version 16) paragraph 20

Purpose of data	Baseline and Project Emission
Additional comments	NA

Data/parameter	$MCF_{ww,, treatment,BL}$
Unit	Fraction
Description	Methane correction factor for baseline wastewater treatment systems i
Source of data	Values from Table III.H.1 of AMS-III.H version 16
Value(s) applied	0.8
Choice of data ormeasurement methods and procedures	In the baseline scenario, the wastewater would have been treated in open loagoon with depth more than 2 meters, hence the MCF is 0.8 according to the Table III.H.1of AMS-III.H version 16
Purpose of data	The data is used for baseline emission reduction calculation
Additional comments	NA

Data/parameter	$\eta_{COD,BL,i}$
Unit	%
Description	COD removal efficiency of the baseline treatment system i.
Source of data	As the project activity is a Greenfield project, the COD removal efficiency is ddetermined in accordance with paragraph 28 (2) (a) of the baseline and monitoring methodology. The COD removal efficiency is obtained from 10-day measurement campaign in the existing wastewater treatment system of other palm oil mills.
Value(s) applied	83.15
Choice of data ormeasurement methods and procedures	Calculated based on the results of the 10 Day measurement campaign that was performed by experts to determine the $COD_{influent}$ and $COD_{effluent}$ of the baseline wastewater treatment in existing open lagoons of other palm oil mills under normal operating conditions. In line with the requirement of the baseline monitoring methodology the result has been multiplied by 0.89 to account for the uncertainty range
Purpose of data	The data is used for calculation of baseline emission.
Additional comments	Data is fixed ex-ante

Data/parameter	$MCF_{ww,treatment\ PJ,k}$
Unit	--
Description	Methane correction factor for project wastewater treatment system *k* (i.e. the anaerobic digester in this CPA).
Source of data	Table III.H.1. of AMS-III.H version 16
Value(s) applied	0.8
Choice of data ormeasurement methods and procedures	IPCC value as per Table III.H.1 in AMS-III.H version 16. The same has been checked and found to be correct.
Purpose of data	Data is used to estimate project emission
Additional comments	NA

Data/parameter	UF_{PJ}
Unit	--
Description	Model correction to account for model uncertainties

Source of data	AMS-III.H (version 16) paragraph 29
Value(s) applied	1.12
Choice of data ormeasurement methods and procedures	As per AMS-III.H (version 16) paragraph 29
Purpose of data	Data is used to estimate project emission
Additional comments	NA

Data/parameter	CFE_{ww}
Unit	--
Description	Capture efficiency of the biogas recovery equipment in the anaerobic digester.
Source of data	Paragraph 30 AMS-III.H (version 16)
Value(s) applied	0.9
Choice of data ormeasurement methods and procedures	Default value as per AMS-III.H (version 16)
Purpose of data	Data is used to estimate project emission
Additional comments	--

Data/parameter	$\rho_{CH4,n}$
Unit	kg/m^3
Description	Density of methane gas at normal conditions
Source of data	Tool to determine project emissions from flaring gases containing methane
Value(s) applied	0.716
Choice of data ormeasurement methods and procedures	Default value as per “Tool to determine project emissions from flaring gases containing methane” (Annex13- EB 28)
Purpose of data	The data is used to estimate the project emission.
Additional comments	NA

Data/parameter	$\eta_{COD,PJ,j}$
Unit	%
Description	COD removal efficiency of the project treatment system j.
Source of data	The COD removal efficiency is obtained from the supplier of the anaerobic digester
Value(s) applied	85
Choice of data ormeasurement methods and procedures	The value is used from manufacturer specification.
Purpose of data	The data is used to estimate the project emission.
Additional comments	--

Data/parameter	$\eta_{flare,h}$
Unit	%
Description	Flare efficiency in hour *h*
Source of data	Default value for open flaring as per “Tool to determine project emissions from flaring gases containing methane”

Value(s) applied	0.5, if flare is detected for at least 20 minutes during an hour 0, otherwise
Choice of data ormeasurement methods and procedures	The flaring system used in the CPA is open flaring. Default value of 50% flare efficiency can be used if the flare is detected for at least 20 minutes during an hour. Otherwise, the default efficiency to be considered as 0%. As per "Tool to determine project emissions from flaring gases containing methane" (Annex13- EB 28)
Purpose of data	The data is used to estimate the project emission.
Additional comments	Flare detector will be installed and monitored in the project scenario.

Data/parameter	NCV_{diesel}
Unit	TJ/Tonne
Description	NCV of diesel
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.2- Default Net Calorific Values (NCVs) and Upper limit of the 95% confidence intervals. Link:http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_1_Ch1_Introduction.pdf
Value(s) applied	0.04
Choice of data ormeasurement methods and procedures	Default value from IPCC has been considered.
Purpose of data	Calculation of project emissions
Additional comments	The value is fixed ex-ante.

Data/parameter	$Density_{,diesel}$
Unit	Kg/Liter
Description	Density of fuel (diesel) in year y
Source of data	Table A3.8 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004
Value(s) applied	0.8439
Choice of data ormeasurement methods and procedures	Default value from has been considered.
Purpose of data	Calculation of project emissions
Additional comments	The value is fixed ex-ante.

Data/parameter	$EF_{CO2,diesel}$
Unit	tCO_2/TJ
Description	Weigted average of emission factor of fuel (diesel) in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.2- Default Net Calorific Values (NCVs) and Upper limit of the 95% confidence intervals. Link:http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_1_Ch1_Introduction.pdf
Value(s) applied	74.8
Choice of data ormeasurement methods and procedures	Default value from IPCC has been considered.
Purpose of data	*Calculation of project emissions*

Additional comments	The value is fixed ex-ante.

G.2. Data and parameters monitored

Data/parameter	**$Q_{ww,i}$**
Unit	m^3
Description	Volume of untreated wastewater entering (inflow) the anaerobic digester in the CPA in year y.
Measured/calculated/ default	Measured
Source of data	Continuous measurement of the POME through flow meter
Value(s) of monitored parameter	92490
Monitoring equipment	Flow meter Make: Endress +Hauser Type: 4x Calibration validity-3 years
Measuring/reading/ recording frequency	Continuous measurement, monthly reporting
Calculation method (if applicable)	Measurements are undertaken by using flow meters. The accuracy and class of the meter is as per applicable industry standard.
QA/QC procedures	The flow is being monitored continuously by calibrated flow meter(s), and aggregated monthly. Calibration of the flow meter was not required during current monitoring periodbeing valid for 3 years.
Purpose of data	To calculate baseline emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	**$COD_{untreated,y}$**
Unit	$tCOD/m^3$
Description	Chemical oxygen demand of the POME entering the CPA treatment system
Measured/calculated/ default	Measured
Source of data	Representative Sampling by CPA implementer
Value(s) of monitored parameter	Teh average value over current monitoring period is 0.063752
Monitoring equipment	Sampling
Measuring/reading/ recording frequency	Daily measurement, monthly average
Calculation method (if applicable)	Measurement of COD is being conducted according to standard practice at in-house laboratory. COD measurements istaken through sampling process ensuring 90/10 confidence/precision level.
QA/QC procedures	--
Purpose of data	To calculate baseline emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	**$COD_{treated,y}$**
Unit	$tCOD/m^3$
Description	Chemical oxygen demand of the treated POME leaving the anaerobic digester in the project scenario.

Measured/calculated/ default	Measured
Source of data	Representative Sampling by CPA implementer
Value(s) of monitored parameter	Teh average value over current monitoring period is 0.008576
Monitoring equipment	Sampling
Measuring/reading/ recording frequency	Daily measurement, monthly average
Calculation method (if applicable)	Measurement of COD is being conducted according to standard practice at in-house laboratory. COD measurements istaken through sampling process ensuring 90/10 confidence/precision level.
QA/QC procedures	--
Purpose of data	To calculate baseline emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	**$BG_{burnt,y}$**
Unit	m^3
Description	Annual volume of biogas combusted in the boiler in year y
Measured/calculated/ default	Measured
Source of data	Measured using continuous flow meters.
Value(s) of monitored parameter	2527583
Monitoring equipment	Flow meter Make: Edress + Hauser Type: PROWIRL 73 Calibration validity 3 years
Measuring/reading/ recording frequency	Continuous measurement, hourly recording, monthly reporting
Calculation method (if applicable)	The biogas combusted in boiler has been monitored using continous flow meter having accuracy class as per applicable industry standard. The flow meter is also capable of monitoring temperature and pressure of the biogas.
QA/QC procedures	The calibration of flow meter was not required during current monitoring period.
Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later. This parameter is monitored to calculate $BG_{burnt,y}$, where $BG_{burnt,y}$= $BG_{combusted,y}$ + $BG_{flared,y}$.

Data/parameter	**$w_{ch4,y}$**
Unit	%
Description	Methane content in the biogas in year y.
Measured/calculated/ default	Measured
Source of data	Onsite measurement using gas analyser.
Value(s) of monitored parameter	69.78
Monitoring equipment	Analyser
Measuring/reading/ recording frequency	Monthly

Calculation method (if applicable)	The fraction of methane in the gas is being measured with periodical measurements at a 90/10 confidence/precision level by appointed staff of the project owner. It is measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO2 is not permitted. The methane content measurement is carried out close to a location in the system where a biogas flow measurement taken place.
QA/QC procedures	The measurement is monitored regularly and the analyser used is calibrated periodically as per vendor's specifications.
Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	T
Unit	^{0}C
Description	Temperature of the biogas recovered
Measured/calculated/ default	Measured
Source of data	Measurements from the temperature indicator
Value(s) of monitored parameter	Average value 41.11
Monitoring equipment	Temperature gauge
Measuring/reading/ recording frequency	Measured at the same time when methane content in biogas ($w_{CH4, y}$) is measured
Calculation method (if applicable)	The temperature of the biogas is required to determine the density of the methane combusted. The biogas flow meter employed measures flow, pressure and temperatureand display or outputs normalised flow of biogas, hence separate monitoring of temperature was not required as per registered CPA, however, the value is monitored for cross check.
QA/QC procedures	Calibration was not required in current monitoring period.
Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	**P**
Unit	Pa
Description	Pressure of the biogas
Measured/calculated/ default	Measured
Source of data	Absolute pressure transmitter
Value(s) of monitored parameter	1470
Monitoring equipment	Pressure gauge
Measuring/reading/ recording frequency	Hourly and monthly recording
Calculation method (if applicable)	The pressure of the biogas is required to determine the density of the methane combusted.As the biogas flow meter employed measures flow, pressure and temperatureand display normalised flow of biogas, hence separate monitoring of pressure of biogas was not required.
QA/QC procedures	Calibration was not required in current monitoring period.
Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	$fv_{i,h}$
Unit	--
Description	Volumetric fraction of component i in the residual gas in the hour h where i = CH4
Measured/calculated/ default	Measured on site
Source of data	Onsite measurement records by CPA implementor
Value(s) of monitored parameter	69.78
Monitoring equipment	Analyser Make-ORSAT
Measuring/reading/ recording frequency	Daily analysis, monthly average and monthly recording
Calculation method (if applicable)	The fraction of methane in the gas being measuredon daily basis and avergae monthly value recorded. The analyser used for measuring fraction of methane is capable of directly measuringmethane content in the biogas. The methane content measurement has been carried out at pecified location provided before biogas flow meter. The accuracy and class of the equipment is as per applicable industry standard. The value for this parameter is also used for the data parameter $w_{CH4,y}$ (methane content in biogas in year y) as both these parameters are usedto determine the fraction of methane.
QA/QC procedures	The calibration of measurement equipment was not required during current monitoring period. Azero check and a typical value check has been performed by comparison with astandard certified gas to cross check the results.
Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later. As a simplified approach, project proponent has only measured the methane content of the residual gas and consider the remaining part as N_2.

Data/parameter	**$FV_{RG,h}$**
Unit	m^3
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h
Measured/calculated/ default	Measured
Source of data	Measurement using flow meter
Value(s) of monitored parameter	2853754
Monitoring equipment	Flow meter Make-Endress + Hauser Type: PROWIRL 73 Calibration validity 3 years.
Measuring/reading/ recording frequency	Continous monitoring, hourly reading and hourly/monthly recording
Calculation method (if applicable)	Both measurements (flow rate of the residual gas and volumetric fraction of methane in the residual gas) is measured with the same reference condition dry basis. The residual gas moisture was average around 40^0C. The parameter monitored oncontinuous basis. Values averaged on hourly basis. The accuracy and class of the meter is as per applicable industry standard. The value for this monitoring parameter has been also used for $BG_{flared,y}$ (quantity of biogas flared during year y) which will be added to $BG_{combusted,y}$ todetermine the total quantity of biogas ($BG_{burnt,y}$).
QA/QC procedures	Calibration of the flow meter was not required in current monitoring period according to themanufacturer's recommendation.

Purpose of data	To calculate project emission
Additional comments	Data will be archived for 2 years from the end of the crediting period or the last request for issuance whichever is later.

Data/parameter	**FC_{diesel}**
Unit	Liter/day
Description	Quantity of fuel type (diesel) combusted in DG sets during the year y
Measured/calculated/ default	Onsite measurement
Source of data	Log book
Value(s) of monitored parameter	0
Monitoring equipment	Volume meter
Measuring/reading/ recording frequency	Continous and monthly aggregation
Calculation method (if applicable)	The consumption of diesel is monitored using volume meters on continuous basis and aggregated monthly.
QA/QC procedures	The data is recorded in Log-book for each fill & aggregated on monthly basis. it can be cross-checked through the invoiced/purchase receipts and opening and closing stocks of diesel
Purpose of data	Calculation of project emissions
Additional comments	All the data will be archived till a period of two years from the end of the crediting period or last issuance whichever is later.

G.3. Implementation of specific-caseCPA level sampling plan

>>

During current monitoring period, COD levels (i.e. CODuntreated,y and CODtreated,y) being determined through sampling. Representative sample size was determined to ensure at least 90/10confidence/precision level requirement, for which this CPA hasfollow the “Best Practice ExamplesFocusing on Sample Size and Reliability Calculations” (Annex-6, EB 67) (hereinafter referred to as “BestPractice Examples”). The CPA has followed the relevant guidance applicable to “Measurement in BiogasProjects” from clause 96 through clause 112 of the Best Practice Examples.

Random COD samples is being taken every day during current monitoringperiod for obtaining the COD values. These monitored results has been used to calculate the mean andstandard deviation for COD results as input parameters in equation 39 (page 20, Annex 6, EB 67 Report)for determining the actual/required sample size for COD measurements over the entire monitoring period.

SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks

H.1. Calculation of baseline emissions or baseline net GHG removalsby sinks

>>

The baseline emission are calculated using below equation

$$BE_y = BE_{power,y} + BE_{ww,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}$$

Where,

$BE_{power,y}$ =Baseline emission from electricity or fossil fuel consumption in year y (considered 0 tCO_2e as conservative)

$BE_{ww,discharge,y}$ = Baseline methane emissions from degradable organic carbon in treated

wastewater discharged into sea/river/lake in year y

$BE_{s,final,y}$ = Baseline methane emissions from anaerobic decay of the final sludge produced in year y (considered 0 tCO_2e as final sludge would have been used for land application)

Hence baseline emission equation reduces to
$BE_y = BE_{ww,treatment,y}$

Where,

$$BE_{ww,treatment,y} = \Sigma(Q_{ww,i,y} * COD_{untreated,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * DF * GWP_{CH4}$$

Where,
$Q_{ww,i,y}$ Volume of wastewater treated in baseline wastewater treatment system i in year y which is affected by the CPA (m^3/year)
$COD_{untreated,i,y}$ Chemical Oxygen Demand of the wastewater inflow to the baseline treatment system i in year y (t/m^3).
$\eta_{COD,BL,i}$ COD removal efficiency of the baseline treatment system.
$MCF_{ww,treatment,BL,i}$ Methane correction factor for the baseline wastewater treatment system i (MCF value can be obtained from Table III.H.1 in AMS-III.H version 16)
$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD)
UF_{BL} Model correction factor to account for model uncertainties (0.89)
GWP_{CH4} Global warming potential for methane (value of 21)

Parameter	Value	Unit	Source
$Q_{ww,i,y}$	92490	m^3	Monitored using flow meter by CPA implementer
$COD_{untreated,i,y}$	0.063752	t/m^3 COD	Monitored using sampling by CPA implementer value taken as average over current monitoring period
$\eta_{COD,BL,i}$	83.15%	%	Fixed ex-ante
$MCF_{ww,treatment,BL,i}$	0.8	--	MCFvalue obtained from Table III.H.1, AMS-III.H V-16
$B_{o,ww}$	0.25	$KgCH_4$/kg COD	IPCC default value
UF_{BL}	0.89	--	AMS-III.H V-16
GWP_{CH4}	21	--	Default value

$BE_{ww,treatment,y}$ = 92490*0.063752*83.15%*0.8*0.25*0.89*21

$BE_{ww,treatment,y}$ =18327.08tCO_2e

$BE_{ww,treatment,y}$ = 18327 tCO_2e (rounded down)

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

>>
The project emission is calculated using below equation

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

Where,
(i) CO_2 emissions from the electricity and fuel used by the CPA ($PE_{power,y}$)
(ii) Methane emissions from wastewater treatment systems affected by the CPA, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$)
(iii) Methane emissions on account of inefficiency of the CPA wastewater treatment systems and

presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$)
(iv) Methane emissions from the decay of the final sludge generated by the CPA treatment systems ($PE_{s,final,y}$)
(v) Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$)
(vi) Methane emissions due to incomplete flaring ($PE_{flaring,y}$)
(vii) Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$)

1. Project emission from consumption of fossil fuel (DG set) based elevctricity

$PE_{power,y}$ =0

As electricity is generated from biogas, its considered as zero.

2. Project emission from wastewater treatment systems affected by CPA and not equiped with biogas recovery system is zero as project activity does not have wastewater treatment system without biogas recovery.

Hence, $PE_{ww,treatment,y}$ = 0 tCO_2e

3. Project emission from treated wastewater is consisered zero, project activity utilises treated watewater for land application.

$PE_{ww,discharge,y}$ = 0

4.Project emission from sludge treatment is zero as used for land application

Hence $PE_{s,final,y}$= 0 tCO_2e

5. Project emission from biogas release in capture system

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

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

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

Parameter	Value	Unit	Source
$Q_{ww,y}$	92490	m^3	Monitored using flow meter by CPA implementer for current monitoring period
$COD_{ww,removed,PJ,ky}$	0.055177	t/m^3 COD	Calculated by CPA implementer value taken as average over current monitoring period
$MCF_{ww,treatment,PJ,k}$	0.8	--	MCFvalue obtained from Table III.H.1, AMS-III.H V-16
$B_{o,ww}$	0.25	$KgCH_4/kg$ COD	IPCC default value
UF_{PJ}	1.12	--	AMS-III.H V-16
GWP_{CH4}	21	--	Default value
CEF	0.9	--	Default value

$MEP_{ww,treatment,y}$ = 92490*0.25*1.12*0.055177*0.8

$MEP_{ww,treatment,y}$ = 1143.13 t CH_4

Hence, $PE_{fugitive,y}$ = (1-0.9) * 1143.13 *21

$PE_{fugitive,y}$ = 2400.59 tCO_2e

6. Project emission due to flaring of biogas

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

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

Parameter	Value	Unit	Source
η_{flare}	0.5	--	default value
$FV_{RG,h}$	326171	m^3	Calculated by CPA implementer value taken as aggregate for current monitoring period
$fv_{CH4,RG,h}$	69.78%	--	Value monitored by CPA implementor on hourly basis and averaged over current moitoring period
$\rho_{CH4,n}$	0.716		IPCC default value
GWP_{CH4}	21	--	Default value

Hence, $PE_{flaring,y}$ = 326171*69.78%*0.716*(1-0.5)*21/1000

$PE_{flaring,y}$ = 1711.06 tCO_2e

7. Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$=0 tCO_2e)

Total project emission
$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{flaring,y} + PE_{biomass,y}$

PE_y = 0 + 0 + 0 + 0 + 2400.59 + 1711.06 +0

PE_y = 4112 tCO_2e (rounded up)

H.3. Calculation of leakage

>>
The CPA does not involve equipment transfer from another activity thus there are no leakages to be accounted for this CPA.
LE_y = 0

According to paragraph 33 of AMS-III.H version 16, for case 1(f), ex-post emission reductions shall bebased on the lowest value as per the following equation (paragraph 34 of AMS-III.H version 16):
$ER_{y,\ ex\ post} = \min((BE_{y,\ ex\ post} - PE_{y,\ ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - PE_{biomass,y} - LE_{y,ex\ post}))$

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

$BG_{burnt,y}$ Annual volume of biogas burnt in year y (m3)
$w_{CH4,y}$Methane content of the biogas in the year y (volume fraction)
D_{CH4} Density of methane at the temperature and pressure of the biogas in the year y (t/m3)
FE Flare efficiency in year y (fraction). If the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% will be applied

Parameter	Value	Unit	Source
η_{flare}	0.5	--	default value as conservative

$BG_{burnt,y}$	2527583	m^3	Monitored by CPA implementer value taken as aggregate over current monitoring period
$fv_{CH4,RG,h}$/ $w_{CH4,y}$	69.78%	--	Value monitored by CPA implementor on hourly basis and averaged over current moitoring period
$\rho_{CH4,n}/D_{CH4}$	0.716		IPCC default value
GWP_{CH4}	21	--	Default value

MD_y =(2527583*69.78%*0.716*0.5*21)/1000

MD_y =14970.48 tCO_2e

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

$ER_{y, ex\ post}$ = min ((14215, (14970.48)

$ER_{y, ex\ post}$ =14215 tCO_2e

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

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	GHG emission reductionsor net GHG removals by sinks (tCO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
7864-002	18327	4112	0	0	14215	14215
Total	18327	4112	0	0	14215	14215

H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in theincludedCPA-DD(s)

Specific-case CPA reference number	Value estimated in exante calculation in the includedCPA-DD(s)	Actual values achieved bythe specific-case CPA(s) during this monitoring period
7864-001	30042[1]	14215
Total	30042	14215

H.6. Remarks on difference from the estimated value in the includedCPA-DD(s)

>>There is a decrease of 52.68% from estimated ERs in registered PDD has been observed during this monitoring period.The project emission due to flaring was considered as zero in ex-ante calculation which is found significant during ex-post emission calculation. Also the palm oil mill was not operational at full load resulting lower value of POME, which is main input to project activity.

[1]Calculated based on number of days in current monitoring period i.e. 260 days

Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities

Coordinating/managing entity and/or responsible person/entity	☒ Coordinating/managing entity ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	PT. Knowledge Integration Services (Indonesia)
Street/P.O. Box	Sudirman Central District Business Jl.Jend.Sudirman Kav.52-53
Building	One Pacific Place 15th floor
City	Jakarta
State/Region	Jakarta
Postcode	12190
Country	Indonesia
Telephone	+6221 2550 2407
Fax	+6221 2550 2555
E-mail	indonesia@knowledge-integration.org
Website	www.knowledge-integration.org
Contact person	Mr. K. R. Raghunath
Title	Managing Director
Salutation	Mr
Last name	Raghunath
Middle name	R
First name	K
Department	--
Mobile	+62821 6535 8786
Direct fax	--
Direct tel.	--
Personal e-mail	raghu@knowledge-integration.org

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